Social Capital in Virtual Learning Communities and Distributed Communities of Practice*

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Abstract

Social capital has recently emerged as an important interdisciplinary research area. It is frequently used as a framework for understanding various social issues in temporal communities, neighbourhoods and groups. In particular, researchers in the social sciences and the humanities have used social capital to understand trust, shared understanding, reciprocal relationships, social network structures, common norms and cooperation, and the roles these entities play in various aspects of temporal communities. Despite proliferation of research in this area, little work has been done to extend this effort to technology-driven learning communities (also known as virtual learning communities). This paper surveys key interdisciplinary research areas in social capital. It also explores how the notions of social capital and trust can be extended to virtual communities, including virtual learning communities and distributed communities of practice. Research issues surrounding social capital and trust as they relate to technology-driven learning communities are identified.

Introduction

Social capital has become an important research area drawing on several disciplines in the social sciences and the humanities. Recently, it has been used extensively to address social problems in temporal communities. For example social capital has been used as a framework to address problems of lack of civic engagement (Putnam, 1993a; 2000), the role of social capital and civic virtue (Sirianni & Friedland, 1995), and social capital as a gateway to economic gains (Sobel, 2002). social capital has also provided a theoretical framework for studying community development (Gittell & Vidal, 1998), organizational development (Cohen & Prusak, 2001) grief intervention (Preece, 2002), the economic performance of firms (Baker, 1990), the creation of intellectual capital (Nahapiet & Ghoshal, 1998), learning in response to change and sustainability in communities (Falk & Harrison, 2000) community and school achievement (World Bank, 1999), community development issues (Gittell & Vidal, 1998), and patterns of social disparity created by lack of technological skills in society and the benefits to those who possess such skills) (Resnick, 2002).

Despite growing research efforts to examine, understand and apply social capital and use trust as a proxy to determine the presence or absence of social capital in physical communities, little has been done to extend this understanding to virtual communities,

including both virtual learning communities and distributed communities of practice . The sprawling development of virtual communities as hubs for information exchange and knowledge construction makes the construct of social capital relevant to understanding communication and learning in virtual settings.

Our position in this review is that constructivism emerges out of interactions in a virtual community, and a social constructivist epistemology underpins the development of social capital in virtual communities. High social capital is crucial for creating successful virtual learning environments (both virtual learning communities and distributed communities of practice). In this article, we provide a deep exploration of the nature of social capital and offers potential directions for research in social capital within virtual learning communities and distributed communities of practice.

Social Capital

Researchers in the social sciences and humanities consider social ties to be a social resource. Such a resource is referred to as social capital. Narayan and Pritchett (1997) suggested that communities with high social capital have frequent interaction, which in turn cultivates norms of reciprocity through which learners become more willing to help one another, and which improve coordination and dissemination of information and knowledge sharing. Social capital has been used as a framework for understanding a wide range of social issues in temporal communities. It has been used for the investigation of issues such as trust, participation, and cooperation.

Defining Social Capital

Social capital is an imprecise social construct that has emerged from a rather murky swamp of terminology, but it is still useful for exploring culture, society and social networks. The notion of social capital originated from studies of conventional or temporal communities. social capital highlights the central importance of networks of strong personal relationships that develop over a period of time. Such relationships, it is argued, provide a basis for trust, cooperation, and collective action (Jacobs, 1965).

In one of the earliest definitions of social capital, Hanifan (1916) stated that social capital included "those intangible substances [that] count for most in the daily lives of people - namely goodwill, fellowship, sympathy and social intercourse among the individuals and families who make up a social unit." Many years later, Coleman (1988) followed a similar line of thinking when he suggested that social capital refers to supportive relationships among adults and children that promote the sharing of norms and values.

But more recently, some definitions of social capital have adopted a more institutional tone, and they attempt to articulate the value that social structures contribute to organizations. For example, Fountain (1998) defines social capital as the institutional effectiveness of inter-organizational relationships and cooperation—horizontally among similar firms in associations, vertically in supply chains, and multidirectional links to sources of technical knowledge, human resources, and public agencies. This form of capital, Fountain argues, is as powerful as physical and human capital, and is the "stock" that is created when a group of organizations develop the ability to work together for

mutually productive gains. Similarly, Woolcock (1998) argues that social capital 'encompasses the norms and networks facilitating collective action for mutual benefit.'

Social scientists and learning science writers have favoured blending the human and institutional orientations by emphasizing a wide range of interpersonal relationships, and how these contribute to personal and organizational resources. For example, Nahapiet and Ghoshal (1998) defined social capital as the sum of actual and potential resources embedded within, available through and derived from the network of relationships possessed by an individual or social unit. And Fukuyama (1999) included informal norms that promote cooperation between two or more individuals. The norms that constitute social capital can range from a norm of reciprocity between two friends, all the way up to complex and elaborately articulated doctrines like Christianity, Islamism or Confucianism. And so by definition, trust, networks, civil society, and the like which have been associated with social capital are all epiphenomenal, arising as a result of social capital but not constituting social capital itself.

A meta-societal definition of social capital was offered by the World Bank (1999), which referred to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. In this view, social capital is seen not merely as the sum of the institutions that underpin a society – it is the glue that holds them together.

In order to discriminate social capital from physical capital, Putnam (2000) argued that physical capital refers to physical objects and human capital refers to the properties of individuals. He further suggested that social capital refers to the connections among individuals—their social networks, their norms of reciprocity, and the trust that arises from them. Cohen and Prusak (2001) extend Putnam's definition to define social capital as a stock of active connections among people, which covers the trust, mutual understanding, and shared values and behaviours that bind people as members of human networks and communities.

Clearly, there is no single definition of social capital, but it is possible to categorize current definitions into two major categories. There is a structural dimension (Bourdieu, 1983; Coleman, 1988; Fountain, 1997; Nahapiet & Ghoshal, 1998; Wolcock, 1998; World Bank, 1999), and a content dimension in which social capital resides (Cohen & Prusak, 2001; Fukuyama, 1999; Hanifan, 1916; 1920; Putnam, 2000). The structural dimension refers to the fundamental elements of the network such as types of ties and connections and the social organization of the community. The content dimension of social capital includes the types of norms, trust, shared understanding and those variables that hold people together.

Drawing from these structural and content dimensions of social capital it is possible to conclude that there is no single construct called social capital, but rather, social capital can be understood as a composite of different variables, each of which can be interpreted independently. As a working definition, we define social capital in virtual learning communities as *a common social resource that facilitates information exchange, knowledge sharing, and knowledge construction through continuous interaction, built on trust and maintained through shared understanding.*

Approaches to Measuring Social Capital

Linked to the failure to reach consensus on a definition for social capital, there is a perplexing problem with measuring the concept. Fukuyama (1999) has suggested that one of the most common shortcomings of social capital is the absence of consensus on how to measure it. Because social capital has proven to be imprecise and elusive concept, almost everyone who writes about measuring it finds it necessary to provide some definition from their own perspective. For example Foley and Edwards (1999), Paxton (1999), Portes (1998), Turner (1999), and Woodcock (1998) have examined the issue of measuring social capital and followed different definitions. Researchers like Bowles (1999) and Durlauf (1999) provide brief, critical measurement dimensions of social capital but mainly from an economic point of view.

It seems there are various reasons why a standard yardstick for measuring social capital hasn't been developed. First social capital is a multivariate and multidimensional concept. Second, social capital is considered as the property of groups or communities or individuals. And measuring concepts such as communities is already problematic, as sociologists and anthropologist have struggled unsuccessfully over several decades to agree on a standard definition of a community. Third, there are limited numbers of empirical studies that attempt to measure social capital as a primary outcome. This creates problems for researchers who are normally reduced to compiling secondary indicators of social capital such as measures of trust, voting rate, membership in associations, civic engagement etc.

Possible Benefits of Social Capital

Researchers and writers in the social sciences and humanities have consistently supported the presence and value of social capital in physical communities, and this has promoted extending social capital research to new contexts. Putnam (2000) suggested that social capital allows people to resolve collective problems more easily; that is, people are normally better off if they cooperate with each other. Mechanisms such as social sanctions are used for coping with breaches in social norms (e.g., a case in which individuals benefit by shirking their responsibilities, hoping others will do their work for them). He also observed that social capital greases the wheel that allows communities to advance smoothly. For instance, when people are trusting and trustworthy, and maintain continuous interaction, everyday business becomes more easy and enjoyable. Furthermore, he added that networks also serve as a conduit for helpful information dissemination that contributes to the achievement of personal as well as community goals. For example, people who are well connected usually receive good news first.

Social capital can help preserve social norms in the community and reduce delinquent or selfish behaviour. People who are well connected in a community and have active trusting connections with others are likely to behave in the accepted social manner. For example, medical doctors will normally be constrained to behave in specific ways, have specific eating habits, even dress in specific ways, especially in public. This is not necessarily because they want to do so, but because of the expectation the community puts on them.

The community benefits of social capital appear to extend to formal educational institutions. The World Bank (1999) found that schools were more effective when parents and local communities were actively involved. Teachers were more committed and

students had high tests scores. The mentoring, networking and mutual support associated with high levels of social capital contributes to success in education (Coleman, 1988).

Firms benefit from social capital because it facilitates cooperation and coordination, which minimizes transaction costs, such as negotiation and enforcement, imperfect information and layers of unnecessary bureaucracy. Reciprocal, interdependent relationships reinforce compliance, which helps firms minimize financial risks. For instance, in a production system such as automobile company, where there is a lack of cooperative agreement, a parts manufacturer might be able to take advantage of others by strategically altering prices. In the corporate sector, social capital can provide a competitive edge because efficiency gains in time and information allow more resources to be devoted to producing and marketing a better product at a higher volume.

Social capital can bridge cultural differences by building a common identity and shared understanding. The fact that building social capital requires continuous interaction enables people to identify common interests and build trust. This raises their level of shared commitment, and encourages a sense of solidarity within a community. Furthermore, from the perspective of organizational management, Prusak and Cohen (2001) claim that social capital can promote better knowledge sharing due to established trust relationships, common frames of reference and shared goals.

Pitfalls of Social Capital

Despite benefits of social capital in communities, including outcomes that lead to a better quality of health, education, cooperation, collaboration and trust, there are also a number of potential drawbacks. The presence of social capital in communities might exert a negative influence. For instance, in multicultural societies where people are closely affiliated to communities but pay close allegiance to tribal, ethnic, or political allegiances to their own groups rather than national interests, there is a decline in the national political culture.

Communities that exhibit highly cohesive forms of social capital are not necessarily beneficial to a society. These groups might encourage internal trust among their members while spreading hate and terror to the larger society. Such is the case with many terrorist organizations and organized crime groups. Communities that exhibit highly cohesive forms of social capital are thus not necessarily beneficial to the overall society.

Cohesive communities that manifest strong social capital may exclude others from entering into the communities, and this can lead to abuses that harm the community. For example, individuals in influential government positions may exercise an unspoken policy of employing members of the community regardless of their qualifications, and this can result in excluding qualified workers from the workforce. Similarly in the corporate sector, if social capital is developed with the wrong partners or there is not enough autonomy, then ingenuity, reputation and ultimately revenue can suffer. For example, intense social capital in a family-firm may promote inefficient norms such as nepotism, which can hinder profitability (Fukuyama 1995).

The construct of social capital is also problematic for researchers and scholars. Woolcock (1998) argues that the indiscriminate and uncritical adoption of social capital across disciplines risks explaining too much with too little substance. The fact that communities exist within particular contexts makes every community unique. However,

measurement and application of social capital are context dependent, and so research on social capital may lack theoretical specificity and simplistically link one cause to one variable. social capital research must recognize the multivariate nature of social capital. For instance, Putnam (2000) suggests that a decline in associational life leads directly to a lack of civic engagement. He also treats a decrease in trusting behavior in a community as direct evidence of a decrease in social capital. While these relationships no doubt exist, the underlying relationships are probably much more complex.

Implications of Social Capital

Nahapiet and Ghoshal (1998) suggested that social capital could facilitate the development of knowledge capital by exchanging information and sharing knowledge. Woolcock (1998) proposed three dimensions of social capital: bonding, bridging and linking. According to Woolcock (1998), *bonding social capital* refers to relationships with people who are alike. Communities that demonstrate strong internal cohesion easily and fluidly share knowledge. *Bridging social capital* is establishing relationships with people who are different. This might include people from other communities, cultures or socio-economic backgrounds. Individuals in communities that manifest bridging dimensions of social capital enjoy gathering information and knowledge from outside their communities and remaining updated on external issues. *Linking social capital* refers to relationships with people in power. Linking social capital enables individuals to leverage resources, ideas, information and knowledge within a community or groups.

Putnam (2000) distinguishes between bonding and bridging. He states that bonding relates to social capital within a community of individuals who already know each other. On the other hand, bridging refers to connections among individuals who did not know each other previously. Bonding in social capital is good for building specific reciprocity and mobilizing solidarity within a community. Bridging, by contrast, is better for building links to external assets and for information diffusion.

Social capital also describes circumstances in which individuals can use membership in communities and networks to secure benefits such as easy access to information and knowledge gathered by others in the community. Bourdieu and Wacquant (1992) suggested that individuals, by virtue of their possession of a durable network of institutionalized relationships, can derive benefits from the cumulative actual and virtual resources residing in a community. Studies have suggested that social capital is created through purposeful action and resultant knowledge can be transformed into conventional economic gains (Bourdieu, 1996; Sobel, 2002).

Social capital can be beneficial to both individuals and the community in which these individuals reside. However, the extent to which an individual can derive economic gains from social capital depends on the extent to which an individual is connected to others in the community (i.e., who an individual knows, how close his/her relationship is to others, and the resources available through these connections). For example, people who are well connected to others of some significance in a community can have access to information about job opportunities, which in turn provides them with personal economic gains.

Although Putnam (2000) suggested that social capital is a private as well as a public resource, Bourdieu (1996) considers social capital to be an attribute of an *individual in a social context*. For Putnam (2000), social capital is private because individuals can choose to or not to dispose of their connection to the community. Arrow (2000) has similarly noted that one cannot transfer social capital from one individual to another. Sobel (2002) however, argues that it is possible to indirectly transfer social capital from one person to another. He noted that a part of the social capital of a storeowner for example, is the reputation of his/her shop. And it is possible to transfer ownership of the store to another person without destroying the faith customers have in the products in the shop.

These claims are echoed in popular economic analysis, which asserts that establishing corporate identities for good names is a way to establish markets for certain types of social capital (Tadelis, 1999). For instance companies that have earned a good reputation for the production of particular brands are likely to attract more investment. Such arguments might be grounded in market research, but the analyses lack the distinctions between trust, identity, reputation, and social capital. It is most likely that conclusions from this analysis indicate a casual use of the term social capital, and therefore do not contribute much to a clear understanding of what variables constitute social capital and how such variables should be measured. social capital might be closely correlated to other concepts but these concepts should not be used synonymously with social capital. Putnam (1993b) pointed out that social capital is a composite of norms, trust and networks that enable participants to act together effectively to pursue shared goals. In principle, the more that people connect to each other, the more they are likely to develop social relationships with each other, which in turn might facilitate the development of trust or even distrust. For shared understanding and trust to be brought about by the presence of social capital highly depends on the nature of the individuals involved in the relationships. Where there is high trust, it has been demonstrated that people are more willing to engage in social exchanges (Putnam, 1993a). Trust may indicate openness to the potential for creating knowledge capital. But treating variables such as trust, cooperation, norms as synonymous to social capital undermines our understanding of the influence of interactions among these variables on the development of social capital.

A central proposition of social capital is that networks of relationships constitute an important resource for social action and the conduct of social affairs (Bordieu, 1986). Access to resources within a network can reach beyond small clusters of intimate relationships built up over time (which lead to feelings of obligation, and trust (Bordieu, 1986) through 'weak ties' (Granovetter, 1973) and 'friends of friends') to gain access to additional information and privileges. Bordieu (1986) identifies how social capital can be derived from membership in specific networks, especially where the membership is restricted or "bonded" (Putnam, 2000).

Nahapiet and Ghoshal (1998) identified different structures of social capital clusters: structural, relational, and cognitive. The structural dimension of social capital relates to an individual's ability to make connections to others within a community. This

is normally done through information dissemination. An advantage of this dimension is that it reduces the amount of time and investment required of an individual to gather information.

The significance of the relational dimension of social capital is highlighted in Szulanski's (1996) study of the transfer of best practices within organizations. There are four components of the relational dimension of social capital: trust, norms, obligations and identification (Nahapiet & Ghoshal, 1998). In general are many important aspects of the relational dimension, including network ties, access to information through what an individual knows; network configuration, density, connectivity and hierarchy, as well as the ability to have 'weak-ties' (Granovetter, 1973).

The cognitive dimension is an important aspect of social capital, and according to Boisot (1995) and Boland and Tenaski (1995) it is predicated on meaningful communication as an essential part of combination processes. They argue that this requires at least some sharing of context between the parties involve in the exchange. Sharing might come about through shared codes and language (i.e., the extent to which people share a common language facilitates their ability to gain access to others and information). Differences in language and codes keep people apart (Nahapiet & Ghoshal, 1998), and shared narratives adhere people (Orr, 1990; Wenger 1998).

Lave and Wenger (1991) and Brown and Duguid (1991; 2000) observed that shared language and codes facilitate individuals' abilities to gain access to people and information, but when individuals do not share language and codes, they can fail to come together. Language is not only a means by which individual can communicate and exchange knowledge and information, but it also determines how individuals perceive information they receive from individuals within their community or outside the community. A shared language, formed over time, within communities, enables members to share a common conceptual apparatus for evaluating the likely benefits of exchange.

Social anthropologists have long suggested that shared narratives, in the form of myths, stories and metaphors, are a powerful means for creating, exchanging and preserving rich sets of meaning (Clark, 1972). The strength of shared narratives, for enabling the exchange of information and sharing of knowledge is emphasized by Lave and Wenger (1991), Wenger (1998), Orr (1990) and Brown and Duguid (1991; 2000). While many researchers seem to agree that shared languages, codes and narratives provide an important resource for the construction and maintenance of communities, they also warned about the dangers of having well defined community boundaries, which can make it difficult for a community to integrate new members and assimilate new knowledge into the community from other communities (Wenger, 1998).

Trust and Social Capital

In almost every discussion of social capital, trust is treated as a central variable. In fact, most approaches for measuring social capital, whether quantitative or qualitative, ask questions that are directly aimed at measuring the level of trust. Researchers treat trust as if it can directly produce social capital. For example, Putnam (2000) argues that trust is related to social capital in that social capital generates trust and the expectation of reciprocity. The World Bank (1999) further suggests that the basic premise of social

capital rests on interaction, and interaction enables people to build communities, and to commit themselves to each other through trusting social relationships. A sense of belonging and the concrete experience of social networks (and the relationships of trust and shared understanding that are involved), can produce social capital.

While there is a relationship between social capital and trust, such a relationship cannot be reduced to simple cause and effect interpretations. Rather, the relationship is reciprocal and complex--one that shares variance with other intermediate variables. For instance, trust can generate common norms and shared understanding and common norms and shared understanding can evolve into social capital. In addition, the presence of social capital in a community can encourage more trusting relationships.

Furthermore, various forms of trust might influence social capital differently. For instance, individuals might trust a particular community but they might not necessarily trust other individual members of that community. Referring to the discussion of the shortcomings of social capital, communities that manifest strong internal cohesion might exhibit strong social capital at that level, but such a community might develop a strong resistance to outsiders and the entire society in which it belongs. In other words any community that has strong in-group trust (trust in specific people) and lacks generalized trust (general trust in human nature) might manifest negative social capital at the societal level.

Studies on trusting behaviour emphasize relationships, which require face-to-face interaction. However, it is still not known what mechanisms can promote trust in a community where face-to-face interaction is very limited and in situations where individuals hardly know each other. This further complicated by the fact the notion of trust consists of other variables such as reputation and recommendation, which might foster trust.

Critical Dimensions for Developing Trust Measurements

Measurement of a concept like trust is just as problematic as measuring social capital. But recent empirical studies have posited the idea that there are at least two different scales for measuring trust—partner trust (trust in a specific known person) (Lundasen, 2001) and generalized trust (trust in people in general) (Couch & Jones, 1997). Trust in people in general (generalized trust) corresponds to "thick and thin" trust (Putnam, 1993b; Fukuyama, 1995). Several assumptions about trust include:

- Trust is a measurable belief, and its measurement is based on a number of factors such as attitudes, perceptions, evidence, and experiences;
- Trust evolves and changes over time;
- Trust is directed and relative;
- Trust in individuals does not necessarily translate into trust in a system or a group;
- Trust is reflexive, yet trust in oneself is relative;
- Trust is transferable from one context to another but not from one individual to another;
- Trust is not transitive, (i.e., if agent **a** trusts agent **b** and agent **b** trusts agent **c**, this does not automatically translate that agent **a** will trust agent **c**).
- Trusting others can involve cultural attitudes;
- Trust can be based on individual competence;

- Agents can trust other agents with whom they have a long history of interaction;
- An agent can trust those individual agents with whom it shares similar culture—*cultural trust*;
- Trust can be based on personal experiences;
- Agents can trust a legal institution more than the individual agents that belong to it;
- An agent will choose to trust another person whom he/she does not know in a situation where there is little choice in who to trust. This is similar to blind trust (Lamsal, 2001).

A prerequisite condition for trust to occur is awareness, and the concept of awareness has been explored extensively in Computer Supported Collaborative Work (CSCW). Awareness in CSCW generally refers to an understanding of the overall state of the system (Dourish & Bellotti, 1992). Dourish and Bellotti (1992) further suggested that awareness is deriving understanding the actions of other people in order to understand the context of your own actions. Solhlenkemp (1999) concludes that without awareness, co-coordinated and co-operative work is almost impossible. Gutwin and Greenberg (1998) suggested four types of awareness: social awareness, task awareness, concept awareness and workspace awareness. Social awareness is the awareness that people have about the social connections within the group. Task awareness is the awareness of how a shared task will be completed. Concept awareness refers to the awareness of how a particular activity or piece of knowledge fits into an individual's existing knowledge. Workplace awareness is sensitivity to the context, and what is appropriate or inappropriate in a particular work setting.

There are also other types of awareness that are mentioned in the CSCW literature: *causal awareness* of others in a group, which refers to the sense of who is around, what they are up to and whether people are available (Borning & Travers, 1991); and situation *awareness*, a phenomenon of experts interacting with complex systems and adjusting their performance dynamically (Gibson 1995). *Conversational awareness* refers to the ability of two or more people to adjust their conversation based on cues picked up from their conversation partners (Clark 1996).

But despite the proliferation of types of awareness in the literature, we suggest adding two more types—*socio-cultural awareness* and *knowledge awareness*. Socio-cultural awareness is related to social awareness because it seeks to understand the demographic and social profile of individuals in a community, and it can be defined as *current information on every individual's social background in the community: this includes* country of origin, *gender, first language, known reputation, language(s), cultural beliefs, as well as information about the community, such as goals and group identity*.

Knowledge awareness is related to concept awareness, since both of them attempt to provide information that is useful for learning or acquisition of knowledge in a particular domain. Knowledge awareness refers to *an individual's knowledge capabilities: such as information on level of skills, knowledge and experiences in a particular domain within a community*.

Virtual Communities and Social Capital

The construct of social capital, as it has developed in the study of temporal communities, can be used to study virtual communities. Social capital depends on the development of social relationships and these relationships are built on social connections. But social connection requires people to become aware of the people with whom they connect (socio-cultural awareness), and under what circumstances they can obtain peer-support, collaborate, learn, and work (knowledge awareness) together as a community. Understanding socio-cultural and knowledge backgrounds of individuals and their communities are critical to the development of trusting relationships, which in turn influences the development of social capital in virtual learning communities. It is reasonable to speculate that these variables will play out differently in virtual settings, given the physical separation and relative anonymity of community members, and the social barriers imposed by technology.

Developments in global communication networks support social engagement that, in turn, promotes the formation of virtual social systems. The dominant metaphor for describing a distributed social system is virtual community. The proliferation of virtual communities as hubs for exchanging information and knowledge has attracted research interest from several disciplines. Cross-disciplinary research, especially in the social sciences and humanities, has focused on the nature of virtual communities and the value they provide to society. In technology related areas, researchers are interested in ways of constructing technologies to support virtual communities. In education, researchers are interested in how virtual communities support learning.

Researchers in the social sciences and humanities have contributed a significant body of work on virtual communities. A common focus of this research is how technological developments affect the formation of social structures in temporal communities and virtual communities, and in particular, the relationship between virtual communities and temporal communities has been explored. In most cases, knowledge drawn from such studies critically examines technological developments in society and the effects of technology on social structures.

Despite growing interest in the investigation of social, educational and technological issues in virtual communities, the overall quality and depth of research varies considerably. One possible reason is that virtual communities and research issues surrounding them cut across disciplines, and there are limited interdisciplinary methodologies for addressing these issues thoroughly. In addition, because the area is relatively new, there has been little opportunity to address many emerging research issues in virtual communities. Wellman, (1979) acknowledged that asking the right kinds of questions, formulating interesting hypotheses and adapting research methods to an emerging field poses many challenges. Further, in an interdisciplinary area, it normally takes time for the scientific community to relate to each other in a way that makes any kind of collaborative progress in research possible (Stolterman, Argren, & Croon, 2000).

Research and methodological approaches adapted to these kinds of studies are diverse, and they range from empirical to theoretical. For example, empirical sociological and cultural studies on virtual communities can be identified (Cothrel, 1999; Kollock &

Smith, 1997; Parks, 1996; Wellman & Milena, 1998; Wellman, 1999), and the literature also includes in-depth cases studies (Smith, 1992; Turkle, 1995; Wickre, 1995). In technology-related fields, such as computer science and information systems, research is mainly aimed at understanding developments in technology and how these developments can be used to build tools and systems that support changing social structures. This research covers philosophical, educational, social and technological approaches (Benedict, 1991; Coyne, 1995; McCalla, 2000; Mitchell, 1995; Preece, 2002; Stefnik, 1996). In general, cross-disciplinary research perspectives can be subcategorized into applied technology, ethno-narrative, cultural studies, and socio-technical perspectives, and each of these can contribute to social capital inquiry by providing distinct perspectives on shared problems.

- **Applied technology perspectives.** Much of the work done on virtual communities by computer scientists and information systems researchers has a key goal of understanding social issues that can be used for building technologies that foster interaction in virtual environments. A growing number of freelance developers and researchers in industry and universities, are investigating different ways to create software packages that add new functionality to systems that support interaction, collaboration and learning in virtual communities (Kim, 2000; McCalla, 2000; Preece, 2000; Resnick, 2002; Schraefel, Ho, Chignell, & Milton 2000). This area of research and development includes the open source movement. A recent report states that the open source software communities are among the most successful-and least understood-examples of high-performance collaboration and community building on the Internet (Kim, 2003). Research and development on the open source movement could be useful as it might provide insight into building useful tools that support the development of social capital in groups, as well as enrich our understanding of how these types of communities conduct the business of collaborative development.

- **Ethno-narrative perspectives.** This category of researchers includes people who write about their personal experiences as members of virtual communities. They consider themselves to be indulging in a form of quasi-empirical research. They normally take a narrative approach, similar to participant observation inquiry used in anthropology. The ethno-narrative focus is mainly on comparative analysis of virtual and temporal communities. Although their approach is grounded in participant observation, it is difficult to label their work as scientific. Results of these studies do not have external validity, and conclusions are tentative and limited to the groups under study (c.f. Downes, 2001; Rhiengold, 1993; 2002). Stolterman, Croon and Argren (2000) argue that although the generalizability and validity of these studies are limited, their results provide a useful narrative introduction to the field and promote further inquiry into the nature of virtual communities and technologies that can be developed to support these communities. We suggest that narrative research can be used to reveal the interplay of subtle variables that contribute to social capital; the nature of social

capital in virtual communities may be embedded in the stories told by participants.

- **Cultural studies perspectives.** Cultural studies often take a postmodern perspective and employ contemporary philosophical approaches. The basic goal of such studies is to investigate the relationship between the virtual and the actual, and they reside strictly within the context of cultural interpretation. Approaches in this category include experimental studies with an emphasis on cultural events in virtual communities. The background disciplines of this group are diverse, including social psychology, philosophy, psychology and fine arts. Examples of cultural studies perspectives can be found in Brook and Boal (1995), Dery (1994) and Hershman- Leason (1996). A cultural perspective could be particularly important to understanding social capital, because virtual communities transcend cultures and invite integration across traditional geographical, political, religious and ethnic boundaries.

- **Sociotechnical perspectives.** This research direction emphasizes that human needs and characteristics should be given as much weight as technical and commercial issues when new technologies are being designed. Examples of sociotechnical perspectives include work by Mumford (1987), Norman (1996), Preece (2002), Preece (2000), Schwier (2001), and Shneiderman (1998). This research resulted in the development of several frameworks, such as community-centred development (Preece, 2000). A sociotechnical approach is based on the following premises:
  - *User-centred design* (Norman 1986). User-centred design focuses on the user rather than on the technology;
  - *Contextual enquiry*. Contextual enquiry requires the understanding of the user's context and its potential influence on the use of technology (Preece 2000);
  - *Participatory design.* Strong user participation is fostered throughout the design process (Mumford 1987);
  - *Direct- Manipulation* (Shneiderman, 1998). The interface allows concepts to be directly manipulated.

While sociologists argue about how to define community, this discussion understands a community to be a group of people who relate socially to each other to achieve some common goals. These relationships often reinforce one another, and they are neither serial nor isolated. Fundamental to this notion of community is a measure of commitment to shared values, norms, and meanings, a shared history and identification within a particular culture. A temporal community resides in a fixed locale and its members usually meet, talk and develop knowledge of each other. A virtual community, on the other hand, is a composite of people, the space where they interact, their goals, and the technologies that they use to communicate, collaborate, and work together to achieve their goals as a community. In a virtual community, members might not be aware of other participants' backgrounds, and this lack of awareness mitigates the development of social capital.

Virtual Learning Communities and Distributed Communities of Practice

Virtual communities take various forms, most of which are organized around temporal community models. They share certain elements, such as common goals, shared understanding, trust, and adherence to a common set of social protocols. Our interest in social capital centres on the role it plays in virtual learning environments that emphasize learning.

Two major forms of virtual learning environments are *virtual learning communities* (McCalla, 2000; Schwier, 2001), and *distributed communities of practice*. A VLC is a group of people who gather in cyberspace with the intention of pursuing learning goals (Daniel, McCalla & Schwier, 2002), while a distributed community of practice refers to a group of geographically distributed individuals who are informally bound together by shared expertise and shared interests or work. Such individuals depend on information and communication technologies to connect to each other. A key difference between distributed communities of practice and virtual learning communities is the nature of membership identity. While most individuals in virtual learning communities often hardly know each other, individuals in distributed communities of practice are typically well known to each other (see Table 1). Although all virtual communities have an element of learning in them, not every community can be referred to as a learning community. A learning community implies that members have explicit goals involving learning. Also, highly skilled or knowledgeable individuals in a community are a necessary but not a sufficient condition for a community to become a "learning community." Knowledgeable or experienced individuals in a learning community join those who are less knowledgeable so that members grow mutually as a community.

Table 1. Key Features of Virtual Learning Communities and Distributed Communities of Practice

Virtual Learning Communities	Distributed Communities of Practice
• Less stable membership	• Reasonably stable membership
• Low degree of individual awareness	• High degree of individual awareness
• More formalized and more focused learning goals	• Informal learning goals
• More diverse language	• Common language
• Low shared understanding	• High shared understanding
• Strong sense of identity	• Loose sense of identity
• Strict distribution of responsibilities	• No formal distribution of responsibilities
• Easily disbanded	• Less easily disbanded
• Low level of trust	• Reasonable level of trust
• Life span determined by extent to which goals or requirements are satisfied	• Life span determined by the value the community provides to its members
• Pre-planned enterprise and fixed goals	• A joint enterprise as understood and continually renegotiated by its members
• Domain specific /interests	• Shared practice/profession

Lesser and Prusak (1999) used structural, relational and cognitive dimensions to describe how communities of practice support developing social capital in groups. The structural dimension emphasizes how communities encourage networks to develop among individuals with similar interests. Structurally, a community can serve as a clearinghouse for connecting individuals, as a reference mechanism for evaluating the knowledge of other participants without contacting them directly, and as a channel for connecting community members to individuals outside the network. The relational dimension provides a method of testing the value and commitment of other community members. In essence, the relational dimension relates to trust by supporting opportunities for individuals to evaluate the trustworthiness of others in the community. The cognitive dimension includes shared knowledge objects or other artifacts, stories and "vernacular" within the community. The aim of all of these dimensions is to improve organizational performance by helping individuals manage their own knowledge and participation in the community.

In a community of practice individuals are characterized by tight-knit relationships, they work together towards common goals and they are willing to collaborate to solve common problems, share best practices, support each other, and have a common identity. The theory of community of practice is used to define organizational strategies to promote collaboration, teamwork, and group learning mainly in the corporate sector. Currently, public and private corporations have adopted this theory to position themselves for leadership in the knowledge economy. Successful communities of practice are organized around the needs of their members and as such, exhibit a wide range of sizes, structures, and means of communication. Our notion of distributed communities of practice is built upon the theory of communities of practice developed by Lave and Wenger (1991). Their key features of distributed communities of practice are listed below:

- **Shared interests**—Membership is organized around topics or domain issues that are important to them.
- **Common identity**—Members develop shared understanding and common identity.
- **Shared information and knowledge**—Members share information and knowledge, or they are willing to develop a culture of sharing, voluntarily responding to requests for help.
- **Voluntary participation**—Members normally voluntarily participate in the activities of the community.
- **Autonomy in setting goals**—A distributed community of practice sets its own agenda based on the needs of the members and these needs change over time as the community evolves and membership and environment changes.
- **Awareness of social protocols and goals**—Members in a distributed community of practice are normally aware of the acceptable social protocols and goals of the community.

- **Awareness of membership**—Members in a distributed community of practice are normally aware of each other in the community; that is, individuals have a reasonable knowledge of who is who and what they do in the community.
- **Effective means of communications**— Effective communication among others remains a key distinguishing factor among communities. Robust communication may include face-to-face meetings and technology-mediated communication such as email, videoconferencing, discussion forums, WebPages, intelligent agents.

Virtual learning communities are closely related to distributed communities of practice in many ways. For example, both emphasize a social constructivist epistemology and they may both have learning goals. However, virtual learning communities and distributed communities of practice also have considerable differences in membership, goals and social norms. Fundamental elements that make up virtual learning communities include:

- **Individuals**—People interact socially as they strive to satisfy their own learning needs or perform special roles in the community to enhance learning.
- **Content**—Individuals in virtual learning communities have explicit goals for learning about a particular content domain or topic.
- **Shared purpose**—Individuals focus on an interest, need, information, service, or support, which provides a reason for belonging to the community.
- **Social protocols**—Virtual learning communities have tacit assumptions, rituals, protocols, rules, and laws that guide interactions among members.
- **Communication**—CMI tools are used to support and mediate social interaction and facilitate a 'sense of togetherness.' Communication also involves exchanging information and sharing knowledge.

We consider collaboration in learning environments, the most important shared characteristic in virtual learning communities and distributed communities of practice, to be central to the development of social capital. Studies have demonstrated that collaborative learning enhances active exchange of ideas and increases interest among the participants while also promoting critical thinking (Garrison, 1997; Hiltz, 1998). Heinrichs (2003) observed that learning environments with rich interaction and collaboration increase the chances for deep learning, and this implies a strong link between social capital and learning in these types of environments. Collaborative environments support meaningful learning by sharing and employing what students know in the assessment of learning (Pellegrino, 2001).

Collaborative learning environments, whether virtual or temporal, are developed on the assumption that knowledge is a complex entity that is shaped by social context, not a simple product to be transmitted or shared. Knowledge is the combination of information, context, and experience, and while there is no agreed upon standard definition of knowledge, knowledge can be conveniently classified as either tacit or explicit (see Table 2).

Table 2. Comparative characteristics of tacit and explicit knowledge.

Tacit Knowledge	**Explicit Knowledge**
• Drawn from experience and is the most powerful form of knowledge	• Can become obsolete quickly
• Difficult to articulate formally	• Formal articulation possible, and can be processed and stored by automated means, or other media
• Difficult to communicate and share	• Easily communicated and shared
• Includes privately held insights, feelings, culture and values	• Formally articulated and public
• Hard to steal or copy	• Can be copied and imitated easily
• Shared only when individuals are willing to engage in social interaction	• Can be transmitted

These types of knowledge are common to both temporal and virtual communities but the protocol for transmitting each one of them differs. The knowledge construction process in virtual learning communities involves continuous engagement in social processes (see Figure 1). Individuals share data and the data are processed into information. In turn, information can be situated in a particular context and turned into knowledge for a particular individual. How specific knowledge is generated from data and information depends on how the data are stored, and how information is presented, organized, communicated and received by particular individuals.
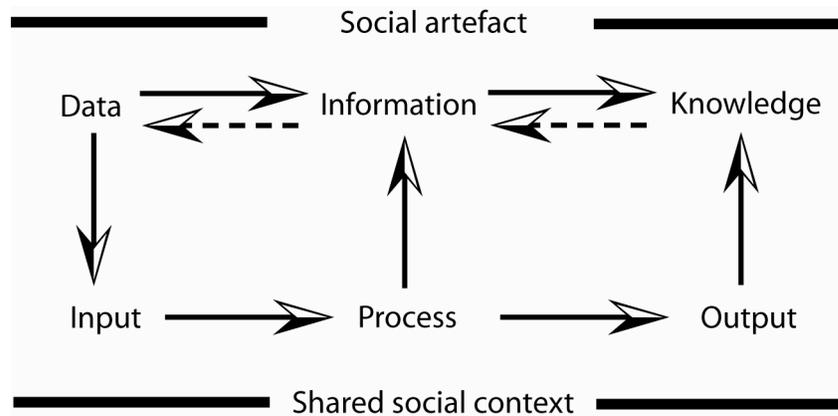

Figure 1. A process model for knowledge construction in virtual communities.

Moreover, the way data are shared or information is presented and communicated depends on specific or general sets of protocols available in particular communities. An individual's cognitive processes determine how information is processed into knowledge. The cyclical process in the model implies that knowledge is both an input and product in itself. That is to say that what constitutes knowledge for one individual might be information for another individual, and what counts as information for an individual in a specific time might become data later.

Over the years, many researchers have used the metaphor of community to describe collaborative learning in virtual and temporal settings (Cothrel, 1999; Kim, 2000;

Nichani, 2000; Palloff & Pratt, 1999; Preece, 2000; Wellman & Milena, 1998; Wenger, 1991; Wenger & Snyder, 2000). Collay, Dunlap, Enloe and Gagnon (1998) suggested that individuals in a community learn by constructing knowledge and connecting meanings to their understanding, and by sharing these meanings with others in the community, in other words, by developing and exchanging social capital.

Most learning activities in communities are informal, involving exchanging personal experiences, lessons and information. Wenger (1998) suggested that sharing tacit knowledge (knowledge driven from personal experiences) within a community yields higher success than sharing explicit knowledge does. Tacit knowledge cannot be elaborated and then documented in a convenient set of guidelines, nor can it be distilled into a discrete data set and stored in an information retrieval system. It is individual knowledge, privately held, that can be shared with others in a community. For example, co-workers interact socially, help each other to solve problems, seek new challenges and in doing so advance the goals of the community.

Learning as part of historical experiences is more prominent in socio-cultural learning theories and constructivist theories of learning. According to these theories, how we construct knowledge will depend on what we already know, including the kinds of historical experiences that we have had and how we have come to organize these into existing knowledge structures. Vygotsky (1978) emphasized the influence of cultural and social contexts in learning and social constructivism is currently the most accepted epistemological position associated with computer-based learning (Kanuka & Andersen, 1998). Social constructivism views knowledge as grounded in the relationship between the knower and the known. This implies that knowledge is generated through social interaction, and through this interaction individuals gradually accumulate advances in their levels of knowing. Garrison and Anderson (2003) and Anderson and Garrison (1998) argue that the type of interaction that can take place in a learning community is complex, and may include student-student interaction, student-teacher interaction and student-content interaction.

Despite the limitations of current theories, the concept of a community as a learning organism provides an analytical framework for investigating learning contexts involving individuals and groups. It also serves as basis to understand and analyze learning as a social process. Constituent variables to social capital, such as shared understanding, trust, reciprocity, shared values, shared social protocols, and shared goals can affect the process of knowledge construction in virtual learning communities. Effective interactions among these factors can help group members solve collective problems, collaborate, learn and develop social relationships that can tie them to a community.

Research Issues

Current research on virtual learning environments is narrow and fragmented and uses discipline-specific approaches. These approaches fail to address the interdisciplinary nature of the social and technical issues in these communities. Future research requires the identification of interdisciplinary approaches that provide cross-fertilization for

analysis, synthesis, and application of many tools drawn from cognitive sciences, learning sciences, the social sciences and humanities and applied disciplines in computer science. Interdisciplinary approaches are well suited to the investigation of incomplete and imprecise concepts like social capital.

With wide-spread use and development of computing technologies that support collaborative learning in virtual environments, there is a commensurate need to introduce general frameworks, such as social capital, to address social and technological issues in these communities. This review suggests that although social capital is theoretically useful as a label for describing a large social phenomenon, it is actually a complex web of interactions among numerous variables. Researchers in the social sciences and the humanities have studied social capital extensively and attributed it to a number of variables, including the structure of social networks, trust, reciprocity, common values and norms, shared understanding and cooperation. There has been little work done to understand the relationships among these variables and how social capital relates to each of them.

Our review also suggested that most of the studies on social capital are limited to temporal communities, and little has been done to extend the understanding of social capital to technology-supported communities. Virtual learning environments are increasingly becoming platforms for the construction and exchange of knowledge. This suggests that there is a need to explore the utility of social capital in these communities. In order to extend the notion of social capital to virtual settings, there is need to develop more precise, more complete and more tractable models of social capital. Social capital models will involve the identification of key variables such as trust, shared understanding, reciprocity and shared norms which can be manipulated using computational tools. Understanding the role of awareness in fostering the development of trusting relationships is critical to the development of social capital in virtual communities. And finally, extending social capital to virtual communities may require the development of computational models and knowledge representation techniques, and identifying existing or new techniques that can be applied for analysis, representation and development of computational models of social capital.

We offer the following list of issues that could serve to develop a research agenda on social capital.
- Social capital lacks clear definition and consequently, it is difficult to develop concrete measurement scales.
- Social capital is a complex construct that is a mixture of more primitive variables like trust, reciprocity, cooperation, shared norms and shared understanding. There is lack of a clear, concise and consistent framework for understanding which of the contributing variables are most influential, and how they interact with each other.
- Studies have shown that social capital emerges from interaction and it depends on the characteristics of individuals and groups. Nonetheless, it is not clear what the

key characteristics of individuals and groups might be that can contribute to the development of social capital.

- Research on social capital mainly assumes that social capital is correlated to positive, pro-social outcomes, but such research ignores the negative ways that social capital may be manifest.
- social capital depends on different levels of trusting relationships. However individuals in virtual communities are geographically and culturally distributed and often have different levels of knowledge and skills. Since these individuals span space, time, and cultures, they have little knowledge of others beyond assumptions and stereotypes. A lack of sufficient information about others hinders individuals' abilities to develop trust.
- Trust primarily develops through interaction in face-to-face encounters. There are limited computational tools that can augment, promote and maintain trust in virtual environments.
- Social capital has been applied to understand different social issues but there is no work done on the effects of social capital on learning in more traditional environments, technology–based environments or "blended learning" environments.
- Social capital depends on other variables such as cohesion among individuals, but few studies correlate the influence of cohesion on the overall social capital in a group.

In the final analysis, social capital is a useful construct for thinking about collaborative virtual learning environments and distributed communities of practice. But its greatest contribution at this time is that it offers a general framework for examining a host of questions that remain unresolved.

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