Sustaining Computer Use and Learning in Community Computing Contexts:

Making Technology Part of "Who They are and What They Do"

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Abstract

In this paper, we describe our work promoting technological sustainability among community organizations in Centre County, Pennsylvania (USA). We define sustainability as a dynamic process in which IT professionals, designers, and researchers work with community groups in ways that give them greater control over technology in their organization. Promoting sustainability involves finding ways of encouraging technology learning and planning in community groups. We report on the efforts of a community organization that works with area nonprofits to promote IT adoption and a participatory design research project aimed at helping community groups use technology to solve problems that they think are important. We report on a joint effort to provide web design training for area nonprofits using this shared experience to consider ways of bridging research and practice when addressing sustainability in community computing contexts.

Introduction

The goal of sustaining technology use and learning in community computing contexts is a difficult problem because often community groups do not realize the extent to which technology has become tied to their mission. Technology plays an important role in community organizations enabling them to advertise services, meet the data gathering requirements needed to secure grant funding, and create partnerships to address shared problems. Despite this importance, many community organizations do not have a long-term technology plan in place and they often face significant challenges when implementing IT in their organizations. Some of these challenges include few full-time staff members, the need to rely on volunteers to implement technology projects, limited (or nonexistent) technology budgets, and reliance on grants that include a technology component to take on new technology initiatives in their organization. As a result, technology decision-making in community organizations tends to be ad hoc and opportunistic as groups rely on their ability to gather the resources needed to take on a project.

This context raises interesting questions for IT professionals, for researchers, and for the community groups themselves about how to sustain technology use, learning, and planning in an organization over time. For example, how do you sustain technology learning in an organization that relies on volunteers who come and go or in organizations where much of the organizational knowledge resides in a few full-time staff members? Sustainability in this context involves finding ways to support groups as they learn about technology, as they identify ways that technology can be used to address organizational and community level problems, and as they develop plans to take on projects involving technology.

In this paper, we consider the issue of sustainability from different perspectives, from the point of view of an IT professional who is involved in CentreConnect, an organization that works to encourage technology use among community groups, and a research team involved in a participatory design project, Civic Nexus, that studies ways to support technology learning, use, and planning in community computing contexts. Our joint concern with sustainability led us to work together to implement a web-design training course geared towards area nonprofits. We use this experience to further articulate our vision of sustainability and to consider the ways that research and practice can inform each other when addressing sustainability in community computing contexts.

Community Profile: Centre County, PA (USA)

The trend towards studying community computing is tied to the larger realization that technology use has become embedded in our daily lives. This has lead to a growing interest in community computing that examines the ways community groups can leverage technology to achieve positive community and organizational outcomes (Gurstein, 2002; Keeble & Loader, 2001). We construe community computing broadly to include the use and design of a particular community information system or technology (e.g. web browser or a search engine), the examination of technology-related procedures and practices embedded in every day work practices, and the implementation and evaluation of technology interventions (e.g. training session). We focus on the ways that computer and Internet technologies support place-based communities: people that live near each other that share resources and information (Carroll & Rosson, 2001).

In this paper, the specific place in which we work is Centre County located in central Pennsylvania (USA). The nucleus of the county is State College, which is home to The

Pennsylvania State University. While the U.S. Census Bureau classifies the area as a metropolitan area (U.S. Census Bureau, 2002), much of the region that surrounds State College is rural. Centre County has a population of 141,636 residents. The population of Centre County is largely white (91.4%). A large proportion of the residents have a high school diploma (88.3%) and one-third have a Bachelor's degree (36.3%). The median household income in 1999 was $36,165 with 18.8% of people in the county living below the government defined poverty line. Given these demographics, it is not surprising that there is a relatively high level of Internet adoption in the area especially in the nucleus of the county. The Knight Foundation (2003) reported that 73% of State College residents go on online to access information or to send email. In comparison, Internet penetration rates for adults in the United States have ranged between 57 and 61% since October 2001 (Pew, 2003). It is likely that Internet use and access is much lower for more rural areas in the county that do not have high speed Internet or cable television access.

Volunteerism and community participation are important issue for community groups because they often rely on volunteers to carry out technology projects for their organization. The presence of the university provides a resource that can be leveraged by the community in the form of a skilled volunteer pool that can be called upon when undertaking technology projects. This is true in the sense that university staff, faculty, and students may provide technical help to community organizations informally as members of a religious, social, or civic organization. There are also more formal university activities that tend to provide short-term technology assistance to community groups such as classes with a service learning component, internships, continuing education outreach efforts, and community-oriented research or service projects. It may be more difficult, however, for community groups in more rural parts of the county to utilize, and feel comfortable drawing upon university resources.

Both CentreConnect and Civic Nexus are concerned with working with community organizations in Centre County so that they have greater control over the use of technology in their organization. Our positioning in the community contributes different insights into the issue of sustainability that will be explored in the next section.

Starting Points for Defining Sustainability

Broadly construed, concerns with sustainability are centered on determining how and if people in community computing settings are able to realize the potential of technology to achieve goals that are important to them. This question has been asked in different ways with researchers and practitioners focusing on: (a) the feasibility of various models (e.g. CTCs) and the physical, social, and technical requirements that must be in place to ensure technology access to citizens (Clement & Shade, 2000; Benassi, De Cindio, & Ripamonti, 2004), (b) the role of the government in addressing issues that affect the public good such as providing access to government information through web portals, to the Internet itself, and to marginalized members of society who may lack the resources or training necessary to access such services. (Doody, 2004; Musgrave, 2004: Malina & Ball; Taylor, 2004; Rideout & Reddick; Schauder, Stillman, & Johansen, 2004), (c) outcome-based approaches that question the kinds of results that CTCs are trying to achieve (learning, job readiness, access to information, political participation) and the factors needed to encourage long-term changes in the lives of its users (Gordon & Gordon, 2004), and (d) socio-technical investigations of IT adoption and features of one's social network (e.g. social capital) that tend to support or inhibit IT adoption (Day and Cupidi, 2004; Doody, 2004; Malina and Ball, 2004; Prell, Harrison, Zappen, & Hubacek, 2004). Given the differences between these approaches in terms of emphasis and unit of analysis (user of a CTC, CTC itself, geographic community), it is important to clearly articulate one's definition of sustainability and the theoretical and practical grounding that guides one's definition.

Our starting point in defining sustainability in this paper is a concern with working with community groups in a way that gives them greater control over technology in their organization. Control over technology involves a group's ability to use technology to address problems that they think are important. On a broader level, control also involves a more long-term approach to managing technology use, planning, and learning taking into account the challenges (e.g. lack of financial resources, few staff members, shifting volunteer base) inherent to community computing settings. This view of sustainability is grounded in research that takes a situated approach to the study of technology use and adoption in community groups (Bruce & Hogan, 1998; Loader, Hague, & Eagle, 2000; Turk & Trees; Slack, 2000) and participatory design efforts geared towards working with groups as they adopt IT in their work (Balka 1997, 1995, Benston, 1990; Collins, 2000; Fortier; McPhail et al, 1998; Mogensen & Shapiro, 1998; Robertson, 1998; Trigg 2000). Studies that have taken this approach, for example, have show how features of the community such as organizational inertia or power issues can inhibit the extent to which people participate in the process of design and their use of technology (Finquelievich, 2000; Halaska, 2000).

This view of sustainability is also grounded in our practical and research experience working with groups in Centre County. In this section, we work to articulate the assumptions that we make in defining sustainability in our work. We start by describing the work done by Author 1 who is involved in promoting technology use in community organizations though CentreConnect. His practical experience helps to frame the problems experienced by community groups as they seek to use and implement technology in their organization. Next, we will describe the research efforts undertaken by the Civic Nexus research group that studies technology use among area community groups. We use these experiences to frame a project that we did together to address and understand sustainability issues for organizations in our community.

CentreConnect

CentreConnect is a community organization that works with area nonprofits to help them get information about their mission, services, and events to residents in Centre County. CentreConnect hosts web sites for community-oriented organizations and helps to promote the value of having a web presence. CentreConnect also serves as a web portal so that area citizens have a convenient place to find information about the community. CentreConnect started out as a nonprofit and has since merged with C-NET, a government and education public access television station. The merger helped to ensure the long-term existence of CentreConnect because they were able to share the overhead of running the organization with C-NET. The merger also reflected a recognition that the two organizations shared a common purpose in providing community information to area citizens and a common base of volunteers who were interested in this mission. The leaders of both organizations also believed that the merger would position the combined organization better for the future as media channels converge. The view of sustainability presented in this section draws from the second author's (Clitherow's) work with CentreConnect and the technology training and consulting services that he provides to area nonprofits.

Organizations need to see the centrality of IT to achieve their mission.

Most small community-based organizations have some understanding of how technology can help them meet their goals. More pressing priorities often force technology issues to a much lower priority as the organization pursues its primary goal. For example, if an organization is formed to support unwed mothers in a community, the group will not likely allocate funding or personnel resources to pursue any technology based aspect of their work. However, as their

primary mission takes shape, it becomes clear how a website, email list or newsletter will help them get out the word about their work. Given a minimal budget to begin with, the organization often seeks knowledgeable volunteers to help them execute a plan. Fortunately, many communities such as ours have a broad base of talented IT members who willingly give their time.

The fallacy in this arrangement is that often the leaders of the organization do not appreciate what is required to implement technical solutions and they do not fully understand the tradeoffs involved in relying on volunteers to pursue their mission. Few of the organizations I have worked with have developed a core set of volunteers responsible for technology planning and implementation. Consequently, once the "volunteer technician" has implemented the plan, found other interests to occupy his/her time, or simply moved geographically to a new job or assignment, the organization is left with little understanding of what they have or how to maintain it. Websites quickly atrophy; newsletters cease or become less frequent and lose some of the "glamour" they had upon launch; and mailing lists age. Beneficiaries and supporters of the organization who have become dependent on this above-mentioned form of communication may become disenchanted and find support, assistance, or rewards from some other ("competing") organization.

Community groups need to effectively manage human and technical resources.

Training and resources appear to be major factors that contribute to sustainability issues in community organizations. If organizations are going to have their technology platforms supported and potentially enhanced, then they have to locate, train, and continually staff some kind of support base within their organization. This issue continues to be the overriding problem in our community-based organizations. They have become dependent on a specific individual or group of individuals to provide a solution and are lulled into a false sense of security. When something happens to upset the support base, there is no continuity plan. Few of these organizations plan IT resources the way they think about administrative resources. Most of the non-profits I have worked with have some paid administrative staff. None of them have a paid IT staff. They rely on volunteers. However, with each new innovation, IT is becoming more critical to their mission. No organization can enjoy long-term viability if they reply on volunteer staff to meet mission critical needs.

Community groups often lack long-term IT planning.

Community organizations tend not to realize the ways IT has become critical to their mission, which is tied to a lack of long-term IT planning in their organization. Perhaps the technology involved is beyond the leader's experience, or perhaps the leaders are content to let the "techies" handle that aspect of the job. While some organizations do set up a procedure to review the technology in their organization that is critical to their cause, they also need a continuity plan and to budget for the long-terms costs involved in carrying out a technology project. For example, if an organization develops an on-line resource that people begin to depend on, the organization must plan how to maintain the site and provide updated information. Failing to do so will drive original users/supporters to find other avenues to meet their needs.

The lack of technology planning may also be tied to the invisibility of many of the technologies that they use. As they use technology that they can't see or touch such as web sites, networks, or remote access, the lack of a maintenance strategy becomes an issue. All the things that have made them successful from a technology perspective successful become taken for granted. For example, one local organization that I have worked with was unable to update their

online member directory for three years while trying to find a resource that could help them move forward.

The goals of CentreConnect are closely aligned with the sustainability goals of the Civic Nexus project described in the next section. CentreConnect has played many different roles in the Civic Nexus project helping the research group to think through research issues, serving as a link to other community organizations, and as community partner participating in the research project. CentreConnect's practical experience working with community groups has been important in helping Civic Nexus to think more broadly about the challenges that nonprofit groups face when implementing IT in their organizations. This practical experience also served as a check for some of the observations that we are making in working with other community groups. Finally, CentreConnect has served as a community partner in our research as we worked with them on a technology project.

Civic Nexus

Civic Nexus is a three-year participatory design project with the goal of working with community groups to facilitate their ability to use and learn about technology as they pursue existing goals and as they envision new directions for their organization. The view of sustainability presented in this section draws from the experience of researchers affiliated with xxx Lab in the School of xxx at The Pennsylvania State University who work on the Civic Nexus project. The Civic Nexus project builds on previous work that takes a long-term participatory design approach that combines ethnographic fieldwork with participatory design to create information systems that address local needs (Carroll, Chin, Rosson, Neale, 2000). We use ethnographic fieldwork to understand the factors that influence technology use, adoption, and decision-making in these community groups. Through this knowledge we work with the group to carry out a technology project that meets goals that they define as being central to their mission. In this way, we hope to encourage sustainability by working with the group to promote technology use, learning, and planning in the organization.

For the last year, we have conducted fieldwork and have identified (and in some cases carried out) technology projects with a diverse set of community partners including an environmental group, a high school learning enrichment program, a historical society, and CentreConnect (Merkel, et. al, 2004). In working with our community partners, we explicitly position ourselves in more of a consultant or advisory role working with the group as they carry out a technology project rather than taking over the "doing" of the project. For example, in working with a community group we would not create a website for them but we would point the group to tools that they might use to create and maintain a website, help them think through some of the technology decisions that they may need to make, and introduce tools such as scenarios to help the group think about the audience and activities that they want the site to support. We provide a more detailed account of our research elsewhere (Merkel, et al 2004) so we use this section to describe some issues related to sustainability that we have identified through our research.

Promoting sustainability requires designers to take on less directive roles.

Our concern with sustainability is both a research interest and an issue that helps to govern how we position ourselves when we work with community groups. We go beyond traditional participatory design models that seek to make users active participants in the design process. Instead, our research and design efforts involve finding ways for our community partners to take control of the design process itself by directing what should be done, by taking a central role in the "doing," and by maintaining the technology infrastructure itself. The goal is to fade away with

the participants maintaining and developing the achievement that is produced. This requires us to find ways to create an environment in which groups can sustain their ability to solve technical problems and direct change themselves. In our work, we have considered a number of different roles that emphasize the less directive role that we wish to play including that of a lurker, facilitator, consultant, and bard (Carroll, 2004, Merkel, et al, 2004).

Designers can provide conceptual and technical tools in ways that promote sustainability

Another issue we consider in our project is how to provide technical and conceptual tools in ways that promote long-term learning and technology planning. We want to avoid creating a situation in which community members are dependent on a technical tool that we create. Through our work, we have also come to realize the ways designers can introduce conceptual tools that can be used by the community groups themselves. One tool that we have used is scenarios that can use with community groups in the process of design. For example, the Spring Creek Watershed Community used scenarios to think through how an audience might use their website and to elicit design requirements in the process of redesigning their website (Farooq, et. al, 2004). Similarly, we found that designers can play an important role in helping community groups envision how technology might be used in their organization, give them confidence to try something new, and help them in the planning of technology projects.

Community history influences efforts to encourage sustainability

In our work we also learned about the mismatches that can occur when working with community groups to promote technology learning and planning. In some cases, it took a while to overcome the group's model of relying on volunteers to get technology projects completed. For example, in working with the historical society we found it difficult to settle on "the" project to work on (Merkel, et al., 2004). As we worked more with the group, we realized that there was a deeper mismatch between their normal practice for getting technology projects done and our vision of playing a less directive role in the process. Our assumption entering this research setting was that the historical society would choose a project to work on and we would taking a consultant role as they directed and organized the project. Their assumption was that we would select a project from a list of potential projects that they provided and then we would begin implementing the project. While we are still working to define a technology project, in many ways our work with this group has been invaluable in helping us appreciate the decision-making dynamics of the groups and the assumptions that we made about sustainability.

Shifts in practice can be difficult and the impacts indirect

As people gain more experience with technology, they tend to redefine the meaning of technology in their organization, their own organizational roles, and their relationship to technology. For example, we worked with a group of high school students to develop an online health course for their school (Xiao, et al, 2004). This project required the teacher who directed the project to take on a new role, that of project facilitator, because she did not have the technical knowledge her students possessed to complete the project. This project required the students to take a much more active role in directing their own learning as they were in charge of creating the design for the online course. This project also led the school to examine how to adjust its existing curriculum to integrate the web course format with traditional classroom teaching. We also found that sometimes it can be difficult to evaluate the impacts of a technology projects because the

outcomes can be indirect. For example, the health course prototype that the students developed provided a proof of concept that a course could be offered online and encouraged teachers not affiliated with the health course to think about how they might use the technology in their own teaching.

In many ways, the issues represented in this section are questions that we have had to think about in finding ways of working with our community partners to promote sustainability. In the next section, we describe a collaborative effort between CentreConnect and Civic Nexus to deliver a web-design training course for area community groups.

Working Together to Promote Technological Sustainability

In this section, we describe the process of working together to deliver a training course to area nonprofits and the ways that this collaboration helped us think more about promoting sustainability in community computing contexts. The impetus for the web design course was an evaluation by CentreConnect of the extent to which community groups were taking advantage of its web hosting services. One set of community groups that CentreConnect targets is 200 social service agencies that meet regularly to share information about their activities. In working with this group, CentreConnect noticed that less than half of these organizations had websites on its web portal and many of the websites that were online had not been updated in several years. They were also aware of some community organizations that wanted a web presence but were not sure how to get started. Based on this analysis, they decided to offer a web design training course that was co-sponsored by the local public library. CentreConnect helped to recruit community groups and the library hosted the training session. Civic Nexus was involved in planning meetings to develop the curriculum and training material for the course and served as a co-instructor in the delivery of the training.

In our early meetings, we worked together to shape the course and thought about how we might incorporate our mutual ideas about sustainability into the curriculum. CentreConnect had a clear idea about the type of topics that they wanted to cover and the need to pitch the training to an audience that had moderate technology skills and little or no web design skills. The training course that we developed was 7 hours long delivered over three class sessions. In the course, we covered what it means to have a web presence, how to design an organizational web page, and website maintenance. We asked the students to bring in material from their organization that they wanted to put online and worked on these student-defined projects in class. In the course, we taught the students to use FrontPage to design and edit their organizations' webpages. There were several trade-offs involved in this tool choice that will be addressed below.

The groups attending the course included social service agencies, government agencies, and some local community organizations. Most of the participating organizations already had a web presence but the people attending the course were typically not involved in creating the initial web presence. Their goals for attending the course varied. In some cases, the group was not happy with their organization's website and they wanted to update the site. In other cases, the participants saw the potential of the web to promote their organization, their services, and their issues. For example, some organizations wanted their website to provide descriptions of the programs that they offered while others wanted to put their organizational newsletters online. Finally, groups saw the potential to add new resources to their site such as information that seniors could use to make better informed choices between prescription drug plans. Many of the participants had attended training programs before but these courses did not give them time to put their own content online.

In working on the course together, we developed some insights about the collaborative process of incorporating sustainability into the training course. Based on our experience working with the groups, we also reflected on the need for tools that support community activities and some of the limits of training in trying to encourage long-term change in community technology practices.

Collaboration can lead to more effective interventions.

Our collaborative effort to design and deliver the training course was important because we were able to draw on different types of expertise to shape the curriculum that was produced. The insights gained through talking through the design of the course led us to co-develop training material that was more appropriate to the skill level and experiences of our audience. Early in the process of developing the course, Civic Nexus suggested that existing on-line material used to teach web-based technology courses at Penn State could be used in the web design course for the community groups. Based on their experience working with community groups, CentreConnect suggested that this material was not appropriate for our audience. For example, it was difficult to find the material if one was not familiar with the university and its web space. The courses were password protected and required a university identification to access the material. While community members could apply for a user name and password, the extra steps involved could present a barrier for some community members that might inhibit them from accessing the material. There was also concern about the sheer quantity of the material available online and the more academic tone used in conveying concepts that was not geared specifically towards novice users. While certainly concerns with finding appropriate content is a concern when preparing any training course, these discussions caused us to think through our assumptions about the community groups participating in the course, their learning needs, and the learning barriers that they might encounter in a much more explicit and ongoing way.

Beyond the training material that was to be used, our collaboration also influenced the content that was covered in the course. Early in the process, CentreConnect envisioned a course that would contain two sessions, an introduction to web design and a session in which community groups worked directly on developing a web site for their organization. Civic Nexus suggested some changes to this initial thinking based on our concern with promoting long-term technology planning and learning in community organizations. We suggested the additional of a third class to give people more time to work on their websites and to address the need for a long-term plan to maintain the sites that they produced. We also incorporated the perspective of the users taking the course by building time into the course where they could work on their own organizational websites. We were able to address their more specific concerns as questions arose in the process of working on their sites. These examples point to the value of collaboration in designing interventions for community groups.

Limitations of using training as a method to encourage organizational change

The training provided us with the chance to reflect on the value and some of the limits in using training as a method to promote sustainability in organizations. One of the problems that community groups face is that they do not have a lot of time to devote to working on their web site. One value of the training sessions was that it provided the community groups with a dedicated stretch of time where could think about the material that they would like to see online and the overall structure of their web site. Class members typically had a clear project in mind when attending the course so we could help them think about how they might achieve their goals and they could directly work on putting material online that was meaningful to their group. For example, we could talk about some of the issues involved in putting a newsletter online and how

they might convert existing newsletters to electronic form. Because they gained a better understanding about the process of web design through the course, they could work directly to improve their existing websites. They could also communicate more effectively with their technology staff (if they had one) because they had a better idea about what the design of a web site entailed, they devoted time to thinking through their existing web presence, and they learned about typical elements on an organizational web page.

Our work with the community groups also led us to reflect on some of the limits of training as a method to promote long-term change in the organizations. While the course did provide students with time to work on their own web sites, the course did not give them enough time to fully develop and implement their web sites. It takes time (more than the class allowed) for students to manage learning web design basics and, at the same time, applying these principles to the design of a website using materials that they brought to class. This suggests the need to find ways to support students over time as they get familiar with the technology and as they think through how they will use the technology in their organization.

Need for tools geared towards community activities

Another significant sustainability issue that the training raised is the importance of tool choice for community groups. In the course, we decided to teach the students to use FrontPage because many community groups simply do not have a budget to use more expensive software packages. We also felt that this software was more appropriate for this audience because, given their lack of technical experience, the software works in ways that are similar to other software packages that they had likely used. This software was also chosen because it would allow the students to develop relatively sophisticated looking web site with limited design skills through the use of templates. In teaching the course, we found that the templates available in the program did not match the community-oriented nature of the organizations and the activities that they wanted to support on their web sites. We also found that there was a trade-off involved in using the templates because they hid the functionality of the program. This caused problems because the students had fairly specific ideas about what they wanted to do (e.g. put an art exhibit online, put a newsletter online, organize information about the community services they offer), but they were not sure how to modify or add to the templates.

This suggests the need for tools specifically geared towards the activities carried out in community computing contexts. Some of these activities include providing information about programs/services, the mission of the organization, photo galleries of people and events, and space for organizational news and newsletters. It may have been more productive in our training to develop a template in FrontPage that would have captured these community-oriented activities rather than using the standard business-oriented templates that came with the program. On a broader level, this also points to a practical application for research; improving existing tools by identifying typical community activities that could be supported through technology. Open source content management systems and wikis provide examples of collaborative tools that may support community work more effectively. The use of these tools, however, need to be weighed with the costs involved in recruiting expertise into the organization to design and implement these tools and the time involved to learn to use them effectively.

Sustainability should be addressed explicitly when working with groups

Since sustainability was a concern for both CentreConnect and Civic Nexus, we decided to directly raise the issue of sustainability as we taught the course. We raised this issue in the third class addressing issues such as the need to manage technology learning in their organization (e.g.

Who will update the site when you are on vacation? Who will maintain the site if you, your technology person, or a volunteer leaves the organization?) and the need for a long-term technology plan (e.g. What will happen to the site when the grant runs out? Who is going to add content to these more dynamic features of the site?).

Our experience suggests that IT professionals should make sustainability planning an explicit part of the work that they do with organizations. Like many staff members in community groups, the nonprofits taking part in our training did not have experience carrying out a technology project like the design of a website. The value of a training course goes beyond just teaching technical skills. A training course can help organizations think through some of the long-term costs involved in maintaining a website like keeping the information on the site up-to-date or managing training in the organization so that they are not dependent on one person to make changes. This may also involve helping the groups make more informed choices about where to devote their efforts when putting information on-line and the trade-offs involved when implementing more dynamic features to a website. An online feature like a calendar may be a good way to advertise community activities but it also increases the amount of time and effort that must be devote to the website.

The training that we conducted represented a blending of the practical experience that CentreConnect brought to the course and the more research-oriented concerns of the Civic Nexus project. This experience led us to reflect further about what it means to help a group make technology more central to their mission and the importance of finding ways of connecting research and practice.

Sustainability as a Process of Mutual Inquiry

As we began the process of working together on a technology project, our definition of sustainability was tied to the idea that as IT professionals we must find ways of working with community groups in ways that give them greater control over the use of technology in their organizations. Our initial understanding was based on practical experience encouraging groups to adopt web technologies into their organizations (CentreConnect) and a research project focused on encouraging technology use, learning, and planning in community computing contexts (Civic Nexus). We worked together to design and implement a web design training course aimed at teaching area nonprofits how to create and maintain their organizational websites building a concern with sustainability explicitly into the course.

The experience of working together on the web design course led us to view sustainability as a process of mutual inquiry into what it means to be sustainable; what it means to achieve a "good use" or a "successful" outcome (Gurstein, 2003). We draw this point from Dewey who viewed technology as "active productive inquiry"; the process of applying tools, broadly construed, to gain control over a situation that is problematic (Hickman, 1990). From this perspective, learning involves the active reshaping of artifacts and situations that are not what we would like them to be. Organizations already use technology (artifacts, procedures, rules of thumb, theories, etc.) to address the problems encountered in their work. The problem is not a lack of technology but rather than the current technology that the organizations has is no longer adequate to address the problems in their work.

One of the practical issues that a concern with "good use" raises is how to determine what counts as a "good outcome" or "success" when working with community groups. Technology <u>is</u> part of who community groups are and what they do, so inquiry involves opening up a dialogue where we talk about the goals that they want to achieve and find ways to help them achieve these

goals in a way that is sustainable. Reflection becomes a part of the process of design as we work with the groups to understand what counts as a "good" outcome and as we question whether we are pursuing a technology plan that fits the group's needs, practices, and values. The process is dynamic in the sense that groups may differ in the way they define what counts as a technology "success" and this definition may change as they gain more experience with technology.

At the same time, "good use" is a rather abstract concept that may be difficult to address directly. Often, stakeholders do not share common assumptions about the problems community groups face or the solutions required to address these problems. If a group does not have experience carrying out a technology project, they may have an idea about what they would like to achieve but may not know what this entails, how to discriminate between technology options, or how to make their vision concrete. The practical experience of Clitherow working with groups in the community and the research experience of Civic Nexus reported in this paper helps to illustrate places where there may be a lack of common ground between stakeholders. Clitherow observed that sometimes community groups do not see the centrality of technology to their mission and they need a more long-term approach to managing human and technical resources and IT planning in their organization. In the Civic Nexus project, the research team observed that community history impacts IT adoption and that the process of adopting new technology practices can be difficult because it necessitates identity shifts and the taking on of new roles. Taking into account sustainability also requires designers to take on less directive roles, using conceptual tools in addition to technical tools to support the work of community groups.

Our joint effort to provide training to community groups has led us to consider the way that shared activities may be more effective than shared discussion in consolidating collaborations and reaching shared understandings. Shared activities, like the redesign of a website, creates a space where assumptions can be tested and tacit knowledge can be shared among stakeholders, including community groups, IT professionals, researchers, and users. Shared activities create a space where stakeholders can think through the ways that technology might help a group achieve their mission and how they might achieve these goals in a way that is sustainable across the lifespan of the organizations. This is a lesson we learned through the process of working together to design and implement the web design training course. The process of working together to create the training course allowed us to tailor the course material more effectively to our students and to think about how we might address sustainability issues in the training course.

The value of viewing sustainability as a process of mutual inquiry and emphasizing shared activities is that this approach provides a way of bridging research and practice. As researchers, shared activities help us understand in a deeper way the connection between technology use and community life. At the same time, the results gathered through research may help community groups to envision ways that they might use technology and puts their work within the larger context of other efforts aimed at applying technology to community-oriented problems (community informatics). This view of sustainability requires IT professionals and researchers to find situated ways of working with groups that acknowledge both the technical and social dimensions of sustainability. On the technical end, this might involve helping groups think through some of the affordances of particular technologies, helping them scope out a technology project, and helping them understand some of the long-term costs involved when taking on a technology project. On the social end, this might involve working with groups to assess how technology is used in their organization, the impact that new technology practices might have on their work, and some of the sociotechnical issues involved in implementing a technology solution (e.g. privacy, surveillance issues, security).

As we move forward with our work, we will continue to look for ways to support groups as they use technology to achieve goals that they think are important. Pursuing "good use" as a research and practical strategy requires that we go beyond applying generic solution to generic problems. The challenge that this poses for researchers and for IT professionals is to find ways of working with groups in ways that takes into account the unique set of characteristics present in community computing settings. We are working to find techniques that make "good use" more explicit such as through the use of shared activities and scenarios. We are also exploring the way that tools can be built to support community activities and the way that collaborative tools may allow groups to work in ways that are more in-line with the distributed nature of the work in community computing contexts. The connection between CentreConnect and Civic Nexus is important in this regard because this may result in the identification of new features that may assist community activities and may directly impact the types of services that an organization like CentreConnect could provide. We recognize that an important feature of our community is the fact that there is a technology skilled volunteer base connected to the university. We hope to work with groups that are less connected to the university to understand the unique set of factors that influence IT adoption in more rural settings.

On a practical level, this view also requires designers, IT professionals, and the groups themselves to make careful decisions about which technology projects to implement, which tools to use, and how to carry out the work itself. Groups will still face the tension between some of the long-term benefits to planning and the immediate costs that this entails (time involved in learning something new, allocation of scarce resources) which is exactly where the groups lack resources. In the final analysis, sustainability planning may be more important than proceeding with the original project implementation. If an organization does not understand the requirements for ongoing sustainability, how can they budget or staff? Perhaps it's best for an organization to realize they cannot afford to maintain a technological solution before they build and provide one. Or perhaps it is best to tackle small innovations using technology along a path that allows an organization to demonstrate its ability to sustain what it has created before over committing. Since many organizations do not understand the magnitude of the sustainability dilemma, it is incumbent upon the IT community to provide such knowledge as part of any technological solution.

Conclusion

The community computing milieu presents formidable challenges for technology intervention. In the end, the key issue for community groups is sustainability of technology use, i.e. the process of using technology should be sustainable over different resources (human, financial, technical, and temporal). Based on this mantra, we have attempted to evoke these sustainability issues in our work with community groups as part of CentreConnect and Civic Nexus.

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