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# Special Section on Learning in Communities

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Community learning is an area of investigation that goes to the heart of community informatics as we attend to questions of how knowledge is shaped and shared at the local level. Learning in communities spans a wide variety of institutions devoted to formal and informal educational processes and is deeply rooted in the goals and capacity inherent in participating individuals, groups, and organizations. How does a community learn across difference? How do information and communication technologies support learning? How do they threaten to reify harmful socioeconomic divides?

This special section of the *Journal of Community Informatics* is based on a multidisciplinary workshop organized by John Carroll and held in August 2005 at Penn State's School of Information Sciences and Technology. It contains an informal report of the workshop, as well as 'mini papers' contributed by some of the participants.

We hope that this Special Section on Learning in Communities will contribute to the field of community informatics, stimulating further conversation among researchers, practitioners, and policymakers.

# Informal Workshop Report: Learning In Communities, August 14-17, 2005, University Park, PA

## Introduction

Most learning takes place in communities. People continually learn through their participation with others in everyday activities. Such learning is important in contemporary society because formal education cannot prepare people for a world that changes rapidly and continually. We need to live in learning communities.

A discourse on learning in communities encompasses (at least) communities of practice, learning communities, community networks, communities of interest, learning organizations, learning-by-doing, cognitive apprenticeship, subjugated learning, collaborative/cooperative learning, situated cognition, design as inquiry, knowledge management, lifelong learning, informal learning, case-based learning, and learning cultures. Though it is difficult to find any contemporary technical work in the multidisciplinary space of informal learning and collaborative activity that does not appeal to at least one of these touchstone concepts, it is also difficult to find work that tries to confront or to systematize the full range of them.

Existing conferences tend to "stovepipe" such discussions: Thus, meetings of the Cognitive Science Society and the *Journal of the Learning Sciences* focus much attention on the concepts of cognitive apprenticeship, situated cognition, collaborative/cooperative learning, and even classroom-based learning communities, but ignore informal and collective learning, such as learning organizations, community networks, and learning cultures. Information Systems conference and journals focus much attention on knowledge management and learning organizations, but do not focus on community networks and informal learning. The *Computer-Support Cooperative Work* Conference and Journal address knowledge management, communities of practice, and to a limited extent, community networks, but rarely consider case-based learning, learning cultures, life-long learning or subjugated learning. The *Communities and Technology* Conference and the *Journal of Community Informatics* focus on communities of practice, community networks, and subjugated learning, but typically do not address issues such as cognitive apprenticeship, situated cognition, and learning communities.

## The meeting

On August 14-17, 2005, a multidisciplinary group of scholars met at Penn State's School of Information Sciences and Technology to discuss "learning in communities." The goals of this workshop were to bring together a wide range of perspectives and approaches to learning in communities, to articulate the state of the art, and to define agendas for research and technology infrastructures and initiatives. The group included the following:

- Ann Peterson Bishop, Community Informatics Initiative, Graduate School of Library and Information Science, University of Illinois, Urbana-Champaign: Bishop is interested in community information systems for traditionally marginalized groups; she was a founder of the Prairienet community network.
- John M. Carroll, School of Information Sciences and Technology and Center for Human-Computer Interaction, Penn State, University Park: Carroll investigates social and computational infrastructures for community-based learning, and is Principal Investigator for the National Science Foundation's Civic Nexus project in sustainable information technology learning.

- Andrew Clement, Faculty of Information Studies, University of Toronto: Clement has worked in community informatics for 30 years, and is currently Principal Investigator for the Canadian Research Alliance for Community Innovation and Networking.
- Gerhard Fischer, Department of Computer Science and Institute for Cognitive Science, University of Colorado, Boulder, CO: Fischer investigates reflective communities, tools and environments to support lifelong learning and facilitate creativity.
- Christopher Hoadley, Department of Instructional Systems and School of Information Sciences and Technology, Penn State, University Park, PA: Hoadley is interested in knowledge-building communities, and in techniques for measuring community achievements.
- Andrea Kavanaugh, Center for Human-Computer Interaction, Virginia Tech, Blacksburg, VA: Kavanaugh investigates communication behavior and effects in the context of community networks; she made a decade-long study of the Blacksburg Electronic Village, and is now evaluating Internet services in local government.
- Nancy Kranich, Library Consultant and Past President of the American Library Association: Kranich is interested in the role of libraries in providing an information commons, facilitating community-building and democracy, and in enhancing civic literacy.
- Lynette Kvasny, School of Information Sciences and Technology and Center for the Information Society, Penn State, University Park: Kvasny is interested in how inner city and third world women understand and recruit information technology to build social, cultural, and economic capital.
- Jenny Preece, University of Maryland, College Park, MD: Preece has studied behavior in health-related communities, contrasting face-to-face and online interactions; she is currently investigating community-development in the context of the International Children's Digital Library.
- Paul Resnick, School of Information, University of Michigan, Ann Arbor, MI: Resnick is interested in the role universities could play in information technology cooperative extension, and in how to cultivate information technology careers in the civic sector.
- Mary Beth Rosson, School of Information Sciences and Technology and Center for Human-Computer Interaction, Penn State, University Park, PA: Rosson investigates end-user programming and design, particularly in community computing contexts.
- Jorge Schement, Department of Telecommunications and Institute for Information Policy, Penn State, University Park, PA: Schement investigates telecommunication policy implications for Hispanic-American communities, rural areas, and evolving conceptions of democracy.
- Mark Schlager, Center for Technology in Learning, SRI, Menlo Park, CA: Schlager is interested in community infrastructures, and has investigated community-based approaches to teacher professional development in TappedIn through the past decade.
- Murali Venkatesh, School of Information Studies, Syracuse University, NY: Venkatesh investigates power and progressive social action in the context of broadband civic network planning.
- Volker Wulf, University of Siegen and Fraunhofer Institute of Applied Information Technology, Germany: Wulf is interested in supporting knowledge management in communities and social networks, especially in the context of multi-cultural communities.

## Orienting themes and questions

We developed a set of orienting questions, as part of the planning process for the workshop and successively elaborated through the course of the workshop itself.

- **Design**: What are effective strategies and methods for initiating (designing) and sustaining communities of various types? How do and how can communities evolve over time?
- **Learning**: Is learning, in the sense of human development, constitutive of healthy communities? How can communities facilitate various educational objectives, such as lifelong learning, cross-generational learning, knowledge-building, and universal technology literacy? What is the role of the university in facilitating communities, with respect to service learning, better integration of community action and research, and support for careers in civic information technology?
- **Context:** How can communities cultivate and leverage indigenous/subjugated knowledge? How do communities cope with power structures of the cultures and institutions in which they are embedded?
- **Agency**: How can communities facilitate innovation and collective action?
- **Measurement and evaluation**: How can we know when a community project or a community succeeds/fails? What are effective strategies and methods for assessing the impacts (e.g. learning, knowledge sharing) of communities on their participants individually and collectively? What are current success stories?
- **Infrastructure**: What are useful information technology tools and techniques for promoting community objectives (end-user programming, participatory design)? How can information technology support community building (for example, by increasing opportunities for civic discourse and by visualizing the community to itself)?
- **Theory:** What are useful models, theories and frameworks for understanding community dynamics (activity theory, distributed cognition)?
- **Diversity**: How can different audiences' needs be met? What power issues relate to different participants' roles and backgrounds? Are there ways that communities can be designed to enhance interconnection between different types of people? How can communities facilitate communication and cooperation across international, cultural, and social boundaries?

Our discussion wound up focusing on three theme clusters: (1) learning in the context of community informatics, (2) paradigms of research and action for studies of learning in community, and (3) community infrastructures that facilitate learning.

## Learning in the context of community informatics

We distinguished "learning in communities", in which learning is often informal, incidental, and integrated with participation in community activity, from "learning communities", which exist for and are all about learning. Learning in communities is not just reciprocal or mutual learning, it is the collaborative construction of ideas in practice.

This concept of learning in communities is implicit in democracy, and discovering how to facilitate such learning is a challenge in the future trajectory of democracy in an age when face-to-face learning may become less important. A key issue for community informatics is how to construct environments that encourage sharing of knowledge, particularly about content and perspectives that are not in the mainstream.

## Paradigms of research and action for studies of learning in communities

There is a tension between research and action in studies of learning in communities. Many of the workshop participants engage in some form of participatory action research. These methods are appropriate, but they are very costly with respect to the time and effort of faculty and students. Standard promotion and tenure values do not weigh community outreach highly.

In US land grant universities, there is a well-developed concept of cooperative extension, though its history is primarily agricultural outreach. Perhaps a concept of information technology cooperative

extension could be developed as a more standard model (Boyte, et al., 2001). One issue to consider is that within universities, there often is a clear distinction between cooperative extension faculty and "regular" research and teaching faculty. Perhaps the extension model would just institutionalize the tension between research and action.

One approach to this tension is to clearly divide consultancy and research engagement. For example, school systems and commercial organizations have well-articulated concepts of consulting. In such a role, one can efficiently provide guidance for a client's problem. But successful consulting often requires focusing totally on solving a specific problem at hand, and not abstracting or generalizing that problem, or on enrolling practitioners as research collaborators.

Consultancy as an action research paradigm produces case studies that can subsequently be reflected on and developed as research activities. (Donald Schön's (1983) work might be a good example of this.)

## Community infrastructures that facilitate learning

Infrastructure is the socio-technical background that allows work activity to move smoothly. It includes hardware and software, processes of governance, social facilitation of learning, and cultural and cognitive models.

Infrastructure is often invisible, but invisibility can entail neglect and breakdown, and can replicate existing power structures. Different segments of society are differentially able to shape infrastructures.

One strategy for managing infrastructures is to make them more visible and participatory, especially during periods of transition when infrastructures are changing. A related strategy is to slow down adoption through collective resistance. One tool for this is raising questions about infrastructures.

We are in a period now of rapid development and adoption of new information technology infrastructures. Several workshop participants are exploring alternative infrastructure initiatives that attempted to deliberately strengthen specific aspects of community-oriented activity, such as discussion and debate or visualization of the community.

## Where do we go from here?

We want to both report on this workshop and to use it as a catalyst for further multidisciplinary discussions, developments, and investigations of learning in communities. We decided to initially organize a sectioned report on the workshop for the *Journal of Community Informatics*. In the longer term, we hope to organize a set of special issues for key journals in the research space.

The first of these special issue projects could emphasize learning as a core function of communities. A second special issue project might address the distinction and integration of descriptive research and action research with respect to methods and theories, and to the role of universities and university faculty in such activity. A third special issue could discuss infrastructure for community-based learning, and in particular, the objective of deliberately designing infrastructures to facilitate learning in communities.

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# Mini Papers from Workshop Participants

# 1. Community Inquiry and Informatics: Collaborative Learning through ICT

**Ann Peterson Bishop, Bertram C. Bruce, and M. Cameron Jones**

Studies of learning and human-computer interaction have often focused on settings and practices that are relatively fixed and well-defined, such as a college-level course, a workgroup in a company, or a museum exploration. These studies have contributed much to our understanding of the potential and the problems associated with incorporating computers into collaborative practice. They have also contributed to the analysis of how learning happens in a wide range of settings. However, such well-defined situations represent but a small portion of realities that are relevant to the field of community informatics (CI),which aims to understand how information and communication technologies (ICTs) are employed to help communities achieve their goals (Gurstein, 2004; Keeble & Loader, 2001). When viewed from the perspective of learning in communities, we see the challenge facing CI in the form of four research questions:

- How do people learn within communities?
- How do communities themselves learn?
- What tools facilitate learning within communities?
- How can communities develop shared capacity in the form of knowledge, skills, and tools?

Our work is grounded in the philosophy of American pragmatism, which rose to prominence at the end of the 19th century and introduced the theory and practice of what we call *community inquiry* into a range of fields, including aesthetics, education, social work, law and public citizenship (Menand, 2001). Developed most fully in the work of John Dewey, community inquiry is based on the premise that if individuals are to understand and create solutions for problems in complex systems, they need opportunities to engage with challenging questions, to learn through participative investigations situated in everyday experiences, to articulate their ideas to others, and to make use of a variety of resources in multiple media. These processes of inquiry form an attitude toward work and life that consists of eager and alert observations, a constant questioning of old procedure in light of new observations, and a use of grounded experience as well as recorded knowledge. The ultimate aim of community inquiry is to develop a "critical, socially engaged intelligence, which enables individuals to understand and participate effectively in the affairs of their community in a collaborative effort to achieve a common good" (John Dewey Project on Progressive Education, 2002).

Community inquiry and informatics combine in the "pragmatic technology" (Hickman, 1990) approach to community-based ICT creation and use. Pragmatic technology encompasses the common language notion of how to design tools to meet real human needs and accommodate to users in their lived situations. It also sees ICTs as developed within a community of inquiry and embodying both means of action and forms of understanding; ICTs are an end result of, as well as a means to accomplish, community learning. Schuler and Day (2004) clearly resonate with the ideas and practice of pragmatic technology in declaring the "subordination of ICTs to building healthy, empowered, active communities" (p. 15) and noting simply that "researchers are part of the world in which they live" (p. 219).

Our Community Informatics Initiative (http://www.cii.uiuc.edu) is an effort to learn how pragmatic, community-based technology can support learning across institutional and social boundaries. The CII

provides training and education, consulting, and action research in community inquiry and informatics in collaboration with non-profit organizations and individuals worldwide. It has produced Community Inquiry Laboratories (iLabs) (http://ilabs.inquiry.uiuc.edu), a suite of free, open-source, web-based software that is developed in an open and ongoing fashion by people from all walks of life who represent different countries and a wide range of ages. iLabs have been used to create hundreds of interactive websites that support the communication and collaboration needed to pursue inquiry in classrooms, community centers, libraries, professional associations, research groups, and other settings—without having to download and install software or have your own server (Bishop, et. al, 2004). iLabs includes software for producing library catalogs, syllabi, document sharing, online inquiry units, discussion forums, blogs, calendars, and image galleries.

iLabs represents experimentation in the integration of community inquiry and informatics. Through collaborative effort (both implicit and explicit, purposive and unknowing) in the creation of content, contribution to interactive elements, incorporation into practice, suggestions and questions, reports of what works and what doesn't, and ongoing discussion, community members are not merely recipients of these technologies, but participate actively in their ongoing development, yielding enhancements which are then available to all users while, at the same time, they learn more about ICT. We have referred to his process of end user software development as "design through use" or "participatory inquiry." To cite just a few examples:

- Members of SisterNet (a local grassroots organization of Black women devoted to nurturing a healthier lifestyle and community activism) created new templates for web-based Inquiry Units that were better suited for the personal health plans they wanted to make;
- Youth in the Paseo Boricua community in Chicago helped develop a web-based catalog for the library in the Puerto Rican Cultural Center, a tool that other iLab users can now adapt for their own purposes;
- A doctoral student in Finland, high school students in France, and others helped develop a system for translating the iLabs interface into multiple languages;
- A local environmental group figured out a way to use iLabs for polling citizens.

Collaborative inquiry has helped us investigate community interactions in many ways, come to a better understanding of "community" as a unit of analysis in multiple endeavors, and experiment with modes of open and mutual learning as a primary process for a range of disparate activities, from software development to the installation of art exhibits.

## Acknowledgements

We wish to thank the Institute for Museum and Library Services and National Science Foundation, whose support helped create the iLabs software. We are grateful for the creativity and hard work of all members of the iLabs collaborative, who have contributed their considerable energy and expertise to community learning.

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# 2. The Participant-Observer in Community-based Learning as Community Bard

**John M. Carroll**

During the past three years our Civic Nexus research group (http://cscl.ist.psu.edu) has been involved in a collection of community learning projects with groups in Centre County, Pennsylvania, a rural area of about 1,000 square miles with a population of 140,000, including the fairly cosmopolitan college town of State College (population 75,000) and the main campus of the Pennsylvania State University. The focus of the project is to investigate, develop, and assess sustainable strategies to help these groups better control their own information technology. We have worked with the county historical society, the regional emergency management coordinator, a sustainable development group, the enrichment program at the local high school, the local chapter of Habitat for Humanity, the symphony orchestra, the local food bank, an environmental preservation group, a local emergency medical services council, a group that works with at-risk youth, and with a group that trains leaders for community groups.

Our original project concept was to form participatory action research (PAR) relationships with these groups, to jointly undertake technology development projects through which our partners would learn by doing, and we could observe how the learning occurred, and how it could be facilitated and sustained (Merkel, Xiao, Farooq, Ganoe, Lee, Carroll & Rosson, 2004). We found that, in general, groups in our community already use Internet technologies, like email and the Web, to carry out their missions, but, also in general, the groups are not satisfied, often feel like they are slipping behind some norm, and do want to consider learning more and doing more. For example, many of the groups are interested in attaining more direct control of their overall Web site design, others are interesting in better integrating their information technology (for example, integrating databases with their Websites), some are interested in adding special functionalities to their Web sites (such as interactive maps), and some are interested in supporting collaborative interactions like discussion forums.

Our PAR projects have several distinctive characteristics relative to standard conceptions of participatory technology projects (Clement & Van den Besselaar, 1993): (1) The *owners* of the project are the community partners. They control the work activity being supported. They authorize the project and the approach taken. (2) The scope of the design concern is fairly broad. It is not limited to a user interface or even an application program; it generally involves adaptations in the work itself, especially including approaches to managing technology and technology training. (3) The scope of the collaboration is also quite broad. These groups are not organized for efficient decision-making and policy implementation, rather they work through consensus building. Thus, decisions develop through considerable spans of time and involve mutual trust. (4) Finally, these groups are more responsible for their own technology than the workers typically studied in classic participatory technology projects. For example, participatory projects with office workers hinge on accurately codifying the work that is to be supported. The office workers will not have to maintain the new systems any more than had to personally maintain the old ones. For community groups, this is different. The only sustainable innovations they can make are those they can either pay for or carry out. There is no corporate infrastructure underwriting their activities; no IT Support department. Thus, their expectations about learning and development are that they will assume responsibility for maintenance and further design (Merkel, Clitherow, Farooq, Xiao, Ganoe, Carroll & Rosson, 2005).

Indeed, the community volunteer groups we are working with are quite unlike those in the classic participatory technology projects. In those projects, participation is conceived of as a strategy for mediating and integrating the interests of workers and managers. These different interests were often themselves conceived of as fundamentally adversarial. In the civic sector, the issues manifest differently. Most of the activity in a community group occurs through minimally coordinated and highly localized initiatives. The

community groups we have worked with have few paid staff members. Most of the work activity is carried out by volunteers, who participate how and to the extent that they wish.

The characteristics of PAR projects, and our interest in investigating and developing sustainable community-based learning, impel a different sort of role for us as participant-observers. Specifically, we have learned that effective participation requires a substantial and long-term involvement in the community group, but at the same time, relegates us to the active periphery of the community. This may sound contradictory. On the one hand, the fact that the groups are constituted by loose networks of volunteers and managed by a mixture of self-initiative and consensus-building, makes it difficult to quickly understand the groups and earn sufficient trust to work with them. On the other hand, we are ultimately concerned with helping to implement sustainable learning strategies in these groups. But if we have to actually become members in order to do that, it becomes impossible to differentiate the "models" we are developing and investigating, from our own personal identities. (See Carroll, Chin, Rosson & Neale, 2000, for a broader version of this argument.)

We call this role in the active periphery "the bard": those fellows with lutes and plumed hats, roaming about, singing ballads in medieval courts. Bards were not knights, chancellors, or bishops; they were not even blacksmiths, tailors or farmers. They were not core members of the medieval community at any stratum. However, their songs reminded all the members of the community of their collective exploits, of the folkways, mores, and values that regulate and sustain their practices, and of their future objectives and visions. Their songs inspired other actors in the community to undertake great quests, to defend their comrades, or just to be a bit more creative and daring in their farming or whatever else they did. The bard's tools are themselves fairly unthreatening to the interests and practices of others, and at the same time participatory in the sense that a familiar or rousing ballad asks for sing-along (Carroll, 2004).

As the bards of community nonprofits in Centre County, Pennsylvania, we are much more than facilitators. We are much more than occasional visitors. We are continuously involved. We are aware of what is going on in the group, of who is doing what in the group. We understand what the group is about and what it values. We are sounding boards for the group's analysis and planning. We are on occasion direct technical resources for analysis and planning. We *represent the group to itself*, in our case from the particular perspective of technology needs and possibilities. But we are also firmly at the edge of the group. We don't have an operational role. We don't have power.

This role can be uniquely useful: Community groups are not about information technology any more than they are about plumbing. They recruit various technologies in the service of their community goals and functions. It is easy for them to lose sight of their own technology needs and goals. The peripheral participant can remind core members of their own needs and goals, and draw connections between current group issues and opportunities and technology plans. If this reminding is done creatively, it can become a vehicle for defining a zone of proximal development, in Vygotsky's (1978) sense, with respect to technology learning and mastery. The zone of proximal development is the set of concepts, skills, and other capacities that a person or an organization can undertake with help. As an individual or an organization successfully operates within the zone of proximal development, it becomes autonomously competent with a larger set of concepts, skills, and capacities. At that point, it can articulate greater ambitions and continue to push the bounds of its own development. If the peripheral participant can remind the core members of their zone of proximal development with respect to information technology, and perhaps even provide some help so that they can operate within this zone and push out its boundaries, then the peripheral participant can become an instrument of learning and development within the community. (See Carroll & Farooq, 2005, for a more specific and detailed version of this proposal.)

## Acknowledgements

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# 3. Learning in Communities: A Distributed Intelligence Perspective

**Gerhard Fischer**

## Distributed Intelligence: Transcending the Individual Human Mind

The power of the unaided individual mind is highly overrated (Arias et al., 2001). In most traditional approaches, *human cognition* has been seen as existing solely "inside" a person's head, and studies on cognition have often disregarded the physical and social surroundings in which cognition takes place. *Distributed intelligence* (or *distributed cognition*) (Hollan et al., 2001; Pea, 2004; Salomon, 1993) provides an effective theoretical framework for understanding what humans can achieve and how artifacts, tools, and socio-technical environments can be designed and evaluated to empower human beings and to change tasks. Our research efforts are focused to exploit the power of omnipotent and omniscient technology based on reliable and ubiquitous computing environments and an increasing level of technological fluency to help people to facilitate and support learning in communities.

## Social Creativity

*Social creativity* explores computer media and technologies to help people work and learn together (Bennis & Biederman, 1997). It is specifically relevant to complex design problems because they require expertise in a wide range of domains. Software design projects, for example, typically involve designers, programmers, human-computer interaction specialists, marketing people, and end-user participants. Information technologies have reached a level of sophistication, maturity, cost-effectiveness, and distribution such that they are not restricted only to enhancing productivity but they also open up *new creative possibilities* (National Research Council, 2003).

Our work is grounded in the basic belief that there is an *"and"* and not a *"versus"* relationship between individual and social creativity (Fischer, et al., 2005). Creativity occurs in the relationship between an individual and society, and between an individual and his or her technical environment. The mind—rather than driving on solitude—is clearly dependent upon the reflection, renewal, and trust inherent in sustained human relationships (John-Steiner, 2000). We need to support this distributed fabric of interactions by integrating diversity, by making all voices heard, by increasing the back-talk of the situation, and providing systems that are open and transparent, so that people can be aware of and access each other's work, relate it to their own work, transcend the information given, and contribute the results back to the community (Fischer et al., 2004; Hippel, 2005).

In complex design projects, collaboration is crucial for success, yet it is difficult to achieve. Complexity arises from the need to synthesize different perspectives, to exploit conceptual collisions between concepts and ideas coming from different disciplines, to manage large amounts of information potentially relevant to a design task, and to understand the design decisions that have determined the long-term evolution of a designed artifact.

## Exploiting Diversity and Distances by Making All Voices Heard

Social creativity thrives on the *diversity* of perspectives by making all voices heard. It requires constructive dialogs between individuals negotiating their differences while creating their shared voice and vision. We have explored different sources of creativity by exploiting four different *distances*: *spatial, temporal, conceptual, and technological* (Fischer, 2005).

Voices from Different Places: Spatial Distance. Bringing spatially distributed people together with the support of computer-mediated communication allows the prominent defining feature of a group of people interacting with each other to become *shared concerns rather than shared location*. It extends the range of people to be included, thereby exploiting local knowledge. These opportunities have been successfully employed by the open source communities, collaborative content creation communities (such as Wikipedia) as well as by social networks of people who have a shared concern (such as a family member with a disability). Transcending the barrier of spatial distribution is of particular importance in *locally sparse populations*. Addressing this challenge is one of the core objectives of our research work in the CLever (Cognitive Levers: Helping People Help Themselves) project (CLever, 2005; dePaula, 2004).

Voices from the Past: Temporal Distance. Design processes often take place over many years, with initial design followed by extended periods of evolution and redesign. In this sense, design artifacts (including systems that support design tasks, such as reuse environments (Ye & Fischer, 2005)) are not designed once and for all, but instead evolve over long periods of time. Much of the work in ongoing design projects is done as redesign and evolution; often, the people doing this work were not members of the original design team. Long-term collaboration requires that present-day designers be aware of not only the rationale (Moran & Carroll, 1996) behind decisions that shaped the artifact, but also any information about possible alternatives that were considered but not implemented. This requires that the rationale behind decisions be recorded in the first place. A barrier to overcome is that designers are biased toward doing design but not toward putting extra effort into documentation. This creates an additional rationale-capture barrier for long-term design (Grudin, 1987).

The idea of exploiting and building on the voices of the past to enhance social creativity is important not only for software reuse but for our overall cultural heritage. In cultural evolution there are no mechanisms equivalent to genes and chromosomes (Csikszentmihalyi, 1996); therefore, new ideas or inventions are not automatically passed on to the next generation, and education becomes a critical challenge to learn from the past. Many creativity researchers have pointed out that the discoveries of many famous people (e.g., Einstein who could build on the work of Newton) would have been inconceivable without the prior knowledge, without the intellectual and social network that simulated their thinking, and without the social mechanisms that recognized and spread their innovations.

Voices from Different Communities: Conceptual Distances. To analyze the contribution of voices from different communities, we differentiate between two types of communities: communities of practice (CoPs) and communities of interest (CoIs). This distinction will be further elaborated below.

*Communities of Practice (CoPs)* (Wenger, 1998) consist of practitioners who work as a community in a certain domain undertaking similar work. For example, copier repair personnel who work primarily in the field but meet regularly to share "war stories" about how to solve the problems they encountered in their work make up a CoP (Orr, 1996). Learning within a CoP takes the form of *legitimate peripheral participation* (LPP) (Lave & Wenger, 1991), which is a type of apprenticeship model in which newcomers enter the community from the periphery and move toward the center as they become more and more knowledgeable.

Sustained engagement and collaboration lead to boundaries that are based on shared histories of learning and that create discontinuities between participants and non-participants. Highly developed knowledge systems (including conceptual frameworks, technical systems, and human organizations) are biased toward efficient communication within the community at the expense of acting as barriers to communication with outsiders: boundaries that are empowering to the insider are often barriers to outsiders and newcomers to the group.

A community of practice has many possible paths and many roles (identities) within it (e.g., leader, scribe, power-user, visionary, and so forth). Over time, most members move toward the center, and their knowledge becomes part of the foundation of the community's shared background.

*Communities of Interest* (CoIs) (Fischer, 2001) bring together stakeholders from different CoPs and are defined by their collective concern with the resolution of a particular problem. CoIs can be thought of as "communities of communities" (Brown & Duguid, 1991). Examples of CoIs are: (1) a team interested in software development that includes software designers, users, marketing specialists, psychologists, and programmers, or (2) a group of citizens and experts interested in urban planning. Stakeholders within CoIs

are considered as informed participants who are neither experts nor novices, but rather both: they are experts when they communicate their knowledge to others, and they are novices when they learn from others who are experts in areas outside their own knowledge.

Communication in CoIs is difficult because they come from different CoPs, and therefore use different languages, different conceptual knowledge systems, and different notational systems (Snow, 1993). Members of CoIs must learn to communicate with and learn from others (Engeström, 2001) who have different perspectives and perhaps a different vocabulary for describing their ideas. In other words, this symmetry of ignorance must be exploited.

*Comparing CoPs and CoIs.* Learning by making all voices heard within CoIs is more complex and multifaceted than *legitimate peripheral participation* (Lave & Wenger, 1991) in CoPs. Learning in CoPs can be characterized as "learning within a single knowledge system", whereas learning in CoIs is often a consequence of the fact that there are multiple knowledge systems. CoIs have multiple centers of knowledge, with each member considered to be knowledgeable in a particular aspect of the problem and perhaps not so knowledgeable in others.

Table 1 characterizes and differentiates CoPs and CoIs along a number of dimensions. The point of comparing and contrasting CoPs and CoIs is not to pigeonhole groups into either category, but rather to identify patterns of practice and helpful technologies. People can participate in more than one community, or one community can exhibit attributes of both a CoI and a CoP. Our *Center for LifeLong Learning and Design ($L^3D$)* is an example: It has many characteristics of a CoP (having developed its own stories, terminology, and artifacts), but by actively engaging with people from outside our community (e.g., from other colleges on campus, people from industry, international visitors, and so forth), it also has many characteristics of a CoI. Design communities do not have to be strictly either CoPs or CoIs, but they can integrate aspects of both forms of communities. The community type may shift over time, according to events outside the community, the objectives of its members, and the structure of the membership.

**Table 1: Differentiating CoPs and CoIs**

| Dimensions | CoPs | CoIs |
|---|---|---|
| Nature of problems | Different tasks in the same domain | Common task across multiple domains |
| Knowledge development | Refinement of one knowledge system; new ideas coming from within the practice | Synthesis and mutual learning through the integration of multiple knowledge systems |
| Major objectives | Codified knowledge, domain coverage | Shared understanding, making all voices heard |
| Weaknesses | Group-think | Lack of a shared understanding |
| Strengths | Shared ontologies | Social creativity; diversity; making all voices heard |
| People | Beginners and experts; apprentices and masters | Stakeholders (owners of problems) from different domains |
| Learning | Legitimate peripheral participation | Informed participation |

Both forms of design communities exhibit barriers and biases. *CoPs* are biased toward communicating with the same people and taking advantage of a shared background. The existence of an accepted, well-established center (of expertise) and a clear path of learning toward this center allows the differentiation of members into novices, intermediates, and experts. It makes these attributes viable concepts associated with people and provides the foundation for legitimate peripheral participation as a workable learning strategy. The barriers imposed by CoPs are that *group-think* (Janis, 1972) can suppress exposure to, and acceptance of, outside ideas; the more someone is at home in a CoP, the more that person forgets the strange and contingent nature of its categories from the outside.

Voices from Virtual Stakeholders: Technological Distances. The preceding subsections emphasized computer-mediated collaboration among humans to reduce the gaps created by spatial, temporal, and

conceptual distances. Voices from virtual stakeholders are embedded in artifacts such as books and in more interesting and powerful ways in computational artifacts.

Design can be described as a reflective conversation between designers and the designs they create. Designers use materials to construct design situations, and then listen to the "back-talk of the situation" they have created (Schön, 1983). Unlike passive design materials, such as pen and paper, computational design materials are able to interpret the work of designers and actively talk back to them. Barriers occur when the back-talk is represented in a form that users are unable to comprehend (i.e., the back-talk is not a boundary object), or when the back-talk created by the design situation itself is insufficient, and additional mechanisms (e.g., critiquing, simulation, and visualization components) are needed. To increase the back-talk of the situation, we have developed *critiquing systems* (Fischer et al., 1998) that monitor the actions of users as they work and inform the users of potential problems. If users elect to see the information, the critiquing mechanisms find information in the repositories that is relevant to the particular problem and present this information to the user.

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# 4. Spiders in the Net: Universities as Facilitators of Community-based Learning

**Gerhard Fischer, Markus Rohde, and Volker Wulf**

Universities play an important role in the knowledge society (Brown & Duguid, 2000). Beyond their traditional role in research and education, they have the potential exploit local knowledge in (regional) innovations and to provide opportunities for students to become lifelong learners. To realize these potentials, universities, specifically in the fields of applied sciences and engineering, will have to reinvent their conception of education by taking the importance of industrial practise and social networks into account (Tsichritzis, 1999).

Traditionally, university teaching is based on an "instructionist" understanding of learning which assumes that the instructor possesses all relevant knowledge and passes it to the learners (Noam, 1995). The learner is seen as a receptive system that stores, recalls and transfers knowledge. Such an understanding has been criticized from theoretical and practical points of view (cf. Collins et al., 1989; Jonassen and Mandl, 1990). In a highly differentiated world full of open ended and ill-defined problems it is rather unlikely that an individual (professor) or an academic organization (faculty) alone will possess sufficient knowledge to foster learning among students and practitioners sufficiently (Arias, et al., 2001).

We believe that *socio-cultural theories of learning* (Bruner, 1996) and the concepts of *social capital* (Huysman & Wulf, 2004) and *social creativity* (Fischer et al., 2005) hold considerable promise as a theoretical base for the repositioning of universities in the knowledge society. Learning is understood as a collective process (Rogoff, et al., 1998) that is linked to a specific context of action. In socio-cultural theories of learning, communities of practice are the social aggregate in which learning and innovation take place. Knowledge emerges by discursive assignment and social identification (Lave & Wenger, 1991; Wenger, 1998). Social capital is about value derived from being a member of a social aggregate. By being a member, people have access to resources that non-members do not have (Bourdieu, 1985; Huysman & Wulf, 2004; Putnam, 1993). Social capital can serve as an enabler to social learning processes (Cohen & Prusak 2001); Fischer et al., 2004; Huysman &Wulf, 2004), and it represents a precondition for the emergence of communities of practice.

The *Information Systems Research Group (IS)* at the University of Siegen will be taken as an example of how universities may draw on the concepts of communities of practice and social capital to reposition themselves in societal learning processes. Supported by research funds from public and industry sources, the IS group has grown from three to ten staff members (faculty and research associates) during recent years. Research is organized around individual, typically externally funded, projects and practice emerges within these projects or groups of them. To set up a network within the regional IT industry, the IS group got specific funding from the European Structural Fund.

In Siegen, opportunities for enculturation into specific communities of practice are considered to be a major instrument of education at the university level. This approach complements *"learning about"* with *"learning to be"* (the second objective serves as the fundamental principle underlying the *Undergraduate Research Apprenticeship Program* at the University of Colorado, Boulder; for detail see: http://l3d.cs.colorado.edu/urap/). So far, experiences have been primarily gained with enculturation processes into two different types of communities of practice: those within the research group and those within regional IT companies. We have reinterpreted the following elements of the IS curriculum to offer opportunities for students to participate in our practice: seminars, project groups, and the diploma thesis. With regard to each of these elements of the curriculum, we define tasks that are relevant to actual and future research projects in our group (e.g., elaborating the state of the art of a new research area within a seminar, implementing specific software components in the framework of a project group, or designing a prototype in a Masters thesis). We also offer paid jobs for students to work within our research projects on an ongoing base. Since the relevance of these tasks is obvious to students and researchers, an important

precondition for processes of enculturation is met. Enculturation processes into the research group get more likely and intense in those cases when the students follow up on more than one of these learning opportunities.

Though the research projects are typically conducted in cooperation with industry, our practice is more research-oriented compared to the one our graduates will experience in industry after finishing their studies. Therefore, we offer additional types of learning opportunities to students by integrating student teams into the communities of practice of local IT companies. To host teams of two to three students, IT companies define projects close to their core business. The student teams work on these projects in close cooperation with actors from the companies. When working in industry our students are closely coached by members of the research group. The student teams are connected to each other and to their supervisors in academia by means of a community system. Rohde, et al. (2005) present results of an evaluation study of an earlier implementation of this approach in entrepreneurship education.

Community-based approaches to university education provide learning opportunities for academics and companies. While enculturation into the companies' communities of practice is seen as the main mechanism for student learning, students often mediate between university and company practice. Since the students are coached by their advisers during their experience in the company, they carry ideas back and forth between the communities of practise within companies and academia. Companies get word of innovative ideas out of academia while researchers get feedback on the applicability of their concepts. This boundary spanning activity is especially intense when the students have been enculturated previously in academia.

To establish community-based approaches to university education, academic visibility and a sufficient level of social capital are required. The enculturation processes require substantial efforts from companies as well as from students. Companies are only rewarded in the end and in those cases when their proposed project turned out to be successful. Mutual trust between companies and academia is built over time through cooperation in successful projects. To get the process started, a certain reputation built through other (regional) activities is instrumental. Regional networking activities and the joint acquisition of research projects have turned out to be an important means of building social capital. In the future, we will extend this community-building effort to include our network of alumni. To offer appropriate learning opportunities to their students, academics will have to building and maintain a dense web of social relations.

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# 5. Designing Technology for Local Citizen Deliberation

**Andrea Kavanaugh and Philip Isenhour**

Citizen participation in democratic processes in the United States has been facilitated and enhanced since the mid-1990s with the diffusion and adoption of computer networking (Barber, 1984; Coleman and Gotz, 2002; Kavanaugh et al., 2005a, 2005b; Rainie, 2005). Electronic mailing lists and websites pertaining to political interests grew rapidly in the late1990s. Much of this facilitated participation consisted of increased awareness about issues and information, as well as increased capability for coordination, communication and outreach with regard to political activities. Despite these positive outcomes, existing tools are largely used to broadcast information from a few-to-many. There is limited interaction, discussion and deliberation online, except in specially designed centralized forums. These special web sites are very helpful in supporting discussion and even deliberation among interested citizens (for example, in the Minnesota E-Democracy project). Yet they tend to attract and retain the most highly motivated and activist citizens. For the less motivated majority of citizens, there is a need for tools that allow easy authoring and editing and intuitive ways to comment and contribute additional content to a group discussion.

The advent of web logs (i.e., blogs) provides an opportunity to extend the capabilities of traditional electronic mail and discussion lists toward greater social interaction, discussion, and content production. The simplicity of the tools for blogging and their free availability have lowered the bar for users interested in communicating with others in their social networks, their geographic communities and the greater public. Community or group blogs represent a kind of self-organizing social system that allows a number of individuals to interact and learn from each other through the exchange ideas and information, and to help solve collective problems.

Components of the optimal systems that community organizations seek are in place, such as servers, network connectivity and technical support. But gaps in software technology persist, which can be closed with applications that can be customized to meet the specific and unique needs of these organizations. For example, authoring, publishing, and archiving information; soliciting feedback from organization members and the community; holding discussions, tutorials, and forums; planning and coordinating organizational activities; and managing group resources.

The web, in its current form, strongly favors information consumers over information producers. Emerging technologies such as web logs and wikis (Searls & Sifry, 2003) seek to address this deficiency. Blogs -- online journals often used for commentary and content aggregation -- have seen an explosive rise in popularity (Rainie, 2005). They have been adapted for diverse uses, but maintain the basic format of a column or journal entry, typically linking to external resources, and often supporting direct posting from a web browser and discussion forums attached to each entry. Wikis (Guzdial, Rick, & Kehoe, 2001) represent a more flexible and open-ended approach to direct editing. On a Wiki, any user can edit the content of any page using a shorthand language that is translated into HTML. A common element of Wiki shorthand is a simplified mechanism for linking, thereby supporting the goal of creating interconnected hypertexts.

The popularity of weblogs and wikis, including a growing popularity of weblogs among content producers outside of technical fields, suggests that there is demand for tools that provide more direct and simplified publishing than is available with desktop web page publishing software. Such tools seem particularly well matched to the knowledge management needs of nonprofit community organizations and small, but distributed, public sector agencies such as the public health district. These groups will often lack the resources to support full-time web maintenance staff.

The relatively primitive nature of blogs and wikis also suggests opportunities for technology innovation. The tools are generally focused on text publishing and often support interactivity only in the

form of discussion forums. In this sense, blogs and wikis represent something of a step backwards as end-user development tools when compared to pre-web technologies such as MOOs and MUDs (Bruckman, 1999; Haynes & Holmevick, 1998). They also represent two extremes in their enforcement of structure, with blogs (essentially by definition) having a very specific linear structure, and wikis having a sometimes chaotic lack of structure.

To address these issues, integrated authoring tools must support flexible representation and organization of content with format and structure based on the requirements of specific groups of users. Richer interactive tools will be required to support representation, organization, and sharing of ideas and experiences. Tools that integrate synchronous and asynchronous discussion and refinement of content objects, for example, can help capture informal and contextual knowledge that might not be captured in static web pages.

In a series of focus group interviews conducted with adult residents of Blacksburg and Montgomery County, Virginia (Fall 2005) most citizens seemed only vaguely aware of blogs and wikis. Nonetheless, they were clear about the affordances and functionality they wanted from emerging tools. They want to find diverse information such as news that is missing in local newspapers, and to explore different perspectives on issues of national and personal interest. Citizens reported seeking greater usability especially for novices and non-tech savvy users, such as senior citizens. They observed that the local groups with which they affiliate act as important mechanisms for sharing more reliable information and sustaining discussion, since contributors are known to each other. They emphasized the need for balance between offline and online political activities, including deliberation. Peer pressure among group acquaintances helps reduce incidences of personal attacks online. Peer reviewing helps participants authenticate information, thereby fostering greater trust. The few local community groups that have set up (or converted) their websites to wiki-styles benefit from simpler and easier content updating and editing, but they typically required some support and guidance in order to get started. The small but growing number of local blogs with at least occasional political content could be potentially more effective in educating and stimulating exchange among community members if there were mechanisms to aggregate similar content scattered across multiple blogs. Aggregators, search engines, and social bookmarking are examples of ways to facilitate the discovery of these potential connections.

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# 6. Social Reproduction and its Applicability for Community Informatics

**Lynette Kvasny**

## Introduction

For the past decade, committed researchers, politicians, policy makers, investors, and community-based organizations made concerted efforts to redress the digital divide, but the solution has remained somewhat elusive. Information and communication technologies (ICTs) have been portrayed in digital divide discourses as the great equalizer that may be leveraged by local communities to combat economic deprivation and foster social inclusion. Thus, there exists a sense of urgency in "bridging the digital divide." ICT rhetoric is generally utopian, touting innovative models for collaboration, economic activity, learning, and civic involvement.

However, as ICTs become more widely available, we cannot naively assume that historically underserved communities are reaping these highly touted benefits. The rhetoric that celebrates the "bridging of the digital divide" may in fact ring hollow in communities where questions of material existence, not ICT, prevail. People in underserved communities are often consumed with meeting basic human needs such as earning a livelihood, finding comfortable and affordable housing, and creating safe neighborhoods. In light of these persistent economic hardships and related social issues like drugs, crime, discrimination, and homelessness, our well-intended efforts for redressing the digital divide are indeed challenged.

In what follows, I present social reproduction theory as a basis for understanding how ICT may in fact serve to reproduce, rather than alleviate, inequality. When digital divide interventions are informed by Western economic and technological rationalities, they tend to rely on the financial resources and the expertise of external entities. The people experiencing economic hardships and social ills are often portrayed as passive objects, with little agency. By examining the role of ICT in perpetuating these systems of inequality, we are then able to posit transformative ways of thinking about ICT as enabling the resourcefulness of historically underserved communities in meeting their self-determined needs.

## Social Reproduction Theory

Social reproduction theories are fueled by the central question of how and why relationships of inequality and domination are reproduced. This theory can be usefully appropriated by community informatics scholars interested in probing the relationship between class interests and power as exerted through the seemingly democratic practice of providing free or low-cost computer and Internet access and training.

Adopting a social reproduction standpoint, one may start from the premise that digital divide discourses tend to categorize and legitimize the power relations between those social agents with (the haves) and those without (the have nots) computing skills and access. Researchers identify and measure those who do and do not have access. Interventions based on this research seek out those without access, and provide them with opportunities to learn and acquire computing skills for little or no financial cost. Thus, one may conclude that the digital divide is a powerful discourse for socialization into a given social order (the information society).

How then does this socialization into a given social order take place? Reproduction theory provides some conceptual models for investigating this process. There is no single general reproduction theory, but reproduction processes constitute a fundamental problem that has been tackled in contemporary sociology,

mostly in the study of educational institutions. In what follows, I posit three major approaches in reproduction theory.

First, Bowles and Gintis (1976) debunk the century-old ideal of public education as "the great equalizer" among disparate social classes in the U.S. Bowles and Gintis instead argued that public schooling reproduces social and class-based inequities. They adopt a Marxist perspective and argue that schools are training young people for their future economic and occupational position according to their current social class position. On the one hand, students of working-class origin are trained to take orders, to be obedient, and are subject to more disciplinary interventions. On the other hand, children of professionals are trained using more progressive methods, which give them internal discipline and self-presentation skills. The schools and their curriculum structure education so as to produce workers who will fill various socially stratified occupations, thereby maintaining class-based inequities and benefiting the means of capitalist economic production and profit.

While this theory has been criticized because it assumes that futures are largely determined by the economic structure and agents place within it, it does help to raise questions about the implications around the intensity, purpose, autonomy, quality and length of training and access found in public access centers, libraries, universities, workplaces and homes.

Human agency and resistance form the second explanation for social reproduction. From this perspective, dominated agents' resistance to school is a political response to oppression and limited life chances. Resistance theories privilege human agency with dominated agents being able to act, interpret, and exert some power in their lives. This agency, however, tends to keep dominated agents in the lower levels of the economic structure. In Paul Willis' (1997) study of working class male culture in the UK, he found that these males are talented enough to do school work, but they choose not to. Self-exclusion from an educational setting, which was associated with feminine qualities, was experienced as affirming a strong masculine identity. Instead of school, the youths engaged in practices such as theft, smoking, fighting, and consuming alcohol, which they perceived as masculine. The youths also engage in factory work, which became another site for expressing masculinity. While resistance was initially seen as positive, after five or so years of factory work, the young men felt locked into this working-class position and unwittingly reproduced the social structure.

This resistance-oriented approach would be useful for examining “Internet drop-outs” and those who simply refuse to adopt ICT, and to understand how and why this rejection of ICT may fact place folks at a disadvantage. The digital divide is founded on the implicit assumption that access and use provide distinct advantages, and those who fail to adopt ICT will be somehow left behind. Reproduction theory provides a lens for empirically examining this premise.

Culture represents the third explanation for social reproduction. For Bourdieu (1984), culture plays a paramount role in structuring life chances. Each class has its own cultural background, knowledge, dispositions, and tastes that are transmitted through the family. However, the culture of dominant groups forms the knowledge and skills that are most highly valued, and the basis of what is taught in schools. To possess these ways of knowing and skills, which Bourdieu calls cultural capital, means that one is considered educated or talented. To not have this cultural capital means one is considered ignorant or uneducated. Academic performance and educational credentials such as diplomas, certificates, and degrees are largely based upon the congruence between what is taught in school and the cultural capital possessed by students. Thus, those students coming from more affluent homes have greater chances of excelling in school and obtaining credentials that expand occupational opportunities because they posses larger quantities of cultural capital that are privileged in educational settings. In this way, cultural capital inculcated by families and schools plays a large role in structuring access to desirable employment and broader life chances.

Research informed by Bourdieu can provide explanations for how the dominant ideas of a society (i.e., economic development and digital divide) are related to structures of socio-economic class, production and power, and how these ideas are legitimated and perpetuated through ICT. This theoretical framework also provides answers to the question of how advantages fail to be passed on to dominated groups, and how we come to perceive the status quo as natural and inevitable (i.e., legitimacy through powerful institutions such as the media as well as schools).

In summary, social reproduction theories problematize taken-for-granted assumptions about the digital divide and the "people on the wrong side of the divide." These theories may inform studies of how and why social agents conceptualize, appropriate, and perhaps resist ICT, and how these practices may unwittingly lead to continued social exclusion. These theories are perhaps most useful for enabling researchers to challenge notions about the ability of ICT alone to redress uniquely human problems of social justice and equity. For instance, Bourdieu's theoretical perspective informed empirical studies of how and why the proliferation of "free" computers and Internet access regardless of mode of access (home or public) may be problematic for public life, and thus provided a rich understanding of the challenges faced by underserved groups (Kvasny, forthcoming; 2005; Kvasny & Keil, forthcoming). These empirical studies also explain the conflicts that may limit ICTs' role in contributing to broadly desirable social outcomes. These conflicts include socio-economic class, history, race, and legitimate uses of ICT.

## Breaking the Reproductive Cycle

Reproduction theories would see the digital divide as creating docile bodies and reinforcing people's place in society. Humanity is stolen from historically disadvantaged people as they come to be seen as have-nots, the unemployed, and the urban poor. This loss of humanity creates a "fear of freedom" in which people acquiesce to an unfair system. Bourdieu argues that the status quo is preserved because it is essentially unquestioned and naturalized. Agents go about their business and they tend not to pose the theoretical questions of legitimacy because the social world is embodied in both their practices and in their thoughts (i.e., habitus). They reproduce it without active reflection. This does not mean that the oppressed do not reflect on their position, but their perception of themselves as oppressed is often impaired by their submersion in the reality of being oppressed (Freire, 1970).

However, education can be a "practice of freedom" with the potential to transform rather than conform (Freire, 1970). To promote transformative uses of ICT, community informatics scholars should enter into dialogue with communities to construct alternative representations of working class subjects and uses of ICT. The working class should not tacitly accept the dominant class values, but critically interrogate their class position and engage in self-actualizing activities that will enable them to integrate ICT in their everyday lives. The awakening of class-consciousness is often bound up within a process of rehabilitating and rebuilding self-esteem, and reaffirming cultural dignity (Freire, 1970; Giroux, 1983; hooks, 1994). This type of critical, participatory research is transformative in that it may help communities to critically reflect upon the structures that repress their ability to thrive. Communities can then resist these structural forces by creating innovative ways of using ICT to support the issues that are important to their social life situations.

Thus, we must respect the particular worldview as well as the social and cultural capital found in historically underserved communities. We must genuinely engage with them so as to understand the nature of their material situation, raise critical awareness of their situation, collaborate to realize alternatives, and create localized interventions for bringing about change. Engagement along the lines advocated by Freire provides a path for how community informatics researchers can promote uses of ICT that upset reproductive processes.

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# 7. Communities, Learning and Democracy in the Digital Age

**Lynette Kvasny, Nancy Kranich, Jorge Reina Schement**

## The Historical Importance of Access

Access to information networks constitutes the essential tool for enabling citizens to participate in the economic, political, and social life of their communities; and, as such, forms the basis for participatory democracy. Indeed, Jefferson, Madison, and the new Congress made concrete their commitment to an informed public as the foundation of America's nascent democracy; when, in 1789, Congress mandated the first post road. As they did 200 years ago, information networks contribute the glue that binds communities together economically, politically, and socially.

Hence, while the democratic principle for participation is inclusion, the economic principle is contribution; that is, to maximize the potential of each individual is also to maximize a community's wealth. Lack of access to a community's central networks impedes quotidian routines as well as occasional expressions of public duty; and, if persistent, enforces isolation and its derivative alienation. Accordingly, the costs and benefits of inclusivity through access may be measured in a community's progress toward maximizing the contributions of each member and of the whole.

## The Challenge of Achieving Access in the Information Age

In the 21st century, the development of the Internet offers new hope for providing universal service in the public interest--new hope that everyone will have the opportunity to participate in our information society. Even if a household cannot afford nor chooses not to connect to the Internet from home, people can logon at their local library. Thanks to the universal service provisions of the Telecommunications Act of 1996, nearly every community is now connected, thus providing on-ramps to the information superhighway. Nevertheless, the latest research indicates that many low income, minority, disabled, rural, aging, and inner city groups remain behind in their ownership of computers and access to telecommunications networks. No matter whose data is used to describe the "digital divide" between rich and poor, between black and white, between urban and rural, between English and Spanish-speaking, between old and young, between immigrants and Native Americans, we can be certain that there is and promises to remain differential access to the Internet and other communications tools.

## The Components of Access: Context, Connectivity, Capability, and Content

Access to telecommunications services will not, by itself, guarantee success for communities. The other side of the equation requires an understanding of the resources a community must marshal to make the most of access to national and global networks. At the community level, successful access depends on four primary determinants or *4C's* of access: context, connectivity, capability, and content.

### *Context*

For access to be achieved, a wide array of internal and external forces and trends must be considered. These include environmental (e.g., air and water pollution, waste management), economic (e.g., business incentives, tax structures), and social equity (e.g., crime, poverty, unemployment) indicators of community

well-being and sustainability. And although context does not determine a community's developmental trajectory, it does suggest the pertinent needs faced by communities, what types of technology-based interventions might help to fulfill these needs, what kinds of barriers are likely to be encountered, and perhaps more importantly, what kinds of assets the community possesses. By conceptualizing the Internet as a pluralistic domain that includes the broader context in which the technical components are embedded, we explicitly connect social with technical to form the intimate interdependency of the Internet as a socio-technical network. A socio-technical perspective emphasizes the importance of context in determining community-level interventions and their evaluation, as well as the inherent difficulty in developing "best practices" that can be applied across diverse settings.

## *Connectivity*

The seemingly simple fact of laying a cable to connect a household or community belies the complexity of attaining a level of connectivity sufficient to constitute a community asset. Though the Telecommunications Act of 1996 defines high-speed Internet as connection speeds above 256 kbps, higher connection speeds are required to effectively utilize many WWW applications in use today. Telemedicine applications call for connections of 1.5 mbps (T1.5) connections; whereas, many Internet business applications necessitate bandwidths of at least T1.5 or multiple T1.5 connections. To be sure, the level of a community's high-speed connectivity can be measured in different ways: a) points of access – availability at public sites such as schools, libraries or community centers, in the home, in businesses or institutions, b) the number of Internet Service Providers (ISPs) that offer high-speed Internet service in a community, c) and/or, the type and speeds of service offerings available from high-speed Internet providers – DSL, cable modem, wireless, T1.5, DS3, etc. Underserved communities may experience a "broadband digital divide" as governments, businesses and content providers increasingly develop products and services that require high-speed Internet connections.

## *Capability*

Because the utility of any technology derives directly from the skill of the user as well as from the delivery capacity of local institutions, capability gauges the ability to deliver or acquire the service. For individuals, capability encompasses both formal and informal educational attainment and levels of technical sophistication and understanding, along with the willingness to adapt to new technologies and ways of thinking. At the institutional level, capability also relates to the amount of resources a community and its businesses commit to workforce development including teaching effective use of information technology tools and encouraging creativity, productivity, and innovations of local entrepreneurs. Capabilities are cumulative and recursive because individuals and institutions must migrate to new hardware platforms, learn new software applications, and develop new skills as new technologies are introduced and as existing technologies are upgraded. Thus, existing and emerging gaps in proficiency, knowledge, skills, and experience may lead to considerable differences in communities' abilities to leverage the Internet.

## *Content*

Content is interdependent upon the other three C's. Once individuals and communities become connected and have the capabilities and necessary skills to use the Internet, they need a reason for use. Low-income and underserved communities face significant content barriers that include the lack of neighborhood-level information such as housing, childcare, and transportation news; limited information written at a basic literacy level; and inadequate content for culturally diverse populations, including non-English speaking Internet users. If content that is relevant to individuals and members of the community is not available, it will be difficult to encourage and sustain use. Relevant content is necessary because it provides a forum for interacting within local communities as well as a window to the outside world.

## Lifelong Learning --The Persistent Challenge of Access

In contemporary communities, the 4C's converge to facilitate decentralized low or no cost delivery of interactive learning opportunities that enable more active, democratic participation from early childhood through adulthood. No longer confined to a classroom or educational institutions, learners are afforded greater opportunities to take advantage of emerging information and telecommunications technologies to achieve more successful outcomes. Shared spaces, both real and virtual, provide environments where people with common interests and concerns gather and benefit--the greater the participation, the more valuable the resource. These learning networks, often referred to as communities, encourage collaborative knowledge creation and sharing using all forms of media. Within these networks, learners can interact by communicating ideas and engaging in discourse and problem solving. Participants contribute new creations after they gain and benefit from access and participation. These learning spaces, or commons, may enhance both human and social capital. When they incorporate democratic values, free expression and intellectual freedom prevail.

While online opportunities have the potential to serve a multitude of lifelong learning needs of all people, they are only available to those who have access to these new technologies, can afford and comprehend the content, and possess the capabilities necessary to navigate these complex systems successfully. Without equitable access within each of the 4Cs, these learning opportunities pose major challenges to the democratic promise of these open anytime/anyplace educational experiences.

# 8. Supporting the Appropriation of ICT: End-User Development in Civil Societies

**Volkmar Pipek, Mary Beth Rosson, Gunnar Stevens and Volker Wulf**

## Introduction

Information and Communication Technology (ICT) has become an important factor in our personal lives as well as in our social organizations—at work, at home, in our hospitals, in political institutions and in the public media. While in work settings the dynamics of shared business goals, shared task systems, and professional delegation structures result in a relatively predictable and organized design context, the more open-ended and less organized contexts of home or society present considerable challenges for applications of ICT. The goals and interests of the diverse actors in these more general contexts are quite unstable and unpredictable; home and society provide only weak structures of specialization and delegation regarding the use of ICTs. One approach to these challenges is to cede design power to the participating users, so that they can develop solutions that match problems and intentions for action.

There have always been motivations to involve users in the design and development of ICTs. On the one hand, the quality of products might be improved by involving end users in the early phases of design (the "User-Centred Design" tradition); on the other hand, end users have claimed the right to participate in the development of ICTs that affect their (working) environments (e.g., the Scandinavian tradition of "Participatory design"). Beyond these approaches to "change design" by changing design methodologies or other aspects of the setting of professional design work, there have also been approaches to "design for change" by offering technologies and tools that provide the flexibility to be thoroughly modified at the time of use (Henderson & Kyng, 1991). The latter approaches have been proffered under the label of 'Tailoring Support' and 'End-User Development' (Lieberman, et al. 2005; Sutcliffe & Mehandijev, 2004), and complement earlier research on 'End-User Computing' and 'Adaptability/Adaptivity'.

## Active support for technology appropriation

At some point it is no longer sufficient to provide the necessary flexibility for (re-)configuring tools and technologies while in use. It is also necessary to provide stronger support for managing this flexibility. Keeping the tool interaction simple, and providing good manuals may be one strategy, but the adaptation and appropriation of tools is often more a social activity than a problem of individual learning and use. Knowledge sharing and delegation structures often develop, although in home and other informal usage settings these structure are likely to be much more spontaneous and less organized than in professional environments. End-User Development methods can address the social aspects of computing by treating users as a '(virtual) community of tool/technology users', and by providing support for different appropriation activities that users can engage in to make use of a technology. Examples of such activities (Pipek, 2005) include:

- Basic Technological Support: Building highly flexible systems.
- Articulation Support: Support for technology-related articulations (real and online).
- Historicity Support: Visualise appropriation as a process of emerging technologies and usages, e.g., by documenting earlier configuration decisions, providing retrievable storage of configuration and usage descriptions.
- Decision Support: If an agreement is required in a collaborative appropriation activity, providing voting, polling, etc.

- Demonstration Support: Support showing usages from one user (group) to another user (group), provide necessary communication channels.
- Observation Support: Support the visualisation of (accumulated) information on the use of tools and functions in an organisational context.
- Simulation Support: Show effects of possible usage in an exemplified or actual organisational setting (only makes sense if the necessary computational basis can be established).
- Exploration Support: Combination of simulation with extended support for technology configurations and test bed manipulations, individual vs. collaborative exploration modes.
- Explanation Support: Explain reasons for application behaviour, fully automated support vs. user-user- or user-expert-communication.
- Delegation Support: Support delegation patterns within configuration activities; provide remote configuration facilities.
- (Re-) Design support: feedback to designers on the appropriation processes.

These are support ideas derived from the observation of activities that users perform to make use of a technology. They have been partially addressed in earlier research, for example by providing flexibility through component-based approaches (Morch, et al., 2004), or by offering sandboxes for tool exploration (Wulf & Golombek, 2001).

## Supporting 'Virtual Communities of Technology Practice'

Pipek (2005) also gave the example of 'Use Discourse Environments' as one possibility to support the user community in some of these appropriation activities. These environments tightly integrate communication mechanisms with representations of the technologies under consideration, for instance by integrating discourse processes with the configuration facilities of tools, or by providing easy citations of technologies and configuration settings in online discussion forums. By these means, technology needs and usages become more easily describable by end users, and communication among people sharing a similar use background (typically *not* the professional tool designer) is eased. However, evaluations of these environments suggest that the problem cannot be solved by offering technological support alone; additional social or organizational measures (establishing/mediating conventions, stimulation of communication) must also be considered to guarantee long-term success.

The approach to actively support user communities in their appropriation activities promises to alleviate the lack of professional support in home/volunteering settings of ICT usage. It may stimulate the spreading of good practice among users, and it offers a platform to actively deal with conflicts that occur between different stakeholders involved in a shared activity that involves ICT use (e.g., conflicts about visibility of actions and about the configuration of access rights).

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# 9. Developmental Learning Communities

**Mary Beth Rosson and John M. Carroll**

## Introduction

Research over the past two decades has emphasized the importance of learning communities — self-organizing groups of learners who work together on authentic tasks, describing, explaining, listening to, and interpreting one another's ideas. Learning communities often structure their learning by scaffolding embedded both in the activities and in the tools of the community (Bruner, 1960). Learners also develop by participating in the discourse of their community, where they encounter and contribute to the situated negotiation and re-negotiation of meaning (Dewey, 1910). We define a *developmental* learning community as a group of learners who organize their learning activity into phases and their members into roles. The learning in such communities is developmental in the sense that members successively traverse phases and roles. An example would be a university research group including undergraduate students, graduate students, post doctoral students, and faculty.

A key feature of a developmental learning community is its members' understanding—whether implicit or explicit—of *phases* that they progress through as they gain community-relevant knowledge and skills. Often these communities emphasize mastery of skills (e.g., a martial arts community), where different skill levels are labeled to acknowledge members' progress (for instance "apprentice", "practitioner", or "master"). Progress through such phases is accomplished by meeting a community standard or practice that often also includes a change in status for members, perhaps a skill test of some sort, cumulative knowledge or experiences that are judged in some fashion, a prescribed level of insight that is expressed by the member, or a critical episode that persuades the community of the member's progress.

Another characteristic of developmental communities is the relationships among members at different developmental phases. That is, we assume that members share an understanding of what is expected from them at any given phase—for example, how they should relate to less-developed members (outreach, scaffolding, other forms of mentoring); those at their same level (sharing, comparison, synthesis of experience); and those at higher levels (requesting help or mentoring, respect for suggestions).

Members of developmental learning communities also share a motivational orientation about their own and others' development. We suggest that one criterion for membership in a developmental community is a commitment to its developmental goals, that is, a willingness to spend effort in "bringing others along." One factor that may be important in creating this motivation and commitment is social ties—beyond those arising from the community's developmental activities—that cause members to care about others in the community, enough so that they work to enlist new members and encourage the growth of existing members. A developmental community may also provide rewards for members' efforts to promote co-members' learning, such as increased social capital or more explicit forms of recognition.

## Examples of Learning Communities

Developmental learning communities often emerge through everyday activities and lifelong learning. Children who learn from older siblings, parents and other relatives are a simple example (see the discussion in Dewey, 1910); another is a research group populated by members in very different phases of their professional life—senior faculty, junior faculty (e.g. pre-tenure), post-docs, advanced PhD students, junior PhD students, masters students, undergraduate research students, and wage-payroll assistants. In other cases, the community may be formed explicitly to support one another's development of some knowledge base or skill set (e.g., a gardening club).

In Table 1, we summarize the developmental characteristics of several community computing projects with which we have been working over the past few years.

**Table 1. Examples of developmental learning communities in community computing**

| Learning Community | Learning Activities | Developmental Phases |
|---|---|---|
| Civic Nexus | Analysis of, planning for, and implementation of IT needs in a nonprofit organization | Intern, volunteer, web designer, technology committee member, technology committee chair |
| Teacher Bridge | Creating Web-based lessons in science and math, using a variety of interactive tools | Lurker, member, re-user, adapter, author, coach, program developer |
| Women in IST | Problem-based learning of the architecture and programming of Web-based collaborative systems | High school friend, college recruit, pre-major, major, alumna |

The learning communities in Civic Nexus are nonprofit organizations; we are helping them to create sustainable informal learning processes for meeting their own IT needs (Merkel et al., 2004; Merkel et al., 2005). Most of the nonprofits have little if any articulated knowledge about their own IT needs or trajectories, and little organizational infrastructure for recruiting or developing members who can meet these needs. We help them to reflect about their history and status of IT use, hoping that as the groups come to realize what they have been doing and what their needs are, they will be able to design a sustainable process for meeting and evolving their own IT requirements. These groups have a number of existing roles (intern, volunteer, etc.), but are not oriented toward recruiting and developing members through the role; if they are able to initiate a long-term process of IT learning, such an orientation may become part of their community mission.

The Teacher Bridge project (Carroll, Choo et al., 2003; Kim et al., 2003) is a group of teachers learning to build online materials. When we began the project, we deliberately recruited teachers who were already sophisticated computers users; subsequently these teachers have recruited their own peers and acquaintances and others have discovered the project and joined through word-of-mouth. The community is socially and culturally grounded through co-inhabitation of a geographical region (two contiguous counties), so many teachers join with existing place-based friendships and shared interests. These ties help to motivate peer mentoring and coaching. A typical developmental path starts with a teacher looking around at other projects for ideas; s/he may then join the group (become a member) so as to directly reuse or adapt a peer's work; after s/he has experimented in this fashion, s/he may move to more ambitious implementation projects; some teachers take on a coaching role to help others make these moves; we have even observed teachers taking a supervisory role, where one mission is to look across the whole community for opportunities to advise. In this community, the phases and activities that assist in transitions are defined only informally and anecdotally. However one way to see this community is as a developmental community in formation.

In contrast to the other two examples, the Women in IST (Information Science & Technology) group is developmental at its core—by design. Women join the community with the explicit aim to attract, mentor, and otherwise aid the development of less-expert members. It differs from similar communities (e.g., a typical chapter of the Association for Women in Computing) in that undergraduates leverage personal social ties they have maintained with their high schools, using these to contact girls with quite varied interests (e.g., sports, theater) so as to increase general awareness of computing among young women. Alumni members contact and interact with undergraduates on a similar basis. This project illustrates an effort to apply our concept of developmental community as a guiding pattern for learning community design.

## Supporting Developmental Learning Communities

We are exploring two facets of developmental learning communities that might be aided by social or technical interventions: (1) recognition and acceptance of phases in community members' development, and (2) reinforcement of the social ties that motivate developmental activities within the community.

In some cases the developmental structure may already be in place but not yet organized as a community vision. For instance the Women in IST project is grounded on a very familiar set of phases associated with career development and as researchers our contribution has simply been to articulate these phases as a mechanism for forming a new learning community. In contrast, our work with the nonprofits has roles, but they are not associated with development of IT skills. Thus we have focused on a more bottom-up approach, carrying out extensive technology assessment activities and fieldwork aimed at understanding the IT needs and current understandings of each group. Our hope is that by taking this step the organizations can at least see some of the potential for articulating and planning a more systematic IT learning process.

With respect to social ties that might motivate members' developmental goals toward one another, one intervention is to simply highlight existing opportunities. The students and alumni at the core of Women in IST do not see "outside" friendships (e.g., from shared interests unrelated to IST) to be a key element of the learning community. But when the potential role of such relationships was outlined to them, it became obvious. The community recognition that members receive for helping (or being helped) with learning activities can also be reinforced in an online system. Making mentoring relationships is one approach; reputation tools that capture individuals' contributions to different sorts of activities could also facilitate these recognition processes.

## Final Words

Our ideas about developmental communities are preliminary, inspired by our recent work with Women in IST and the perspective it has offered for thinking about our other community learning projects. Clearly development is an inherent component of any learning community and we offer these reflections as a way of exploring the structure and dynamics of a community's developmental activities, including the implications this might have for socio-technical design in such contexts.

At the same time we recognize the possible negative consequences of emphasizing the developmental goals of a learning community. For example Suchman (1995) discusses the tradeoffs in making "invisible" aspects of activities visible; an organization that documents employee roles and responsibilities is in a better position to track and evaluate (whether fairly or unfairly) employees' routine performance. Reifying the developmental phases within a community might convert a tacit learning process into an explicit one; perhaps it would encourage over-zealous junior members or mentors to obsess over developmental goals. Members might focus so much on skills or achievement levels that they become closed to other more interesting or unexpected learning opportunities. Coaches might compete for recognition of the "best" or the "most" successful mentoring accomplishments.

Although such downsides are real concerns for any community, we anticipate that the same social ties that prompt members to engage in developmental efforts will also prevent or at least minimize competitive and individualistic tendencies. If people contribute to one another's development not just for the good of the community, but also because they like and care about each other, then the social capital they earn through their developmental activities will be its own reward.

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# 10. Radical praxis and Civic network design

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Technology-powered civic networks are social constructions that develop in relation to a particular macro-structure (meaning social structure, here referring to historically-constituted relational patterns among social positions). They are proposed and are designed by incumbents of social positions (persons, groups, organizations), and the cultural practices, belief systems, and dispositions -- interests, values, norms, identities -- that are pervasive in that macro-structure at that historical moment should be presumed to shape network form. Macro-structural realities such as differential access to power and resources modulate how effective actors are in inscribing their preferences into the form; structurally-powerful actors tend to be more successful than structurally-powerless actors in this regard. Like organizational forms in general, civic networks are products of a particular intersection of the macro- (macro-structure) and the micro- (the developmental conditions in which human designers interact to produce design products). The network's mission, its operative strategies, and the social constituencies that are included or excluded through design choices are a function of this intersection. This sociological, institutionalist-inspired view of civic network design recommends a certain kind of reflexivity on the part of the designer, one that emphasizes her *historicity*. This, we argue, is an outlook the designer must consciously cultivate.

We view design as the locus of conflict and struggle, whereby entrenched cultural practices, beliefs and dispositions attempt to pattern emergent artifacts in culturally compliant ways and alternative practices, beliefs and dispositions struggle to ground themselves in concrete form. If the first wins out, the design product embodies and reaffirms prevalent macro-structure; an alternative social order finds concrete form if the latter prevails. We include among design products a broad range of artifacts including technical specifications, and service contracts and project by-laws that govern use and further development of the artifact. These products tend to be mutually-reinforcing: contracts and by-laws, for instance, can ensure that the civic network's present technological configuration is reproduced over time and, through it, the preferred social order. As we note below, design must be conceived of in even broader terms, as design of means as well as ends: design includes specification of ICTs, contracts and by-laws, as well as the developmental (or institutional) conditions – the means -- which yield these design products. Our ideal here is the reflexive designer: one who understands technology design in these broad terms and as located in a particular historical moment and open, as such, to historical forces and structural pressures.

Our reflexive designer is aware that as a new social form, the civic network must necessarily emerge in relation to the historically-constituted relational structures in the geo-spatial area, and in relation as well to the practices, beliefs and dispositions prevalent there. To a greater or lesser extent, explicitly or implicitly, civic networking projects attempt to institute new relational patterns in the areas they purport to serve, whereby heretofore excluded constituencies are reinserted into the social fabric and existing relational structures are re-worked in socially-progressive ways; the ideals they champion tend to center around access equity and social inclusion. The reflexive designer sees the developmental setting as an arena where the project's driving ideals encounter entrenched realities in the project area. Design activity entails social choices, which is why they are so contentious. Picking one design option over another includes some constituencies and excludes others. The contest is seldom one of equals. The embedding macro-structure and its asymmetric power distribution empower some social actors over others to effectively "limit change and create domination in the micro sphere" (Burawoy, 1991). These pressures enter the developmental setting through designers' choices to shape network form. Designers serve as conduits through which such pressures are inscribed into the form to reproduce the prevailing macro-structure. But actors can choose to channel alternative forces for "rewiring" the social order.

Individuals (as well as organizations) are host to multiple cultural logics from prior socialization. These logics -- "material practices and symbolic constructions" (Friedland & Alford, 1991) -- embed them and account for the dispositions, practices and beliefs that define them. These logics guide situated action and encode "criteria of legitimacy by which role identities, strategic behaviors, organizational forms…are

constructed and sustained" (Suddaby & Greenwood, 2005). Some of these logics may be more entrenched, more institutionalized than others. Generally, more institutionalized logics tend to guide behavior more readily than do less institutionalized logics. It is conceivable that civic network designers – a category that ideally would include all potential stakeholders -- enter the developmental setting with at least two sets of logics in their cultural toolkit (Swidler, 1986): one that embeds their habitual social role (for example, "community resident", "Internet service provider") and the other, the civic networking logic. The habitual, of course, is invested in and stems from the prevailing social order, while the civic networking logic may (often does) look ahead to an alternative order. The encounter between these logics in design can be more or less contentious depending on how ambitious are the civic networking project's aims to rewire the prevailing order. The more radical the aims, the greater will be the resistance from entrenched dispositions. What can our reflexive designer do to increase the likelihood that the civic networking logic will prevail in this contest, that it will, in fact, effectively counter more conservative orientations to successfully realize itself in concrete form?

*Design* reflects intention and yet, outcomes often are unintended. This is because design activity is usually seen in terms of products or *ends* that result from the activity. Typically, civic networking design committees (or steering committees) set out to specify a particular configuration of information and communication technologies (ICTs) that would enable the network to become operational. This would be an example of *direct design*, where the intent is to direct the product in a certain way to meet certain specifications and aims. But efforts at direct design often fail from unforeseen interactions among the interest of more and less powerful stakeholders (see Goodin, 1996). Our reflexive designer would focus not just on the *ends* of design but importantly on the *means* as well. The means of design are seldom the focus of design activity, and yet they are a crucial element in the social infrastructure of social constructions. *Indirect design* – design of the social conditions within which design activity occurs -- is not only possible but a requirement, we would argue, to guard against unintended outcomes. Design of ends must start with design of the means, which, in the case of civic network design, may be seen as necessary second order public goods influencing production of the civic network – the first order public good (see Gualini, 2002). Situated actions can be guided by design of social conditions for "probabilistic activation" (Tsuokas, 1989) of preferred logics to structure design products in intended ways. How should our reflexive designer go about doing this? There are two possible targets for indirect design interventions, one internal and the other external, and they shape the design committee's social choice processes as well as the design ends that are identified and pursued. Expanding the design committee's managerial capacity (Brint & Karabel, 1991) for monitoring its own internal relations and constitutive practices is an example of the first. Instituting social controls on the committee's external relations is an example of the second.

How the committee thinks about its internal social and material relations profoundly affects the deliberative climate within which design choices are made. What formal and informal rules must be crafted to improve the likelihood that design options are openly debated by a plurality of publics in a spirit of "participatory parity" (Fraser & Honneth, 2003)? Conversation rules must guarantee individual rights while also promoting the pursuit of the common good. Assuring openness is a utopian ideal that is exceedingly difficult to accomplish in the reality of a more-or-less stratified and differentiated polity, where some constituents are more powerful than others, but we argue that this is a liberal democratic ideal worth pursuing by civic network designers. This stems from a conviction that civic networks, like the mass media, are crucial components of a community's public sphere. Conceptually if not empirically, civic networks necessarily are sites of contestation featuring a multiplicity of publics: targets of contestation could be the broader social agenda as well as the form of the network itself. Recognizing the civic network's obligation to be hospitable to a plurality of publics is an important amendment to a common-enough conception of such networks as *community* resources. The term *community* highlights reciprocity, mutuality and consensus. *Publics*, on the other hand, is a broader idea connoting debate and contestation among social groups constituted around divergent interest, ideology, and identity; the term better accommodates dissensus and dissonance (Fraser, 1999). Accordingly, a civic network may be conceived of in *social process* terms rather than as an *entity*, incorporating as it grows and matures both *communities* based on consensus as well as contending *publics*. One might even argue that the desired end-state would be a normalized set of more-or-less consensual publics. A process view acknowledges that the network must stay resilient and representative, both catalyzing and reflecting broader social changes. Such a view also allows designers to think of design in incremental terms. Institutions develop through layering (Thelen, 2003), whereby changes are layered on top of more enduring 'core' elements without necessarily changing them. As long as

participatory parity is assured, designers can proceed on the assumption that they can respond to situational contingencies as they see fit without locking the design into an irreversible state.

Crafting a robust set of guidelines on how the committee should manage its internal relations – including rules of deliberative engagement – is an imperfect but necessary bulwark against the reality of power asymmetry in the macro-structure. Assuring *rough equality* (Fraser, 1999) in the micro-order is a step toward an egalitarian macro-order; it would be hard to argue that there is no link between the means and such ends. Besides rules of engagement ("everyone gets a chance to speak", for e.g.), our reflexive designer would work to include useful techniques in the committee's repertoire to augment its capacity for enlightened self-management and concerted action. For example, What cultural logics and preconceptions of civic networking do designers come into design with? Identifying these at the outset can make actors more reflexive and help "loosen themselves" from knee-jerk recourse to structural reproduction in the choices they make. Expanding capacity for deliberative action may also be helped by instituting an ethos of the long view: actors are unlikely to focalize the near-term if they are answerable to actors with longer time horizons (Pierson, 2000). This looks ahead to social controls.

Social controls – normative or "regulative institutions that ensure individual behavior accords with group demands" (Coser, 1982) -- can shape what courses of action are pursued by legitimizing some behaviors over others. Institutionalizing philanthropic (versus self-interested) behavior by Minneapolis corporations, Galaskiewicz (1991) reports, was helped by "peer pressure and selective incentives"; philanthropic conduct was rewarded with national mass media publicity. Controls instantiate the Kantian publicity principle, which requires that design choices are "publicly defensible" (Goodin, 1996). Local mass media outlets, elected officials, urban planners and opinion-leaders can be external controllers and sources of public oversight on the design process. The reflexive designer will incorporate such sources of control into the design process. This is easier said than done. This might require challenging well-entrenched notions of civic identity that these actors may be invested in. For example, a community that thinks of itself as driven by the logic of economic growth (and which community today isn't?) may yield up few sources of social control who are prepared to go to bat for the social equity logic. Reframing civic, and individual, identity to include the latter could be especially challenging if the community lacks a history of civic activity. Successful reframing, however, would help incorporate community actors as well as other targeted social movements into the project, thus expanding the moral, rhetorical and material resources that the reflexive designer constitutes in a *circle of solidarity* (Jermier, 1998) to guide the committee's design choices and hold it accountable for them.

All social actors have the *capacity* for reflexivity: they are context-aware operatives who select from among logics and action repertoires when deciding how to act in a situation. This institutionalist idea is crucial to the foregoing: indirect design can succeed only if actors are credited with this capacity. *Praxis* refers to analytic *understanding* of the sources of structural inequality and then *acting* to normatively reconstitute the prevailing social order (Benson, 1983). Our reflexive designer may be confronted with the following choices: to inscribe the design with the project's transformative aims or to compromise on those aims in light of situational contingencies. This dilemma is likely to arise in civic networking projects based on broadband ICTs. Broadband requires, as a practical necessity (Winner, 1993), significant technological, financial and know-how resources to sustain. As such, designers may have to choose between two logics: the social equity logic and the financial sustainability logic. Affirming the former is to affirm the goal of structural change through the network; affirming the latter is to empower the prevailing macro-structural resource distribution. These logics need not be mutually-exclusive. Our reflexive designer is an enlightened pragmatist, knowing when to balance strategic structural aims against situational contingencies without, however, losing sight of the prize. She is conscious always of her capacity for social choice, and works to enlighten her fellow designers of the same.

Design choices are social choices. To acknowledge one's capacity for choice is to acknowledge one's historicity. In the context of civic network design, such an outlook stems from ongoing reflection on the project's dialectical relation to broader cultural and structural forces. The challenge for civic networking cohorts everywhere is to institutionalize such an outlook to ensure that (a) designers recognize their design choices as social choices that are publicly deliberated, defended, and challenged and (b) the outlook becomes self-activating and trans-individual, which means every designer – every participant in design -- thinks and acts like our exemplary reflexive designer. Why should we attempt to institutionalize such an

outlook? The field of urban planning offers instructive lessons. In the 1960s, Paul Davidoff argued for a new socially-progressive urban planning outlook called "advocacy planning":

> "The public interest, as he saw it, was not a matter of science but of politics. He called for many plans, rather than one master plan, and for full discussion of the values and interests represented by different plans. He brought the question of who gets what – the distributional question which the rational model had so carefully avoided – to the foreground". (Sandercock, 1998, p. 171)

Urban planning schools adapted this outlook into their curricula, as they did its successors over the years, to train planning professionals sensitized in these alternatives to the technical-rational planning model. The rational planning model and its proponents helped affirm the prevailing social order and its distribution of power and resources. This had been the taken-for-granted approach to planning practice, one that was unreflexively reproduced through urban planning research and training curricula until Davidoff's salvo. The most recent paradigm shift is represented by the radical planning approach. Radical planning praxis, Sandercock notes, is discontinuous with rational planning and is explicitly critical and progressively political in its concerns:

> "Radical practices emerge from experience with and a critique of existing unequal relations and distributions of power, opportunity and resources. The goal of these practices is to work for structural transformation of these systemic inequalities and, in the process, to empower those who have been systematically disempowered" (p. 176).

Bandwidth is socially-produced social space. Urban planning theorists call attention to the replication in built urban space of hegemonic power and resource distributions. Telecommunications bandwidth – broadband, in particular – is no different, wherein some interests are rendered central while others are marginalized, pushed out to the periphery. Spatialization of broadband bandwidth tends to mimic broader social distributions due to the practical necessity of resources required to sustain broadband civic networking projects; ironically, these projects often start out intending to redistribute some or all of those very same resources in socially progressive ways to effect structural change. Bandwidth, of course, can also be designed from a radical standpoint to serve as the site for distributive justice and *insurgent citizenship* (Sandercock, 1998). As an enlightened pragmatist, our reflexive designer recognizes that designs can be changed incrementally, that networks may develop through successive layering. As such, the civic network might start out serving certain publics and expand from there through concentric incorporation of new, hitherto excluded publics. The key to assuring that this occurs is to keep ongoing design discussions open and to guarantee *rough equality* (Fraser, 1999) in deliberative forums. Early adopters representing the state or market may be necessary especially in broadband networking projects: well-resourced "anchor tenants", to use shopping mall terminology, can help sustain the network financially. The trick is to view them as bandwidth *homesteaders* not *colonizers*, and to work to keep the design open to alternative developmental trajectories inspired by the promise of structural transformation.

Social learning is foundational to the means as well as ends of socially-progressive design work. Both defenders and challengers of the prevailing order may learn from the environment to press their case. Just as aggressive market logics may be (and often are) used to justify promoting financial sustainability in purportedly civic endeavors, so could reflexive designers draw on their *circle of solidarity* to mount effective cultural offensives favoring social equity. For example, framing digital inclusion as a civil right links it to broader, deeply resonant cultural tropes and may make available new resources and action repertoires to counter market logics. But establishing and sustaining such links is complex and challenging (Scully & Creed, 2005). Our plea is for higher educational institutions like Information Schools to consider the urban planning discipline as a change model for their academic research and training programs and, through such programmatic efforts, contribute to producing an institutionalized field of socially-progressive technical practice with its own trained cadres and distinctive professional identity. Despite emerging circuits of solidarity (the Learning in Communities meeting at Pennsylvania State University in the summer of 2005 was a step in this direction) focused on civic networking, designers still tend to work in relative isolation; what they may learn from others even within the civic networking arena tends to be more or less opportunistic. Current socially-progressive civic network design practice, we would argue, is analogous to advocacy planning in urban planning, where designers advocate for social inclusion and may even empower the marginalized to fight the fight themselves. But the degree to which advocacy design – if we may call it that – is institutionalized in civic network practice is unclear. The point behind institutionalizing

anything, of course, is to inform thought and action in consistent ways based on an agreed upon corpus of knowledge, and, more fundamentally, to instill a distinctive way or style of responding to challenges. We are not sure this has occurred yet. Depending on the nature and complexity of the project, civic network design choices are very much at risk of being driven disproportionately by technical-rational considerations to the detriment of properly social ones. This is regrettable and must change. As designers and educators we must continue to educate ourselves through social learning while institutionalizing cultural transmission through academic programs to train the next generation of civic network designers, so that they recognize the kinds of social and professional challenges that designers (and planners) in other fields continue to face, and, learning from them, know how to respond creatively to them through their own practice.

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