

# Virtual Technologies: Concepts, Methodologies, Tools, and Applications

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## Chapter 2.13

# Building Virtual Communities Through a De-Marginalized View of Knowledge Networking

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### **ABSTRACT**

The chapter investigates an actionable context of knowledge networking, from the perspective of sustainable development which should accommodate the building of communities in cyberspace so much exemplified in today's Internet and World Wide Web. The premise of this exploration is that members, or participants, in any community are engaged in learning that is critical to the survival and reproduction of that community. Through community participation, learners find and acquire models and have the opportunity themselves to become models and apprentices of others. This investigation provides a basis for thinking about the possibilities of a virtual community and the dynamics of its construction across a variety of computer-based contexts. The design and refinement of technology as the conduit for extending and enhancing the possibilities of virtual community building is an essential issue, but the role of the individuals as participants in such a com-

munity is as important. The idea of sustainable knowledge networking is to bring about continual learning and change for the community in need. The emergent challenge of such a mission is to de-marginalize many of the non-technical issues of building virtual communities for knowledge transfer and learning. The chapter concludes by reiterating the challenge of exposing what it means to create an appropriate context of knowledge networking through which purposeful actions can be supported with the elaboration of suitable information technologies.

### **INTRODUCTION**

The term virtual community today mostly refers to many types of Internet-based social interaction. In fact, the term community, according to Williams (1973), in the English language referred primarily to a geographically localized group of people until approximately the 17th century, and

it expanded somewhere between the 17th and the 19th centuries to include the idea of a group of people who hold something in common, or who share a common sense of identity even if they do not live in a single locale. Interestingly, the term virtual came into the English language from Latin by way of French at about the same time as did community, around the 14th century. Initially, it referred to things that had special and effective physical capacities, linking it closely to our ideas of virtuous. Yet, its meaning underwent changes in the 17th and the 18th centuries to refer to something that seems almost completely real to the people in so far as the effect or result is concerned, although not formally or actually real in the physical sense, according to *The Complete Oxford English Dictionary* (1971).

Rheingold (1994), who appears to have coined the term virtual community in the first place, provides a definition that accords reasonably well with the context of being virtual: namely, people in virtual communities do just about everything people do in real life (meet one another and exchange ideas and information), but we leave our bodies behind. We cannot kiss anybody and nobody can punch us in the nose, but a lot can happen within those boundaries (Rheingold, 1994, pp. 57-58).

In the virtual community, relationship is typically defined not by proximity but by contents of individual interest — classes of objects, ideas, or events about which participants have differing levels of both stored knowledge and stored values (Renninger, 2000). Participants' connections to the community are often based on cognition and affection rather than simply spatial and temporal. Such a connection is also supported by affordances (Gibson, 1966) that invoke imagination about and identification with a site, such as autonomy, support, and depth of content. Besides, the learning that is undertaken as participants work with a site has an opportunity for changed understanding of our self. Thereby, it is important to consider what a virtual community means, what it offers, what it

affords its participants, and what its boundaries are at the advent of the Internet that has undoubtedly created numerous possibilities for interaction that people did not have before (Cherny, 1999; Davis & Brewer, 1997; Herring, 1996).

## **THE BACKGROUND OF KNOWLEDGE NETWORKING**

The last decade of the twentieth century saw explosive growth in discussions about knowledge — knowledge work, knowledge management, knowledge-based organizations, and the knowledge economy (Cortada & Woods, 2000). Against this backdrop, enterprises including educational institutes are challenged to do things more collaboratively in order to remain vital in an increasingly global environment of knowledge networking (Stalk, Evans, & Shulman, 1992). By knowledge networking, it means there is a strong need to share knowledge in a way that makes it easier for individuals, teams, and enterprises to work together to effectively contribute to an organization's success.

This idea of knowledge sharing has well been exemplified in Rheingold's (1994) description of the WELL project (Whole Earth 'Lectronic Link), which is one of the first virtual communities, still going strong today. Rooted in the San Francisco Bay Area, the WELL (<http://www.well.com>) is an open-ended and self-governing community that started in 1985. Attracting people from a wide diversity of backgrounds, many of them professionals, it hosted computer conferences on a wide range of topics — education, arts, recreation, computers, and entertainment. It went on to the Internet in 1992 where over 200 separate conferences are hosted.

Its introductory Web pages emphasize that it is not just another Web site or collection of Web pages: "More than just another 'site' or 'home page' the WELL has a sense of place that is palpable." One spin-off of the WELL was the

Global Business Network (GBN; <http://www.gbn.com>), created in 1986, that drew together planners and strategists from companies like ABB, AT&T, Volvo, BP, and Bell South. This group used a mix of face-to-face meetings and online conferences to develop scenarios of the future. Through GBN, company executives and leading thinkers in a variety of fields would openly share their knowledge and insights. This interplay of knowledge generated new thinking about the future. It also led to increased collaboration among GBN members.

Interestingly, the WELL and the GBN could both be considered as instances of the notion of learning organizations (Senge, 1990; Garvin, 1993; King, 1996; Levine, 2001). Essentially, a learning organization could be considered as an organization that focuses on developing and using its information and knowledge capabilities in order to create higher-value information and knowledge, to modify behaviors to reflect new knowledge and insights, and to improve bottom-line results. Practically, there are many possible instances of a learning organization that could be incorporated into the daily experiences.

An obvious example as mentioned earlier is the concept of community of practice, which according to Wenger, McDermott, and Snyder (2002, p. 4), refers to groups of people who share a common concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise by interacting on an ongoing basis. As people in the community spend time together, they typically share information, insight, and advice. They help one another to solve problems; they ponder common issues, explore ideas, and accumulate knowledge. Often, they become informally bound by the value that they find in learning together. This value is not merely instrumental for their work. Over time, they develop a unique perspective on their topic as well as a body of common knowledge, practices, and approaches. They also develop personal relationships, a com-

mon sense of identity, and established ways of interacting.

Indeed, communities of practice are not a new idea (Wenger, 1998). They were the first knowledge-based social structures, back when humans lived in caves and gathered around the fire to discuss strategies for cornering prey, the shape of arrowheads, or which roots were edible. They have captured the attention today because with the advent of the Internet, especially the World Wide Web, it has been realized that knowledge sharing, coupled with the possibilities of technological advances, is the key to the sustainable development regardless of the temporal and spatial boundaries. Undeniably, in the emerging knowledge society, people are expected to continually improvise and invent new methods to deal with unexpected difficulties and to solve immediate problems, and share these innovations or lessons learned with others through some effective channels. In this regard, the idea of the virtual community has inspired many an organization to initiate their collective learning based not so much on delineated learning paths, but rather on experience sharing, the identification of best practices, and reciprocal support for tackling day-to-day problems in the workplace. Importantly, cultivating virtual communities in strategic areas is considered as a practical way to manage knowledge in terms of critical knowledge domains. Organizations need to identify the people and the specific knowledge needed for their growth, and explore how they connect them into suitable virtual communities of practice so that together they could steward the necessary knowledge.

## **A DEFINABLE CONTEXT FOR VIRTUAL COMMUNITIES**

Literally, the term virtual community is not hard to understand, yet it is slippery to define owing to its multi-disciplinary nature. In order to develop

virtual communities—a complex practical activity—a disciplinary definition is needed to guide the practices. According to Preece (2000, p. 10), an online community consists of four important elements: the people, who interact socially as they strive to satisfy their own needs, or perform special roles, such as leading or moderating; a shared purpose, such as an interest, need, information exchange, or service that provides a reason for the community; policies, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide people's interactions; and computer systems, to support and mediate social interaction and facilitate a sense of togetherness. Indeed, this definition is sufficiently general to apply to a range of different communities, including physical communities that have become networked and those that are embedded in Web sites (Lazar & Preece, 1998).

Undeniably, the idea of virtual community has somehow become a blanket term to describe any collection of people who communicate online, as exemplified by the networked communities (Cohill & Kavanaugh, 1997), also known as the community networks (Schuler, 1996) to which citizens can link through the Internet to discuss typical community issues. For better or worse, people are shaped by the communities to which they belong. As more people gain Internet access, they are increasingly empowered to organize themselves across local, national, and international boundaries. A call to action, a warning message, a cheer of encouragement, and the inspiring words of a leader can be distributed to members at lightning speed and at almost no cost, with just the click of a few keys.

Yet, developing successful virtual communities is not trivial. Successful virtual communities satisfy their members' needs and contribute to the well-being of society. The role of a community developer is to work with community members to plan and guide the community's social evolution. Putting basic policies in place helps members

know how to behave, what to expect from each other, and provides a framework for social growth. As the community develops and forms its own character, its social policies and structure also evolve. Sociability is concerned with planning and developing social policies that are understandable and acceptable to members, to support the community's purpose.

The software that supports the continuous evolution of a community must be dynamically designed and adapted to its growth. More importantly, the software must be designed with good usability so that people can interact and perform their tasks intuitively and easily. Software with good usability supports rapid learning and high skill retention. Understanding a community's needs is essential for developing virtual communities with good sociability and usability: the former focuses on social interaction, and the latter focuses on human-computer interaction. Developers and users have the responsibility to plan, guide, and mold communities to support the people in them. Like contemporary town planners and architects, the researchers can profoundly shape the virtual community landscape, paying particular attention to the issues of usability and sociability therewith to support the activities of knowledge networking.

## **VIRTUALIZATION OF KNOWLEDGE NETWORKING ACTIVITIES**

The move to virtualization has been developing rapidly over the last decade, and has attracted a corresponding vocabulary, such as virtual communities (Rheingold, 1994). A virtual community, like its local counterpart, gives people a sense of identity and belonging, except that instead of being rooted in a physical place, it is a locality in cyberspace. Such communities emerged in the 1980s based around bulletin board systems. Today, they exist on the Internet in newsgroups,

e-mail discussion lists, and conferences, and on company intranets or groupware systems.

Virtual communities come in many shapes and sizes. Some are open to anyone who cares to join, attracted by the topic of interest. Others are closed, in that they can join by invitation or subscription. In practice, people in such communities may or may not work together on a day-to-day basis, but they do value the learning that takes place when they spend time together. What they know may seem trivial or of great value, but their interactions with one another are crucial to their ability to do what they can do. What these groups or communities have in common is that engaging with each other around issues of common interest, sharing insights and information, helping each other, or discussing new ideas together are all part of belonging to the group. Interestingly, this is also the community's process of stewarding knowledge, which can hardly be separated from the communities that own it.

Today, many organizations have realized that unless knowledge is owned by people to whom it matters, it will not be developed, used, and kept up to date optimally. Knowledge is not a thing that can be managed at a distance like in an inventory. It is part of the shared practice of communities that need it, create it, use it, debate it, distribute it, adapt it, and transform it. As the property of a community, knowledge is not static; it involves interactions, conversations, actions, and inventions. Thereby, networking knowledge in a virtual community is not primarily a technological challenge, but one of community development.

Addressing this kind of dynamic knowing that makes a difference in practice requires the participation of people who are fully engaged in the process of creating, refining, communicating, and using knowledge. The thrust to develop, organize, and communicate knowledge must come from those who will use it. What matters is not how much knowledge can be captured, but how documenting can support people's abili-

ties to know and to learn when the community itself becomes the living repository of people's knowledge. In the following discussion, the author examined a case study of community development through looking into the design considerations and strategies for creating online learning communities in order to facilitate the transformation and sharing of resources to support integrated understanding within the communities of teachers and students.

### **The Case of WISE**

WISE, short for the Web-based Integrated Science Environment (Slotta & Linn, 2000; <http://wise.berkeley.edu>), is used to scaffold teacher and student communities as they exchange resources, develop coherent ideas, and support individual understanding in scientific investigations. From a community-building perspective, WISE defines learning communities as supporting networks of personal relationships that enable the exchange of resources and the development of a common framework for analysis of these resources. WISE also defines resources as a collection of ideas or interactions that are accessible to community members and can be incorporated into their practice. Besides, members of the community are expected to jointly analyze resources and develop a common set of criteria for evaluating those resources. However, it is important to discuss how different strategies can progressively involve individual members by helping them become resources for other community members.

### **The WISE Rationale**

WISE is informed by a scaffolded knowledge integration (SKI) framework, which emphasizes coherent understanding by supporting participants as they compare, contrast, sort out, and organize their ideas. The SKI framework is inspired by cognitive apprenticeship (Tudge & Rogdoff, 1989) and

the work of Vygotsky (1978). The framework has four design tenets that jointly encourage students to link and connect their ideas so that they develop more integrated and cohesive ideas. These tenets are: (1) to make the process of thinking visible, (2) to make science accessible, (3) to encourage students to learn from each other, and (4) to foster lifelong learning. WISE stresses the coordination and integration of ideas as well as encouraging different paths for learning.

By mixing hands-on learning with online discussions and modeling tools, WISE helps create a repertoire of experience representations that aid students as they become part of a community of learners. Such representations also provide support for teachers and curriculum designers as they collect resources for constructing learning projects. In many WISE projects, the presence of a shared resource (mostly from Internet sites) is used as evidence to support theories and to ground discussions, creating the potential for negotiation, clarification, justification, synthesis, and other processes that contribute to knowledge integration. Learning to use WISE requires teachers to adopt a new stance toward teaching where they serve more as a guide-on-the-side than as a sage-on-the-stage, transmitting knowledge.

By designing resources to scaffold and support interactions, WISE provides models of constructive engagement, as well as offering community tools for connecting people working on shared projects. Examples include: seeding discussions with comments to illustrate how evidence is used to support different theories; using video clips of student-teacher interactions to anchor discussions about pedagogy; and developing templates for activities to guide project authors as they create projects involving theory debate, critique, and design. The WISE software lets teachers and researchers track how resources circulate through communities, providing insights into the processes of community development. In addition, by making the process of critique visible, it encourages

students to reflect upon the credibility, reliability, and usefulness of those resources.

### **Design Strategies for Teacher Communities**

WISE involves teachers in communities for teaching WISE projects, customizing projects, and authoring new projects. Many teachers use curriculum units as they exist in the project library. As they begin to localize and customize projects, they interact with other teachers who have used the project as well as with the project designers (Linn & Slotta, 2000). Eventually, some teachers join or form partnerships with other community members to author new projects (Linn, 2000). In practice, curriculum design is the arrangement of parts, assembling conceptual, strategic, and material components in a pattern that functions to support specific goals (Mollison, 1990, p. 36).

The WISE NetCourse introduces teachers to the pedagogical framework and the technical supports for WISE through which individual teachers can move from peripheral participation to more sophisticated involvement over time (Lave & Wenger, 1992). In particular, WISE makes authoring accessible in a number of important ways, for example, through project templates for critique, theory debate, and design of projects. It enables community members to learn from one another with collaborative tools such as shared white boards, resource libraries, and task lists.

Indeed, community exists only in the sense of teachers having access to a collection of online discussions about their teaching experiences and strategies. As these teachers reflect on their own practice and begin to customize projects with WISE, they contribute to the community by exchanging ideas with other teachers using similar projects. Therefore, recognizing the need to support teachers' actual practice as a way of involving them in a broader community is a crucial step in the design of self-sustaining communities.



## Design Strategies for Student Communities

The instructional designers and teachers need to ask how they can structure relationships within learning communities so that the community members share resources and help refine each other's ideas. WISE offers innovative strategies for creating personalized electronic discussions that help elicit self-explanation and clarification from students (Cuthbert, Clark, Slotta, & Jorde, 2000). In fact, WISE projects have made advances in supporting students to share ideas in online learning communities, by investigating reflection and knowledge integration through scientific inquiry (Hoadley & Linn, 2000; Linn & Hsi, 2000).

Two of the most successful approaches involve personally seeded discussions and peer review discussions. In personally seeded discussions, WISE uses students' scientific explanations as initial comments in the discussion. Students work to clarify and justify their own scientific principles, comparing and contrasting them with other students' principles. Thinking is made visible for students as they elaborate upon and justify their ideas. By having students explain and defend their own principles, WISE gets students not only to take an interest in their own ideas, but also to take interest in responding to and critiquing the other ideas in the discussion. In peer review discussions, WISE uses students' shared research findings in an online question-and-answer session, creating resources that are accessible to the entire community of learners through such peer review activities as making comments, asking questions, and offering suggestions. In either case, the overarching design is for students to begin to adopt an orientation toward discourse that is based on comparison, critique, and justification, and the critical resources are the community members and their ideas. The common goal is the refinement of the community members' ideas.

Accordingly, the WISE strategies employed typically involve contrasting students' perspec-

tives on a given topic of interest, and increasing students' personal relevance by making them responsible for pursuing specific areas of knowledge. Indeed, contrasting one's perspectives about a given topic can encourage an individual student to clarify his or her own formulation while considering the relevance of other students' opinions (Chi, Lewis, Reimann, & Glaser, 1989; DiSessa & Minstrell, 1998). Besides, by increasing personal relevance around the process of contrasting different students' understanding, WISE helps elicit community members' collaborative thinking (a valuable resource itself) to refine the community's ideas.

## Design Considerations for WISE

According to Cuthbert, Clark, and Linn (2002), there are four main design considerations behind the design of WISE which serve as general guidelines for creating effective online learning communities: (1) support the actual practices and daily tasks of the participants, (2) collect experiences and represent them in an accessible and equitable manner, (3) provide a framework to guide the learning process, and (4) represent the identities of the community members. It is worthwhile to examine some of the strategies related to the four design considerations aimed at creating effective online communities.

- Support the actual practices and daily tasks of the participants: WISE communities support the actual practices and daily tasks of teachers by helping them guide students' learning process through the creation of a visible history of student work. For students, WISE communities support learning practices and tasks by making the thinking of their peers visible, and by illustrating the process of group inquiry. Moreover, WISE elicits teachers' ideas and helps them develop curricula through its authoring communities.

From a knowledge integration perspective, the practice of teaching and learning involves developing a repertoire of models for explaining situations. The scaffolded knowledge integration framework mentioned earlier can help students and teachers in their daily practice by illustrating the repertoire of models which provides general guidelines for designing projects and serves as an inspiration for creating design considerations for online communities.

- Collect experiences and represent them in an accessible and equitable manner: WISE communities collect experiences and represent them in an accessible and equitable manner to promote the process of connecting ideas so that participants (students and teachers) can use them in consequential tasks such as during arguments and debates. Communities, if viewed as a network of relationships and resources, can be structured to elicit ideas, develop shared understanding, and promote the integration of a diverse set of ideas. It is important to investigate the potential of structuring discussions in different ways based on the type of discussion and the associated pedagogical goals. Linking different types of pedagogical goals to design strategies is a challenging task because most community members are not accustomed to reflecting on the nature of their contributions. For instance, there are important differences between discussions depending on whether the purpose of the discussion is debate, brainstorming, or peer review. Each of these discussion types has a distinct structure and format, and hence demands different requirements for setting up, running, and assessing the discussion.
- Provide a framework to guide the learning process: WISE requires participants to support their ideas with evidence (e.g., Internet sites, references to laboratory work, scientific principles, or everyday experiences).

This creates a culture where people ask each other for justification and clarification (Linn & Hsi, 2000). It is essential to investigate how participants adjust their behavior as their peers prompt them to support their ideas with evidence (Cuthbert et al., 2000).

One strategy is to create commonly agreed-upon criteria, and examine how these criteria are adopted and transformed by community members as they interact with one another. For communities to maintain coherence and develop a sense of what is appropriate behavior, it is important that a strong community culture be established with a common set of values and criteria for making contributions (Brown, 1992). Communities need a general framework to help define the mission and vision for the learning process.

In WISE, the knowledge integration framework characterizes the learning and curriculum design processes. This framework lends a shared focus to teacher professional development discussions, creating the potential to view instruction as a design problem that is interpreted to have multiple solutions and can be improved by selecting appropriate solutions and testing them in context. For example, it is important to understand how the WISE strategy off-loads the procedural guidance for students onto the learning environment, so as to free teachers to engage students individually, elicit their ideas, and encourage them to reformulate their ideas by considering other alternatives and supporting their ideas with evidence.

- Represent the identities of community members: Socially relevant information helps participants recognize the coherence of an individual's comments (Hoadley, 1999). WISE provides ways to represent the identities of community members, to illustrate the refinement of ideas, and to mark departures from past views. One common strategy is to link identities to resources based on who

contributed or accessed a resource. Another is to display the identities separately in the profiles section of the community site. Representing people's backgrounds and interests can help develop personal relationships, especially when face-to-face interaction may be limited. However, entering profile information needs to be part of an ongoing process linked to the use of the community system (WISE) so that the task of entering descriptors (say, background, area of expertise, and instructional topics) does not deter members. The idea of mutually revealing information (not being able to see other members' pictures until someone submits) is another way to motivate people to complete their profiles.

### **Knowledge Networking for Learning Communities**

As the WISE story indicates, it is often necessary to coordinate in joint action — more precisely, collaborate — to achieve tasks larger than any one person could accomplish alone. Through the processes of acculturation in learning communities, knowledge and culture are perpetuated and transformed as people interact, define new problems, and take on new challenges. The primary question for any learning community is how they can learn from one another so as to increase their knowledge together. One term for this type of learning community is a knowledge-building community (Scardamalia & Bereiter, 1994), where individuals are committed to share information for the purpose of building understanding (knowledge) in all the participants.

When attempting to design technology in support of such learning communities, it is important to remember the triad of components (Bedny'i & Meister, 1997; Kuutti & Bannon, 1993) which involves in every situation the interdependence of tools, activities, and people; namely, a change in one element affects the others. When a new tool

is introduced, people and their activities change to accommodate it. Over time, people begin to change, learning the new possibilities of the new tool, and adapting their practices (activities) to take advantage of its benefits and work around its shortcomings.

Thereby, in contrast to typical information and knowledge management tools, where the focus is on helping to route information, knowledge networking tools should help foster the constituent activities that increase knowledge building. Hence, these activities include not only information capture and transmission, but also the establishment of social relationships in which people can collaboratively construct understanding.

### **FUTURE TRENDS OF A DE-MARGINALIZED CONTEXT FOR KNOWLEDGE NETWORKING**

The development of virtual communities for knowledge networking is a complex and multifaceted endeavor. If the goal is to help solve the puzzle of how to nurture such communities, there are quite a number of issues to be examined according to Hoadley and Pea (2002, pp. 345-351):

*...defining learning communities, examining existing practices, identifying potential changes to improve practices, finding ways that technology might effect these changes, designing and building the technology, cultivating a community of use, understanding the consequences of the technology, and evaluating the community with respect to the original goal.*

The investigation of these issues constitutes an important de-marginalized context to understand the intricacies behind the building of such virtual communities for the purpose of knowledge building and learning. In practice, each of the eight types of inquiry mentioned draws on a different research paradigm, demonstrating the multi-dis-

ciplinary nature of virtual communities. Here the term de-marginalized is used to emphasize the holistic nature of these issues. Oftentimes, the issues of technology seem to have marginalized the other issues in the discussion of virtualizing learning communities.

In the following discussion, some of the issues have been elaborated that must be de-marginalized in the study of building virtual communities. This is followed by some reflective recommendations on the value of community networks on knowledge sharing.

### **Defining Learning Communities**

Loosely, almost any group of individuals who interact might be called a community, and certainly people change and learn in some fashion as a result of every life experience. Yet, it is often not easy to answer the question of what defines a learning or knowledge-building community. There have been a number of important efforts to offer such definitions.

Organizational behaviorists identify the learning organization as the important proponent (Garratt, 1987) that offers a few concrete measures of learning as a community. Woodruff (1999) describes some features that distinguish learning communities in terms of cohesion. Hsi (1997), following Pea (1993), defined learning communities as communities in which participants construct productive discussions (defined in terms of inclusiveness and knowledge integration processes). Research inquiry is still needed to examine the possible spectrum of communities which may be characterized as learning or knowledge building.

### **Finding Ways Technology Can Help**

Oftentimes, technology is thrown at problems with an attitude that it can solve any problem. The study of human-computer interaction tells a different story. A user is unlikely to adopt

tools that do not support his or her goals at least, as well as other alternatives. Since technology affects the community only through its impact on individual people, supporting a community often means encouraging individuals to behave in a group-oriented fashion through the use of enhanced technology which minimizes costs to the individual users. The idea of participatory design (Bodker, 1991; Ehn, 1989), coupled with the research findings from human-computer interaction, should predict the impact of different technologies on various human activities in the learning communities.

### **Cultivating a Community of Use**

In the process of virtualization, community-oriented tools need nurturing for adoption (or appropriation) to take place, as do the communities they are intended to help (Newman, Griffin, & Cole, 1989; Pea, 1992). Typically, community users come to appropriate a tool by establishing its fitness with their work practices, or changing their work practices to accommodate special properties of the tool as they come to perceive them. The proponents of the technology must help users overcome initial hurdles to appropriation.

They must also help the community and the tool to reach a productive equilibrium, which may include the development of very new practices or ways of working. In fact, creating this culture of use is an important person-to-person task that goes beyond simply taking a technology and throwing it over to the intended user community.

Use is a design issue which does not end with what the technical designers have created, but continues in ways the user community makes out of it in context. It is a form of reciprocal evolution of technology, work practice, and basic research (Allen, 1993), whose action-oriented nature should be understood by technology coordinators, community facilitators, and reformers who help advocate the use of the tool and its participation in the community.

## **Evaluating the Growth of a Virtual Community**

Obviously, the growth of a virtual community depends on the goals against which it used to measure whether the technology, the community, and the individuals are successful. In the case of learning communities, individuals might be assessed for learning, or groups of students might be assessed on their group skills for problem solving in the learning domain. Entire communities might be evaluated on the amount of participation, the degree to which members of the community help other members, or the net quality of the community's output.

A tool's success could be measured by changes in the individual's or group measures, or by looking at the tool's direct use, for example by investigating whether the tool is appropriated, by asking users how they use the tool and whether they find it helpful, or by documenting stories of how the tool changes the community and individuals (Gay & Bennington, 1999).

## **Reflecting on Community Networks for Knowledge Sharing**

The idea of a networked community dates back to 1984 when Tom Grundner in Cleveland, Ohio, USA (Bajjaly, 1999), using a small computer and a single modem line, established an online bulletin board dubbed St. Silicon's Hospital and Information dispensary. His goal was to test the effectiveness of online access as a way to deliver health information to the general public. Local citizens there were able to dial into St. Silicon's, leave medically related questions, and receive an answer from a board-certified physician within a day.

This experiment proved so successful that Grundner secured enough funding to start a full-scale community computer system to provide free e-mail to the people around Cleveland and electronic information in areas as diverse as

law, medicine, education, the arts, science, and government.

In July 1986, this system, called the Cleveland Free-Net, went online. Over the following three years, that system registered more than 7,000 users and handled between 500 and 600 calls per day. A second system, the Youngstown Free-Net, began operation in July 1987. Over the next couple of years, three more systems became operational: Tri-State Online in Cincinnati, Ohio; the Heartland Free-Net in Peoria, Illinois; and the first rural system, the Medina County Free-Net in Medina, Ohio.

In 1989, the concept of a community computer system was expanded and formalized and the National Public Tele-computing Network (NPTN) was born. Its goal was to help new systems come online and to support them afterward with services and information resources. Today, well over 200 communities in the U.S. and Canada host their own community networks.

Although Grundner is now no longer a visible part of the community networking movement and NPTN is no longer a functioning organization, his insights remain true today even though much in the world of computing has changed. Firstly, it is clear that these community computers represent the leading edge of what can only be described as a new telecommunications medium. Secondly, it is clear that a critical mass of people now exists who are prepared to utilize this new medium. Thirdly, there is a certain sense of inevitability to the development of community computing.

Simply stated, people find themselves unable to imagine a century in which they do not have community computer systems, just as the last century had the free public library. Moreover, it is believed that the community network, as a resource, will have at least as much impact on this century just as the public library has had on the society in the last century, such as to satisfy basic information needs of the physical community, to improve community collaboration through joint efforts and resource sharing, to promote

and encourage individual lifelong education, to expand the knowledge base of the citizens of the community, and many others to be thought of.

## **CONCLUSION**

For the past few decades, it has been witnessed that many cities and towns all over the world have established their respective community computer systems, more appropriately called community networks (or virtual communities) based on the discussion of knowledge networking so far. Such community networks help people and organizations to experience the transition from the face-to-face world they know so well to the online, electronic, networked world of the future.

Today, every community can easily connect to the Internet so that distant people and locals alike can tap into the repertoires of local information, communicate with one another, and experience almost firsthand the benefits a particular community has to offer. With this worldwide connectivity, even the smallest, most rural community can become an important part of the burgeoning global village.

Hence, every community can make its appearance in the global platform, telling its own story of growth, and relating why it is a good community to experience. Indeed, as people move into an electronically driven world, the story of each virtual community needs to be told online in terms of its various information or knowledge services offered to its physical members. Thereby, the author has examined in this chapter a specific story in the WISE community, and presented some perspectives on the de-marginalized aspects of building virtual communities.

In closing the discussion, it is essential to articulate the challenge of knowledge networking in virtual communities. In the broadest sense, the major theme of knowledge networking in and among virtual communities could be understood from the perspective of effectively applying

information and communications technologies (ICTs) to improve the lives of local people in different locales, in terms of getting knowledge to those of a community who need it in the right amount of time.

Of much concern here is an effort to theorize the social dimensions of ICT-based knowledge networking. In the words of David Hakken (2002, p. 362), it has to be asked: “What kinds of theorizations make sense in analyzing what happens when a concerted effort is made to introduce a technology supportive of knowledge networking in a holistic way — that is, to try to anticipate and address the social context/consequences of the interventions?” In simpler terms, it can be said, while a community network is based upon technology, its success rests with its people — organizers, information and knowledge providers, sponsors, users, volunteers — who support the virtual community in a variety of ways.

Most importantly, it must be ensured that a level playing field exists between the haves and the have-nots: those who have access to technology and those who do not. These underserved members of the community include those who are poor, uneducated, members of minority groups, elderly, or those with disabilities. But providing access to technology to these groups is not sufficient. It must be ensured further that no discrepancy exists between those who are computer literate and those who are not: the so-called cans and cannots. This is especially important as more and more information goes online and may not be available in any other format.

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## KEY TERMS

**Community Network:** A term often used to refer to a networked community of people (or a virtual community), with subsequent emphasis on three more elements of concerns besides the people: (1) a shared purpose, such as an interest, need, information exchange, or service that provides a reason for the community; (2) policies, in the form of tacit assumptions, rituals, protocols, rules, and laws that guide people's interactions; (3) computer systems, to support and mediate social interaction and facilitate a sense of togetherness.

**De-Marginalization:** A term often used to squarely offset the idea of marginalization, which often means the minimal effect rendered to influence the whole, given the marginal position of the issue in consideration.

**Knowledge Networking:** An emergent activity of people or an organization to share knowledge in a way that makes it easier for individuals, teams, and enterprises to work together (or collaborate) to effectively contribute to one another's success in today's Internet-based knowledge society.

**Virtual Community:** A group of people — be they geographically localized or dispersed — who hold something in common, or who share a common sense of identity, through maintaining some types of social interaction over some electronic medium, such as the Internet and the World Wide Web.

**Virtualization:** A term often used to describe the electronic transformation of some organization in today's Internet era, such as in the context of people's transitioning from a physical bricks-and-mortar village to an electronic clicks-and-mortar experience.

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