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Methodological and Theoretical Frameworks for the Design of Community Information Systems

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Abstract

Noting that communication technologies are built by human beings rather than constituting naturally occurring features of the environment, we argue that social researchers should become involved in the process of design and adopt an orientation toward inquiry based on the concept of *phronesis*. *Phronesis* focuses on questions of ethics and deliberation over values for the purpose of determining how to act in the future. We illustrate how such inquiry might take place in the context of designing a

community information system. More specifically, we discuss two theoretical positions consistent with a phronetic approach that have guided our work and the way that they have effected changes in our understanding of purpose, users, system specifications, and our own service commitments and educational practices.

Introduction

For the last five years, we have been engaged in a variety of curricular and pedagogical projects with the overarching goal of seeking to use information and communication technology (ICT), specifically the World Wide Web, to promote community development and enhance democratic practices. This work, situated in Troy, New York, the home town of Rensselaer Polytechnic Institute (RPI), has given rise to a demonstration Web-based community networking project (Harrison, Zappen, Stephen, Garfield, & Prell, 2001; Harrison, Zappen, & Prell, 2002) and a set of curricular initiatives that have involved students at RPI in working with local community groups in the development of Web-based tools and resources to complement community projects (see Harrison & Zappen, 1999; and Zappen, Harrison, Moore, & Williams, 2002).

Our projects have been quite challenging because, although RPI has ranked highly on Yahoo's list of most wired campuses for many years, the city of Troy, which surrounds the campus, has presented a demographic profile strikingly consistent with that which the NTIA (1999) had previously characterized as experiencing significant disparities in access to technology. Our own anecdotal experiences in the community confirmed that Troy was indeed a faithful representation of a digitally divided community, its residents lacking both knowledge and training in information technology as well as access to both computers and Internet connections. Although matters seem to have improved in the last few years in terms of access to equipment, there is still a long way to go in improving access to knowledge and training.

Most recently, our work has focused on the creation of a Web-based community information system that would serve as a mechanism for community and government organizations that provide services to youth to publicize their events and programs to a number of audiences, including parents, young people, and to each other. The idea for such a system evolved in discussions with Troy City Government, which sought to reinvigorate its Youth Services Bureau, an office that had served as a central clearinghouse for information about youth activities in the city and that city administrators now hoped would conduct its activities more effectively through the use of the information gathering and dissemination capabilities of the World Wide Web.

This project, which has come to be known as "Connected

Kids," has attracted financial support that will enable us to continue our work for some time to come; it has additionally attracted interest and project support from twenty or so community and government organizations beyond Troy City Government. Representatives of these organizations are working with us in a series of participatory design exercises to progressively design and test a community information system, which is taking the form of a multimedia database that users and audiences will access through the Web. In the course of this work, we are collecting data that bears on questions related to the nature and success of a community information system, from the standpoint of synthesizing a set of diverse organizational needs with system design and functionality, as well as from the standpoint of understanding how the inter-organizational collaboration itself affects the community and its practices. We are also incorporating into the project a program of technology training for students, particularly for low-income children. This will enable young people to use the information system as a vehicle for displaying their own creative, educational, and technical products. Our expectation is that young people will be more likely to use and indeed "own" an information system that might serve as a vehicle for self-expression as well as a mechanism to acquire information.

Since we are social researchers, we are not building this software system ourselves. Instead we are collaborating with a computer scientist at RPI and her team of students. They are engaged in programming the database as well as producing a number of innovations in multimedia database design that have the potential to allow us to create a system that behaves in ways more directly responsive to the needs and preferences of our immediate users. The process of collaboration is sequential and iterative: we work with community members in a series of participative design exercises (which sometimes involve members of the programming team); we then bring our assessments back to the programming team for translation into a set of design specifications, which are subsequently programmed, and which we then test in a series of usability and further design exercises. We have now experienced two complete cycles of participatory design/usability, design specification, and programming on various portions of the software system.

We believe that this interdisciplinary and community-wide collaboration is somewhat distinctive; at least we know of no documented instance of software development that has brought community members to work together with each other as well as with social researchers and computer scientists to build a community information system. Indeed, it has struck us that ours is a somewhat peculiar example of information technology research in that in order to study applications of information technology and their consequences within our community, we have had to become involved in initiating and advancing the development of any such applications. Scholars, of course, do conduct participatory design research and usability research in information technology, but not generally on projects of their own initiation or

projects that are aimed at achieving democratic or community-oriented objectives. Such work is more typically undertaken in the service of business or government organizations seeking to develop software products for commercialization or internal use. It is indeed ironic that at this point there are very few empirical studies of participatory design research or usability research that have taken place in the context of community networking or the construction of services to promote democratic practices.

This work has taken us considerably far afield of what we thought we would be doing as social researchers and produced a few raised eyebrows from colleagues who have chosen to describe our work as "community service." While such characterization is certainly no insult, within academic circles it tends to minimize the import and impact of how we have come to understand our work. That has had the effect of stimulating us to think more carefully about the particular path we have chosen and to ask what, if anything, our trajectory may say more generally about how to do information technology research at this point in the development of ICT as a research area.

In this paper, we present our thinking to date about the answer to this question. We begin by looking more generally at the problem of research methodology in the area of information and communication technology, considering the role of ontological and axiological assumptions that appear, retrospectively, to have guided our choices, and that we now articulate in a more self-conscious effort to consider as a model for further research in ICT. More specifically, we argue that, because communication technologies are built by human beings rather than constituting naturally occurring features of the environment, social researchers should become involved in the process of design and adopt an orientation toward inquiry that focuses on questions of ethics and deliberation over values. To illustrate how this methodological choice might work within the context of a concrete research program, we discuss two theoretical positions consistent with this approach that we have used to guide the development of our understandings of purpose, systems specifications and our own service commitments and educational practices.

Methodological Considerations in the Design of Community Information Systems

Although there have been significant calls for academic research in the area of community networks and community information systems (see for example, Schuler 1996, 1997), such information systems are difficult to study for a number of reasons. First, social researchers have generally not been involved at the inception of such projects, with a few exceptions

(Blacksburg Electronic Village is a notable one). Thus, accounts of initial organizing efforts and conceptualizations of software and hardware systems have not been available to the research process, except perhaps retrospectively by their participants. Further, social researchers have not generally been involved in the design process, which means that it has not been possible to incorporate theoretical and research considerations into discussion of particular design decisions and the ultimate choices made. In our case, a third problem was presented: although we were initially quite interested in studying the process of community network formation, there were no such efforts underway in our community when we began to pursue this interest. We were faced with the prospect of finding a geographically distant research site or acting within our community to interest members in applications of information and communication technology. We chose the latter course of action, and eventually ended up playing the roles of community organizer, ICT designer, and system builder, along with the traditional role of social researcher.

In pondering this trajectory, it has been difficult to find a paradigmatic category in which to place our peculiar brand of social science work. It certainly doesn't fit traditional models of social science in which researchers are dispatched to study the effects of an ICT project after it has been deployed within a particular social context. And it is not quite the same as interpretive models of social science in which researchers are principally interested in understanding the meanings that users, participants, and perhaps designers formulate in their experience of particular information or communication technology products or environments, but do not proactively engage in design themselves or engage their research respondents. There is something in what we do that comes close to what happens in engineering disciplines, where the purpose of the research is to design an application or a product that achieves a set of particular goals for a client. But even here, the comparison breaks down since we work with clients from a number of community constituencies as well as bring our own purposes and goals to bear on the design of the project. Such multiplicity of purposes, which include the goals of the researchers, are not typically found in engineering research. Participatory action research is a model of social science research somewhat similar to ours; however, we have hesitated to place ourselves completely under this umbrella. This is because explicators of this approach tend to see researchers as "facilitators" or as assistants to members of a critical reference group who have problematized a situation and are pursuing their own research answers (Wadsworth, 1998). Although we identify with quite a few characteristics of participatory action research, our own work has been very much guided by our own sense of goals and values in designing technology, at least initially, as much as those of our community collaborators.

The model of social science research that comes closest to describing what we have found ourselves doing is what Bent Flyvbjerg (2001) has called "phronetic" research.

Here, following Aristotle, Flyvbjerg differentiates between three intellectual virtues that inform the generation of knowledge: *episteme, techne,* and *phronesis. Episteme* is the virtue most closely associated with traditional scientific knowledge. It produces universal, invariant, and context-independent generalizations about the world and is at the root of the term "epistemology." *Techne*, on the other hand, is associated with craft and is oriented toward finding the particular means that can reliably produce a sought-for goal. Such knowledge is pragmatic, variable, and always dependent on context. In contrast with *episteme* and *techne, phronesis* is associated with ethics and focuses on deliberation over values for the purpose of determining how to act in the future. It also produces knowledge that is pragmatic, variable, and dependent on context, but begins by asking questions about the values that are to be brought to bear on a situation, specifically inquiring about the values that inform the selection of end goals, and reasons from those values to the actions to be undertaken. Although Flyvbjerg is clearly not thinking about information and communication technology research as he writes about *phronesis*, it is also apparent that his model of phronetic research can be usefully adapted to embrace our circumstances as well as those we believe more generally characterize information and communication technology (ICT) research. In what follows, we explore how phronetic research might be adapted in light of issues of ontology and axiology that are frequently associated with ICT research.

Ontological Assumptions

When researchers contemplate issues of ontology, they are invited to consider assumptions about the nature of the phenomenon in question and about the nature of human existence that they bring to bear on very basic decisions about how to do research. Issues of ontology address how things happen in the world, what elements to consider causes and what to consider effects, or how phenomena are reciprocally interdependent in the world.

As it happens, ontological issues have played a central role in the conceptualization of information and communication technologies. Indeed, the technological determinism of early theorists such as Marshall McLuhan (1964) along with that found in the enthusiastic prognostications of young technophiles, has been routinely hauled out and vilified by social scientists of technology. In reality, almost no one recognizes technological determinism as a valid ontological perspective anymore; instead, there are now numerous alternatives that cast technologies as far more ontologically complicated.

Most of these alternatives can be said to derive from a larger ontological position that suggests that technologies and social order reciprocally affect each other in basic structurational processes (Giddens, 1979). That is, while technologies clearly structure the social world and play a discernible role in determining social behavior, technologies take particular forms and assume particular social meanings because they are designed by human

beings working within the context of organizational and social contexts to achieve particular kinds of goals. These goals, such as being able to do something faster or more efficiently, have been characterized as "first order efficiency effects" according to Sproull and Kiesler (1992) or as the "political" consequences of technologies, according to Winner (1986). Either way, the material form of technology presents certain "liberties of action" according to Cherry (1985) that make it possible for people to do things that have not been possible to do before, at least in the same way or with some of the same effects.

But the ontological story doesn't end here. Just because ICTs present certain material capabilities does not necessarily mean that they function exclusively as their designers intended, as many theorists have now argued persuasively. Sproull and Kiesler (1992) have characterized as "second level effects" the unintended social consequences of technology development, which evolve as individuals other than designers and initial users begin to use technology for their own purposes within their particular social contexts. In a more formal statement of what has come to be called the "social shaping of technology," Lievrouw and Livingstone (2002) point out that new media technologies both shape and are shaped by the social, economic, and cultural contexts in which they are developed and that the very acts of technology adoption and research exploring its consequences may come to play important roles in the evolution of their material forms and the roles they play in human affairs.

Emphasizing one moment in this process of structuration, Star and Bowker (2002) call attention to the fact that technologies become embedded deeply in social, political, and cultural life through the process of proliferating standards that are used to build the material infrastructures responsible for technological operations and functionalities. Infrastructure makes technology work, and does so frequently below the level of awareness as it comes to be a taken-for-granted feature of the built environment we inhabit, "tend[ing] to fade into the woodwork" (p. 153). Infrastructure calls attention to itself when it fails to function, or when, designed by others for different purposes, it fails to work for us. Noting that technologies become incorporated in social life through their material instantiation in infrastructure, Star and Bowker (2002) argue in favor of designing infrastructures with flexibility and the capacity to be modified.

Emphasizing a quite different moment in structuration, Fountain (2001) argues that technology is "enacted" when users in organizations selectively perceive and use "only a few of the functions and features of their hardware, software, and telecommunications capacity" (p. 88). In so doing, users, on one hand, may reproduce or strengthen institutionalized mechanisms even when not rational or, alternatively, come to develop new organizational forms or capacities. Fountain is clearly concerned that, in government institutions, technological enactment all too often reproduces existing rules, routines, norms, and power relations, despite the new and innovative

capabilities that ICTs provide for their users. Although examples to the contrary are less frequent, the history of electronic mail use on the Internet has been offered as one compelling example of a technology that was appropriated by its users for purposes quite at odds with those originally intended by Arpanet designers (Abbate, 1999).

Informing these positions is an observation not generally appreciated or taken seriously: information and communication technologies are not naturally occurring features of the environment; instead they are built and deployed, indeed "engineered," by human beings. Historically, the construction of information technologies has not taken place with a high degree of self-consciousness and many have not been constructed specifically as "information technologies." Indeed, some of the most ambitious and enduring information technologies - for example, bureaucracy - have evolved over great expanses of time and seemingly without any central guiding direction beyond the achievement of instrumental goals related to efficiency. And, as Couch (1996) has observed, social scientists have traditionally chosen to view technologies as "phantoms, things apparent to the senses but of no consequence" (p. 239), preferring to focus instead on the message content of technologies rather than on their material forms or social meanings. But more recently, as the information processing capabilities of computers and computer networks have come to be used as tools for goal accomplishment and as computers and their networks have come to be used to reconfigure the effects of time and space as constraints on interaction, researchers have increasingly recognized that ICT systems might best be viewed as tools that humans design and deploy in order to achieve particular organizational, political, and economic objectives (Mansell & Silverstone, 1996).

Axiological Assumptions

Even when researchers acknowledge that ICTs are built and therefore shaped by human beings, they have typically addressed their research to points in time beyond the context of design, that is, beyond the point at which conceptualization, creation, and initial implementation take place. While the social shaping of technology is acknowledged to begin in design, research has tended to gloss this point, focusing more frequently on shaping processes that take place when technologies are diffused. Such studies are valuable, of course, and necessary when design contexts are inaccessible to research. However, design becomes accessible to research when researchers take part in design. When social researchers become part of the design process, design can become a primary site for observing social shaping processes as well as for choosing theoretically relevant material features of technology and observing their subsequent interaction with social practices. To explain this position further, we need to provide some additional background about the process of design.

According to Simon's (1981) classic statement, design is the process by which artifacts are constructed to attain

goals. Unlike the natural sciences, which are concerned with the way things *are*, design is concerned with the way *things ought to be*. For Simon, design is more than something only engineers or architects do: it is the major activity of "any professional whose task is to solve problems, to choose, to synthesize, to decide" (p. 157). Thus, it is possible to see designers in revolutionaries, utopians, policy planners, and musicians. Design is Simon's metaphor for any creative activity that is concerned with constructing a course of action calculated to satisfy a particular set of goals.

Returning for a moment to the Aristotelian concept of techne, it becomes apparent that design subsumes this virtue. For techne is required in order to arrive at judgments related to craft: what kinds of operations, features, or characteristics are needed in order to build an artifact that behaves within the range of desired specifications. However, certain design processes, those aimed at the creation of products and processes whose scope and influence transcend the boundaries of everyday immediate application and operation, would seem to require evaluative considerations that go beyond the achievement of instrumental goals. Certainly, ICTs, which are assumed ontologically to play a considerable role in the structuring of social orders, must find their way into this category. Simon himself seems to recognize the need for evaluative frameworks and proposes an ethical framework for designers that is grounded in his own analysis of the evaluative capabilities and limitations of a rational decision maker. But it is not completely clear whether deliberation over design goals is part of the process of design or if it is somehow independent and external activity. Although Simon posits that design values are fundamental components in his vision of design education, he does not call for debate or discussion about values in design nor does he imply that these considerations are part of the process of achieving his objective, which is to generate a theory of design.

Mansell (1996) argues that design is a powerful conceptual vehicle for social research in that it offers a context for understanding when and how social, economic, and cultural factors interact with technology in structurational processes. The context of design is one that foregrounds human agency and focuses on actions that are intended to realize some particular purpose or intention. Design is an active process in which social actors are "assumed to have an idea of the situation to be reached, a desire for that situation because they value it and some sense of attaining" an outcome through selection (Mansell, 1996, p. 23). A focus on design thus invites social researchers to problematize the specific context in which social institutions and structures influence the development of ICTs.

Complementing this emphasis on design is Mansell's (1996) additional focus on human capabilities. Capabilities refer to divergences in human qualities and to differences between people in the power to reason and act; they are assumed to be unequally distributed in the population. Differential capabilities may consist of differences in knowledge, propensities, habits, power,

and material skills and are to a certain extent determined by political, economic, and social conditions, but to a further extent, can be developed through interaction with technologies.

In research, design and capabilities can be used as informative principles to direct the attention of researchers in generating theory. Design creates technologies with both intended and unintended outcomes that become the basis upon which actions of others are either enabled or constrained. But how the design process unfolds for particular individuals and the impact of its products for particular individuals has much to do with the capabilities of individuals concerned, both proximately and at a distance in time and space. Human beings are knowledgeable agents, but their ability to act in design processes or in their use of technological products of design will depend on their existing knowledge, power, competencies, and ability to learn.

We find Mansell's orientation helpful because it situates researchers in the heart of the design process together with other human participants, both producers who have always been there, and users who frequently have not. However, this scenario threatens to become a sort of social scientific practice of techne unless we are explicit about including the virtue of *phronesis*. Flyvbjerg suggests that the "point of departure" for phronetic research is to pose and pursue the answer to four value-rational questions:

(1) Where are we going?
(2) Is this desirable?
(3) What should be done?
(4) Who gains and who loses, and by which mechanism of power?

On previous approaches to the design of technology, the first two questions are assumed to be already answered, the fourth is generally ignored, and the third is the point of design activities. However, in our experience in designing ICT products, the answers to the first two questions are not at all obvious and the answer to the fourth presents the difference between technologies that we can live with and those that many social science researchers would opt against.

This is particularly the case with research that explores the relationship between technology and democracy. This literature is replete with prognostications that suggest, on the one hand, that new ICTs can support and even enhance the practice and functioning of democracy while, on the other hand, predicting with a sense of doom that ICTs threaten to erode democracy with further centralization, surveillance, the promotion of anti-democratic decision-making processes, and problems of access. It is not so much that research cannot determine which of these directions will prevail; it is more that not enough social experimentation with new technologies has taken place. While there is no question that the answers to such questions will be worked out in patterns of individual and group usage, it is also the case that *what* is designed and *how* it is designed will also play

a role in generating answers. In the design process, people make decisions about what to design and how to design it. If researchers and users are involved in design, these decisions can be informed by their perspectives on the material character of technology as well as by their deliberations about what technology should be doing and how it should be accomplishing its goals.

Participatory Design and the Negotiation of Community Values

The concept of *phronesis* as a kind of *techne* associated with ethics and focused on deliberations about values leads us to ask ourselves what kind of values and whose values and interests we ought to serve. Our fundamental commitment to a kind of social science research that is not divorced from community service suggests that we look to our relationships with our own community for an articulation of these values and to our own research activities as opportunities to shape our ICT design processes and outcomes in accordance with these values. Our community of Troy, New York, is a mirror image of the digital divide: a thriving and relatively affluent university enclave, on the one hand, and a substantial population living at low levels of income and education and with limited access to new information and communication technologies, on the other. We understand that our research constitutes an intervention in our community, that we are seeking to effect changes in that community, in particular changes that bring the benefits of ICT to every member of the community. Recently, we have been exploring the literatures on participatory design (PD) processes and activity theory, which we believe can help us to effect changes of this kind. In the remainder of this paper, we explain how these theoretical perspectives are shaping our approach to the design of the Connected Kids information system in a way that is consistent with the goals of phronetic inquiry as described earlier. In so doing, we offer a brief snapshot of our results, which illustrate how PD processes grounded in activity theory have effected changes in our understanding of our purpose, our organizational users, and our system specifications and how, in the process, they have also led us to rethink our service commitments and our educational practices.

We believe that PD processes can help us to design better ICT systems - better in the sense that they reflect the values of the communities they aim to serve. PD processes grounded in activity theory emphasize the importance of working with participants to develop shared purposes through collaborative discussion and hands-on design activities (Bødker, 1996; Bødker & Grønbæk, 1996; Bødker, Grønbæk, & Kyng, 1993). We also believe that tangible and meaningful exchanges of knowledge and information are essential to PD activity, at least in the context of a local community in which people do not necessarily agree that they want or need ICT resources

and do not necessarily know what they would do with them if they had them. In such a context, PD is a dynamic and ongoing process of exchanging technical and social knowledge and, in the process, negotiating fundamental values and beliefs about where we are going as well as who gains and who loses when we design and deploy ICT resources. Through our work on the Connected Kids information system, we have been designing an information resource that we hope will improve the quality of life for young people in our community. In the process, we have revised our understanding of our shared purpose with our partner organizations, the makeup of the user groups that we hope to serve, and the basic system specifications. At the same time, we have come to realize the limitations of our ability to serve all segments of our community and also the limitations of our current educational practices.

In their work on activity theory, Yrjö Engeström and others emphasize the potential for individuals and groups to learn through collaborative activity focused upon a mediating artifact and directed toward the development of a community bound together by a shared purpose or common goal (Cole & Engeström, 1993; Engeström, 1999a, 1999b). They observe, however, that this collaborative activity is not necessarily grounded in shared purposes or common goals but in the diverse perspectives of different communities of interest. To capture this diversity of interests, they create models of complex activity systems representing the various communities and patterns of interaction in any situated activity (Cole & Engeström, 1993, p. 22-42; Engeström, 1999a, p. 29-35). Within these complex activity systems, different perspectives meet and collide and merge in processes that are collaborative and dialogical but not necessarily directed toward a single unifying purpose. As Engeström (1999a, p. 35) observes, "An activity system is by definition a multivoiced formation." Within such a system, the different viewpoints and perspectives of various participants represent "the unsettled and conflicted relations between different positions and actors" (Engeström, 1999b, p. 382). As a consequence, the system is replete with contradictions or unresolved tensions that may tend to curtail cooperative, productive activity. Cole and Engeström (1993, p. 35-37), for example, find contradictions in a Finnish health-care system between the complexity of patients' problems and the arbitrary matching of physicians to patients, between the need for quality care and the limited time available for consultation, and between the complexity of the patients' problems and the limitations of traditional tools of biomedical analysis. In his own work on activity theory, Engeström (1999a, p. 31-32) finds similar contradictions between the issues confronting the theory and the limited means of collaboration and discussion at his disposal and between these same issues and the fragmented division of labor that pulls various schools of thought apart, thus curtailing joint discussion.

Cole and Engeström and the PD practitioners who follow them nonetheless maintain that these diverse interests and inherent contradictions can be negotiated through mediated collaborative activity (Cole & Engeström, 1993,

p. 30-42; Engeström, 1999b, p. 380-402; Bødker, 1996, p. 218-34; Bødker & Grønbæk, 1996, p.137-55; Bødker, Grønbæk, & Kyng, 1993, p. 164-73). Thus Bødker and Grønbæk (1996, p. 137-40), for example, use Engeström's model of a complex activity system to analyze the contradictions or tensions within the system and to identify opportunities for change. They see cooperative prototyping as a means of assisting PD participants to envision, and actually experience, new possibilities, historically new forms of workplace activity (1996, p. 140-55). In turn, these prototyping sessions provide designers with opportunities for learning - "learning with respect to the activity and the actions and the operations of the users, both with respect to the limitations of the current work practice and the possible changes that may occur when a computer application is introduced" (1996, p. 151-52). We believe that these sessions also provide both designers and users with opportunities for mutual learning, for exchanging technical and social knowledge and sometimes changing their fundamental values and beliefs in the process. In this way, the prototyping sessions encourage design, and redesign, of the prototypes but also, and at the same time, encourage designers and users to re-examine their values and commitments, to ask themselves, and to ask each other, tough questions about who gains and who loses in the process of designing of ICTs.

The Connected Kids Database Design Process and Outcomes

To facilitate exchanges of this kind, the Connected Kids design team has conducted a series of meetings with our partner organizations, including focus-group meetings to develop specifications for the youth-services information system (October 2000); PD sessions to check our understanding of these specifications and to provide an opportunity for hands-on experience with a prototype of the interface for organizational users (November 2001 and January 2002); focus-group meetings with parents and kids to help us to understand how these user audiences access and use Web-based and other kinds of information resources (February through May 2002); and on-site user tests to help us to assess the organizational users' interface in the context of workplace practice (August through November 2002). We plan to design a different user interface for parents and kids and to conduct a similar sequence of tests of this interface. The PD sessions on the organizational users' interface were a key step in this sequence of activities because they provided an opportunity to check our understanding of the system specifications, which were presented to us not as a set of specifications but as a set of issues and concerns of our prospective organizational users.

Participatory-Design Protocol

The October 2000 focus-group meetings brought together

five small groups and a total of 33 participants representing city, county, not-for profit organizations, and school and after-school programs. These participants raised several issues related to the basic functionalities or specifications of the youth-services information system and the extent of participation by parents and kids in the development of the system. They expressed concerns about what appeared to them to be excessive emphasis upon calendar event listings rather than more basic information about their organizations and the programs and services they offer. They also expressed concerns about their difficulty maintaining Web-based resources. Large organizations noted the potential problem of duplicate data entry in both their own information systems and the system we are developing. Small organizations noted their limited access to Web-based resources and also the limits of their knowledge of how to use them. Participants also expressed concerns about our apparent failure to solicit information about parents' and kids' uses of Web-based and other information resources, implying that the system might not be worth building unless it was designed for parents and kids. They suggested that these users would almost certainly expect more interactive and visually engaging interfaces than the ones we were planning for their organizations.

These issues remained unresolved at the end of the focus-group meetings. However, during the remainder of 2000 and the beginning of 2001, we considered these issues and developed a set of design specifications that we believed would address the concerns of the potential users. We then set to work to program some of the most fundamental and essential components of the system.

In Fall 2001, we created a protocol for the PD sessions that we believed would permit us to bring these issues back into focus for our collaborating partners. We felt that we could not proceed with further development of the information system until we had established a strong sense of shared purpose with our partner organizations. At this time, we also felt that we needed to understand our users' needs from a broad organizational perspective, that is, to understand, at least initially, administrative uses rather than day-by-day operations of the system - though we knew that we would eventually have to address these operations as well. We wanted to offer our partner organizations as much support and assistance as we could, within the limits of our ability. Thus we planned the sessions as opportunities to exchange technical and social knowledge about our shared purposes, our organizational users, and our system specifications. We did not plan and did not expect to be challenged to rethink our service commitments and our educational practices as well, but we were.

We conducted eight PD sessions in November 2001 and January 2002 for a total of 26 participants, most of them organizational administrators and many of them also participants in the October 2000 focus-group meetings. We conducted the sessions in our Connected Kids development lab rather than on site, in the workplace. At this stage in the development of the system, we wanted to demonstrate that we had heard the concerns

expressed at the focus-group meetings and that we had developed reasonable and realistic system specifications in response to these concerns. We also wanted to demonstrate that our administrative users were welcome to come into our design lab and express their views directly to members of our design and programming teams. Our protocol for the PD meetings included (1) a review of the system functionalities, as we developed them in response to the concerns expressed in the focus-group meetings; (2) a review of data output and input functions; (3) a hands-on session with a computer-based prototype of the system; and (4) an offer to assist our partner organizations with their implementation of the system. In the course of our discussions, we also had opportunity to explain our plans for future meetings with parents and kids. We showed paper-based mockups of the system functionalities; computer-based demonstrations of two possible outputs from the system, in the form of Web-page templates; and a computer-based prototype of data-input functions. We showed the outputs first - some sample Web-page templates - then the inputs, because we felt that our users would better understand the data-input functions if they first saw what the outputs might look like. After we demonstrated the outputs - the Web-page templates - we invited participants to enter some data into a computer-based prototype of the system to get a feeling for how they might actually use the system. We then asked participants to discuss their reactions to the system with us and with each other. We made both video and audio recordings and then transcribed the recordings for each of the sessions. We found, however, that we were not able to capture the participants' hands-on data-input activity since many of us were talking at once during this activity, thus rendering much of the discussion inaudible. We expect to correct this problem in future PD sessions.

Building a Shared Purpose

At the beginning of each of the PD sessions, we reviewed the results of the October 2000 focus-groups meetings and explained the system functionalities that we believed would address the concerns raised by the participants in these earlier meetings. Consistent with the work of the PD practitioners cited above, we regarded these concerns less as problems than as opportunities for change, to envision new possibilities and new workplace practices. We explained that we were seeking to build a system that would provide a central location for Web-based information for youth-services organizations, parents, and young people and that would be broadly inclusive. That is, we hoped to build a system that would provide information about the youth-services organizations, their programs and services, and their events - not any one but all of these components. We also explained that we understood that the system would have to provide Web-site service for some (usually smaller) organizations and general information, with links to existing Web sites, for other (usually larger) organizations. In response to this sketch of our revised system specifications, participants confirmed that they shared our understanding of these specifications (names and other identifying information are deleted from these

segments of the transcripts). Sometimes they said simply "Sounds good" or "I agree" (1/14/01). At other times they offered more elaboration. For example, one participant who works in a small unit of a larger organization explained the somewhat peculiar problems of such an organizational structure:

I think it will work well because I think in terms of an agency like [larger organization] where it is so large, and a lot of times, well just in terms of the [smaller organization] and some of the services that we offer, people just think [of the large organization] and have to surf through a number of different links just to get to the [smaller organization], so it would be nice if we could have a direct link, as well as link back to the whole agency-wide site where you know they can gain more information and stuff like that, but it would be nice if we could have that link just so they could know what we're doing in terms of youth programming. (1/28/02)

One participant expressed a reservation:

My only concern would be, is that you're trying to be everything to everybody. That the focus [inaudible], that you've got competing groups that lack specific information so mish mash is possible. (1/28/02)

and then added a confirmation and an illustration:

Um, looking at the organizational uses, right now I'm working on a project - Black History Month - what's going on in the City of Troy? That's a lot faster that way, I mean it really is. Right now, I'm digging it up with using the Internet, using phone calling trying to get people to turn in things [big nods from another participant], so we can get them some publicity on what's going on throughout the . . . . In my work it's regional. Primarily in this case for the City of Troy, but that to me, that is accessible and I could know in a snapshot [inaudible] what's going on and be able to help out much quicker promoting things [inaudible]. (1/28/02)

Another participant offered a simple confirmation and then a suggestion:

Makes sense. The things you brought out all make a lot of sense. All right. Are, uh, these going to be in English only? I was kinda curious about that. Is there any thought of any other language? Just after looking at some data on the [inaudible] of the population of Latinos in the city . . . it's almost tripled in the late, in the last ten years. (11/28/01)

Responses such as these seemed to confirm that we had understood participants' concerns and had developed a set of system specifications that would reasonably and realistically address these concerns. But responses such as the one just cited also suggest that participants not only accepted our revised system specifications but also were capable of translating these specifications into their own workplace situations. Further, these responses suggest that our administrative users understood their own organizational roles broadly and strategically. They were concerned, at this point at least, with how their organizations relate to other organizations or how their individual units relate to their organization as a whole. They were also concerned with fundamental values and beliefs, with who wins and who loses, with the basic needs of underserved and underprivileged segments of our community, such as the need to publicize Black History Month or the need to serve our area's growing Hispanic population. In the course of the PD sessions, we

were able to address many but not all of their concerns.

Negotiating Users' Needs

Even as participants confirmed our revised set of system specifications, they expressed further concerns about their user populations grounded in their experience as organizational administrators, concerns illustrative of the basic values and commitments of their organizations. As illustrated above, one participant, representing the City of Troy, observed the needs of our growing Spanish-speaking population. Other participants observed the needs of young people for legal services, the needs of our neighborhood organizations, and the special needs and challenges of school administrators. They also raised again the issue of the role of parents and kids in the development of specifications for the system. Typically, their tone was tentative and exploratory, expressive of their concern about the populations they serve, rather than declarative of specific courses of action or specific system specifications. For example, one participant - a police official - explains that young people with legal difficulties need immediate access to legal services, such as information about alternative-sentencing opportunities. The tone is typical:

I'm wondering, with a unit like mine where we do some enforcement actions, children's programs, or youth programs, . . . with similar kinds of police activity, how do we get people to the Web site? That's, that's my question. I mean, if you're thinking youth, you're not necessarily going to think . . . police. (11/7/01)

and:

Alternative sentencing was fused with a grant, . . . so I'm trying to think how we get all of these components out . . . (11/7/01)

In a similar exploratory vein, another participant - a neighborhood activist - explains the special needs of neighborhood organizations:

As a, as a housing organization we do have some kids' programs, services that we want to publicize and get people to use . . . but just as importantly on the public side we work with a lot of neighborhood associations and other community groups that are always looking for kids to do for their things [sic], so I'm also sitting in this seat as a member of the public and trying to see how neighborhood associations could use this . . . (11/7/01)

Yet another participant, a school administrator, explains the special challenges associated with serving school-age users of the system. If the system is not secure, this administrator observes, the schools might have "a lot of snow days" (11/19/01). We acknowledged the need to market the system within the legal community and emphasized that we understood the need to ensure the security of the system. We explained that we now had sufficient funding to permit us to conduct focus-group meetings with parents and kids. We noted the challenge of providing for the needs of our growing Spanish-speaking population: the problem of attracting graduate students or staff bilingual in English and Spanish, for example, or even identifying online

resources adequate to meet these needs. We have thus had to admit to our partner organizations, and to ourselves, that we cannot hope to serve some of these needs, that our commitment to serving our community is constrained by the limits of our own time, resources, and abilities. Our relationship with our administrative users is, therefore, an ongoing process of negotiating our respective values and beliefs and making decisions, together, about who gains and who loses, even in cases where we fully share each others' values.

Negotiating System Specifications

Participants' responses to the data-output and data-input functions of the information system revealed a strong and growing acceptance of the system. But they also revealed some doubts and hesitations and produced some useful suggestions for further revisions of the system specifications. In general, participants found the data outputs - as illustrated by the Web-page templates - to be functional and attractive, and they found the data-input functions - as demonstrated in the hands-in session with the system prototype - to be relatively simple, straightforward, and easy to use. Nonetheless, they were obviously struggling with the problems of maintaining their own Webs, and while they appeared confident that the information system that we are developing would help them to solve these problems, they remained uncertain about how the system would work in their own day-to-day workplace practices. Once again, their tone was tentative and exploratory, illustrative of their uncertainty about how the system would work for them. One participant from a large organization observes, for example:

It's interesting. That's sort of what's going on in my head. We have a Web site . . . we even have even the capability of having . . . hosting our own Web site. Um. We don't have any staff to do any of this. Our Web site isn't very useful. The information that I provide to put on it is never put on it until it's outdated already. I've offered to do it myself, but that doesn't fit into the bureaucracy of so many different layers of organization . . . , so I'm looking at this thinking "Hm, this would be nice if this could connect to our Web site, but it'd be even better if it could connect to my stuff that I could put out there on time." So I don't know where we really fit into that last part because maybe our Web site will get better, or . . . (11/19/01)

A participant from a small organization expresses similar uncertainty about how the system would work in relation to other systems, an uncertainty mixed with confidence that the system would indeed work better than the paper-based system currently in use:

Well, we're in the process . . . we had a Web site, and it's sort of old, so we have an intern from RPI who's working with us on developing a new one, and we've had a little bit of trouble getting access to our, our . . . , but this site I think is going to be excellent for us because we don't have that much advertisement . . . , so our own Web site being linked to both TroyNet and this Connected Kids should really give us a lot more exposure that we need and be able to put up our schedules instead of passing them out on flyers and putting them in different places, so I think this is going to be great, and plus the database just to keep them coming to the Web site, and Connected Kids is something that we really could use . . . (11/7/01)

We infer from these expressions of concern that we will need to provide some support for both large and small organizations when we are ready to implement the information system. In addition, we are currently providing modest levels of technical and financial support, provided by our funding sources, to every organization working with us, and we are also offering technical support for a few organizations, as the second participant indicates, though we realize that we cannot provide this service for every organization. Once again, we have had to acknowledge the limitations of our own service commitments, due to the limits of our time and resources, and to recognize that we regularly engage in complex negotiations with our partner organizations and make value-laden decisions about who gains and who loses, who gets and who does not get these resources.

Participants' responses to the data-input functions, as illustrated during the hands-on session with the computer prototype, revealed a strong and growing acceptance of the system. Their discussion following the session also produced some useful suggestions about the basic functionalities of the system and encouraged further revision of the system specifications. These suggestions ranged from proposals for surface additions such as more complete instructions for data input to proposals for inside-the-box modifications such as duplicate-page, preview, and multiple-key-word functions. In our hands-on data-input session with system prototype, we anticipated the need to demonstrate the copy-and-paste function that permits easy transfer of electronic data into the system, and we made a point of asking participants to test this function. However, we had not anticipated the need to duplicate whole pages of data, a concern of organizations with numerous programs and services to enter into the system. This need emerged in an exchange between a participant from a large organization, who was concerned with the difficulty of retyping the same data on numerous pages, and a participant from an information-services unit, who reminded us of the relative ease of duplicating pages of data already stored in the database. The participant from the large organization explains:

Yeah, just to make it in terms of, you know, if we were to go in and put this data in, I mean that's going to be just extremely time consuming, . . . is there a way to simplify it, that you could just take the sections out for each? (1/28/02)

The participant from the information-services unit replies with an explanation of the relative ease of duplicating pages of data already stored in the database:

He's asking a very astute question. It's that there should be one database key, . . . organization that will go to the table and bring back the rest of the information like the contact name whatever dedicated to the organization. (1/28/02)

In addition, we could easily have imagined the need for a preview function, but we had not imagined - and probably could not have imagined - the need for a multiple-key-word function, that is, the need to include different key words to describe the same activity for different audiences. This need emerged when one

participant suggested that an activity such as basketball might be described as both "recreation" (for young people) and "gang prevention" (for parents, teachers, and counselors) (11/16/01). These responses, like the others, suggest that the definition of system specifications is an ongoing process of negotiation with our users rather than an isolated moment in the development cycle.

As we have indicated, we have been led to rethink our service commitments and to acknowledge that we cannot address the needs of all of our diverse user populations. In addition, our recognition of our own and our students' limited time and resources has led us to rethink how we structure our own educational practices. At the end of the PD sessions, we explained that we could offer some technical or financial support in the form of a computer, an Internet connection, or some Web-design software to each of the organizations working with us. We also explained that our students could provide some technical support to a few organizations in the form of Web-design work or computer reconstruction, maintenance, or networking. Even so, many of the smaller organizations have difficulty building and maintaining their own Web presence, as the comments above indicate, and they find that our students provide only limited assistance since they work on projects during the course of a single term only - about three and a half months - and produce aesthetically pleasing and technically sophisticated Web products that are nonetheless beyond the ability of the organizations to implement and maintain. As one participant observed of our students, "Sometimes we can't get rid of them . . . they keep coming back" (11/28/01). Once again, we considered these difficulties less as problems than as opportunities for change, opportunities to envision new possibilities in our own workplace practices. We have begun to address these difficulties by restructuring our delivery of educational services, by engaging students either for credit in independent-study courses, or for pay, across longer periods of time so that they are not necessarily limited to a single term of duty and also so that they have greater reason and motivation to follow through on their commitments. In this case, our negotiations with our partner organizations have led us to rethink our traditional ideas about how we should structure and organize our educational practices.

These negotiations with our partner organizations, as represented by the administrative users, thus are helping us to build a sense of shared purpose, to address the needs of diverse user populations, to the extent that we can, and to design an information system that is complex and powerful enough to serve a variety of organizations, both large and small, with divergent capabilities and needs. These negotiations have also helped us to rethink the structure and delivery of educational services in our attempt to serve our organizational users' needs. All of these negotiations, we acknowledge, are complex and value-laden, and we regularly make decisions that entail tradeoffs between one organization and another (including our own), one user population and another, and so, necessarily, one value and another. We nonetheless believe that the lessons of the PD literature are helping

us, together with our partner organizations, to make these decisions wisely and well.

Conclusion

Although new technologies always take material forms and provide capabilities that did not previously exist, what they do and how they do it are choices exercised, consciously or not, by their human creators. ICTs are ontologically complicated in that they are responsible for shaping human behavior, for enabling and constraining action, but they are also shaped by their human creators, which suggests that the relationship between technology and social action is recursive. This, we have argued, presents the possibility of opening up the design process to human actors beyond those historically involved in building ICT artifacts.

The processes and products of ICT design have traditionally been firmly under the control of software and hardware designers and developers and the organizations for whom they work; the role of social science and humanities scholars has seemingly been to assess and critique the outcomes of their work, which has produced a considerable literature on the social consequences of new technologies. However, when social researchers become part of the process of design, and when they involve users for whom technology artifacts are created, then it becomes possible for two new sets of actors to proactively shape the purposes, configuration, and perhaps the ultimate outcome of technology products. Since ICTs are human inventions that have the recursive effect of subsequently shaping human behavior, we have argued that social researchers should be self-consciously involved in their design and development and that inquiry should consider questions related to the purposes, configuration, and power dimensions of the technology. Not only should researchers be involved in ICT design and development, but they should invite and integrate the perspectives of users for whom ICTs are designed and delivered. When this is done, it becomes possible to create technology systems that serve a different set of social needs and interests, in this case, those related to the enhancement of democracy and community.

Our experience has shown that, guided by the literature of participatory design and activity theory, this type of inquiry produces negotiated agreements. We have created opportunities for eliciting input about system purpose and configuration and subsequently sought to address the concerns and values of our collaborators in designing an artifact that meets their needs. However, despite our best intentions, there have been and will always be limits on what can be done, which stem from both resource constraints, as we have noted, and what it is possible to do given the existing state of computer science research. Sometimes, we and our users have asked for capabilities that are just not yet possible to produce, or at least not with our level of financial

resources. Our collaborators have generally understood and been willing to the need to compromise.

As has been the case in our project, resource constraints are contingencies that can be addressed by additional fund raising; but clearly lack of resources can also threaten the viability of developing shared understandings of the purposes of a project. With respect to the constraints imposed by the state of computer science research, we suggest that design processes involving both social researchers and users provide the opportunity to stimulate the development of computer science research in directions that address more specifically the concerns and values of this new set of actors in technology design. As one brief example, our computer science collaborators are now in the process of designing new agent technology to respond specifically to the need to enhance database searching processes for use by very inexperienced technology users, an innovation that has been suggested by our usability exercises. Incorporating such innovation has not generally taken place in the development of technologies for community networking or more broadly in the development of technologies promoting democratic practices and processes. However, involving social researchers and users in the process of technology design presents a new set of possibilities for this to take place.

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