Citizen professional toolkits: empowering communities through mass amateurization

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Abstract: Community Technology Centers (CTCs) and Telecentres provide critical access to Information and Communications Technology (ICT) resources where inequities exist. Additionally, a range of examples exist in which such centers are used by those who may have access elsewhere, but especially value the social interactions found at these community centers. Indeed, these facilities sometimes become meeting places for citizen professionals to participate in Communities of Practice working towards common goals. But while numerous paid professionals find laptops and mobiles the platform of choice for their daily work lives, many CTCs are still built using an impersonal closed room model which is restricted to mass implementation of non-flexible technology directed at no more than basic bridging of the digital divide. Emerging technologies such as low-cost ultra mobile personal computers and smartphones, cloud computing, geographic/neighborhood information systems, and personal webs are revolutionizing how professionals work. High functioning communities are finding ways to take advantage of the mass amateurization brought about by these emerging technologies to engage community members in community development goals, using the diversity of input to enhance the overall quality of outcome. The challenge remains how to empower more communities through access to, and training with, citizen professional ICT. This paper will describe our early experiences using customizable citizen professional toolkits to empower members from economically disadvantaged communities to work as citizen journalists and citizen planners.

Keywords: Toolkit, Photovoice, inquiry, digital storytelling, portable

Public Computing Centers: From Diffusion of Technology to Hubs of Social Change.

Access to information and communications technology (ICT) is considered important for individuals to fully achieve educational and economic development goals. Lack of access has been termed the digital divide (NTIA, 1999, 2000a, b, 2002). Creation of community-based public computing centers can provide an important first step in providing physical access to ICT. Commonly known as Community Technology Centers (CTCs) or Telecentres, these publicly accessible labs thus provide a valuable means for diffusion of technology. An often unstated assumption is that the role of these public computing spaces is a transitory one until such time that sufficient density of private access to ICT is achieved; the public computing facilities are seen as a stepping-stone to the superior but more expensive access in a place of residence (Viseu, et. al, 2006). But examples do exist that in countries like South Korea where even though home computers and broadband Internet access are very high, public computing facilities such as cyber cafes still thrive as social hubs. And researchers such as Cabelos (2006) suggest that the best telecentres are ones that become hubs for social change. This paper will first review a sample of literature that points towards possible changing roles of public computing centers such as CTCs and telecentres. It will then consider a potential toolkit that could be used in part to provide the technical tools needed to equip community members to more effectively serve as citizen professionals in support of community development goals.

Fuchs (1998) points out that while diffusion of technology is often the initial motivator for creating telecentres, this need is reduced over time, at which point telecentres either need to transform to meet other "back of the market" needs, or dissolve. This need to adapt reflects not only a communal change but also an individual change as users of the telecentres go

through a development process in which they: 1) learn how they can harness the equipment and facilities available to meet their needs; 2) relearn information seeking behaviour using the new assets; and 3) learn how they can add to the value and breadth of available on-line knowledge.

Gurstein (2003) points out that achieving educational and economic development goals in an information society requires more than simple physical access to ICT. Instead, a framework of effective use is proposed, defined as: "The capacity and opportunity to successfully integrate ICTs into the accomplishment of self or collaboratively identified goals."

While CTCs as initial stepping-stones for ICT access serves well a framework emphasizing physical diffusion of ICT to meet development goals, a model of spatial hybridity best serves an effective use framework. Public and private physical spaces can each be used to foster public or private behaviors and activities, creating a complex range of interactions with ICT, including public-in-public and private-in-public activities using CTCs and other public computing spaces, and public-in-private and private-in-private activities within homes or other private computing spaces (Viseu, et. al, 2006).

In bringing together community members each with different backgrounds, insights, and skills, telecentres can serve as a place where knowledge acquired by one can be shared with others, an important aspect of any sustainable telecentre. As such, these centers become a gathering place for "communities of practice" (Wenger & Snyder, Jan/Feb2000), that is, groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. Telecentres also can serve to foster communities of inquiry, groups united by shared interest who work together to investigate and act to address common problems (Shields, 1999). Based on the theories and practices of Charles Peirce, John Dewey, and Jane Addams, a number of researchers have proposed that the inquiry cycle, especially as applied to communities of inquiry, provides an exceedingly rich environment for achieving educational and community development goals (Bruce and Bishop 2008; Bishop and Bruce 2007; Bruce and Bishop 2002; Short, et al 1996; Shields, 1999; Wells 2001).

The desire to build social capital is something most telecentres have in common. Cabelos (2006) suggests that "the best telecentres are local gathering places; places where people come together to talk, tell stories and share knowledge." This leads the members of the community into conversations with each other to determine what is needed to improve the local quality of life. In so doing, not only do they become actively engaged in adapting the tools found in telecentres to their own local needs, they also become more connected with each other, thereby further strengthening the community. New technologies enable self-determined media production that is giving voice to communities to share local stories, forge civic bonds, to produce media that meets local needs and to localize and distribute knowledge. In this way, there is an increase in the communities' ability to paint a picture of the future as defined by the communities. Telecentres thus become both hubs where community members enter together in communities of inquiry to determine what is needed to improve the quality of life and the centers where the tools necessary to affect that change are available for community use.

Berry, et. al. (1993) points out that participation in the political process is best fostered through regular face-to-face interactions. The strongest local governments are the ones that create mechanisms to encourage the formation and bi-directional flow of information with healthy neighborhood-based associations. Such associations help balance power between the elite and non-elite within the community and are shown to decrease tensions between those advocating for neighborhood or business interests. As local information hubs and gathering places, telecentres clearly have the potential to step beyond serving as only a channel for the delivery of government services to also being a platform that helps provide communities with the skills needed for a new type of citizenship as they become places to negotiate the future of government creatively and inventively (Cabelos, 2006).

Equipping Public Computing Centers for New Roles

To fully equip citizens to participate in communities of inquiry/practice, it is important to provide the citizenry with the tools and skills necessary to gather and analyze the data used by planners to inform and influence decision makers. Vaughan (2007) states: "The priority of the scientific community and government should be empowering citizens, developing the tools and approaches to bridge the gap between civil society and decision-makers." Scientists are focused on certainty, long data sets and peer-reviewed publications, while citizen scientists provide a mechanism and the information needed in order to begin to inform society's choices more effectively. Wilderman (2007) describes three models of citizen science: 1) consulting model in which the community describes the problem and expert researchers study the problem; 2) citizen as worker in which the expert describes the problem and interprets results while the citizens are engaged in collecting data; and 3) the community-based participatory research model in which the community is trained to describe the problem, collect the data, and provide the analysis and interpretation. To increase democracy by levelling the playing field in the decision-making process, it is necessary to engage community in a community-based participatory research model that increasingly empowers citizens to perform each step of the research cycle (Stoeker, 2005).

Not all individuals become directly involved in the research process. Citizen professionals also become engaged in the process of giving voice to community goals and concerns. Photovoice and digital storytelling are techniques particularly well suited to empowering community voice. A range of studies indicates the value of these techniques to foster community development goals. Photovoice is a highly flexible methodology enabling people to record and reflect their community, promote critical dialog about important community issues and reach policymakers (Wang and Burris, 1997). The technique has been used in many projects around the globe. For example, in Cameroon, disabled people documented their lives and experiences showing the daily challenges they faced. The goal; to increase the influence of grassroots disabled people over social policies, practices and public attitudes in Africa and Asia (Photovoice). A three-year program of digital storytelling was used as a tool for creative empowerment of marginalized youth within Palestinian refugee camps. Weaving together original stories, drama, poetry, photography, music, and digital video, these youth express their own perspectives on Palestinian history, culture and everyday life in the refugee camps, as well as their dreams and aspirations. The often hidden psychological trauma pertaining to violence or loss in their own lives or that of their families and community is often revealed in the stories they write or the aesthetic choices they make in production of their work. They were engendered with an immense sense of shared satisfaction, identity, and confidence, as well as recognition among their peers, family and community (Sawhney, 2009).

Emerging technologies are providing new tools for empowering individual and community engagement. The Horizon Report (Johnson, 2009) points out that newly emerged and emerging technologies such as mobile and cloud computing are leading to a collective intelligence and mass amateurization that is redefining how we think about ambiguity. Cloud computing using large data farms is providing a unifying technological base for grassroots video and collaborative webs that are empowering citizen professionals at many levels. Cloud computing also enables enhanced mobile computing, providing the mechanism whereby computers taken into the field can be used as a tool to directly interface between community and rich datasets in the immediate setting of interest. The Horizon Report also reviews a number of ways in which individuals and communities are able to enhance storytelling, medical, and learning objectives through the growing availability of Geographic Information Systems (GIS) targeted at the consumer market.

If public computing facilities such as telecentres and CTCs are to make the transition from facilities fostering diffusion of technology to community centers empowering citizens through effective use of ICT as citizen professionals such as citizen scientists, citizen planners, and citizen journalists, it is necessary to revisit implementations of technology within these spaces. Viseu, et. al. (2006) have found that while facilities for diffusion typically are set up as a dense cluster of shared terminals designated for worthy usage and located in an open

space for easy monitoring, a center that leads towards effective use would likely create an environment for a range of public and private behaviors and activities. For instance, if a stated goal is to promote electronic commerce, terminals with personal storage space and privacy screens might be indicated. On the other hand, facilities for civic engagement might emphasize gathering spaces for face-to-face meetings and in which the technology is implemented to be unobtrusive but readily available for presentations or side-research to supplement dialog.

In a recent seminar, Dawn Nafus (2009) presented early research from the People and Practices Research Lab at Intel that indicates a need for 'plastic' technologies, computers and other technology that are available to fill opportunistic gaps, that do not demand conscious attention until interrupted, and that easily defer to external contingencies. These data indicate the value of notebook and ultra-mobile PC's for many uses because of their ability to serve as a plastic technology. Interestingly, they have found that even Internet workers rarely spend more than 5 minutes in a given session working on such computers as a result of ongoing external contingencies that demand the core of the workers attention. Weiser (1991) has gone so far as to suggest that the most profound technologies will be the ones that disappear. Taken from the ubiquitous computing framework, the argument is that as technology becomes easier and faster to use, as all ICTs integrate together in a unified whole, technology increasingly becomes a "pleasant and effective 'place' to get things done". Thus, while the traditional computer lab may continue to meet the needs of certain public-in-public computing activities, particularly where a density of computers are needed to meet high access demands, mobile computers may provide a more flexible mechanism for meeting both high access demands and the need for plastic technologies that readily move between public and private computing in public spaces.

The Citizen Professional Toolkits

The goal of the current research, then, is to begin an exploration of how to create mobile CTC extensions to support communities of inquiry/practice in their educational, economic, and community development goals. The design objective has been to create a toolkit that includes many of the common tools used by professionals such as journalists, planners, and scientists. Design criteria include:

* ease of use to encourage adoption by citizens with a range of technology skills;
* room for growth as citizens gain comfort with the technology;
* sufficient quality to provide useful production for a range of presentation mediums;
* portability to encourage use in the field and in different meeting spaces within a CTC or telecentre;
* reasonable pricing to enable implementation by more community organizations.

The components of the toolkit were selected to facilitate communities of inquiry/communities of practice, whether functioning within traditional public computing facilities or in the field. Cameras, camcorders, microphones, GPS units, and the laptop were each chosen to support a range of citizen professional activities from community-based participatory research to photovoice and digital storytelling. Individual citizen professionals may check out a toolkit from a public computing facility, gather data and collection stories, and return to the facility to analyse data and report on findings within a broader group. Alternatively, a community of inquiry may take one or more toolkits into the field, thus creating a mobile extension to a fixed facility, in which multiple parts of the inquiry cycle may be performed within a community of inquiry as a whole.

Following extensive research using a range of technical reviews and interviews of practicing professionals, 10 toolkits were purchased for field testing. Equipment has been tested by pre-professional Master's students at the Graduate School of Library and Information Science at the University of Illinois, by staff from the Community Networking Initiative at the University of Illinois, and by community participants in the Youth

Community Informatics project. Most toolkits have been distributed as Mobile Media Toolkits, complete multimedia recording and production kits contained within a backpack weighing less than 16 pounds. However, two toolkits have been included as a larger CTC installation at the Teen Tech Team project, an after school program emphasizing development of technology and business skills for teens 14-18 years old. The program is located in East St. Louis, Illinois, a city of 35,000 residents, of which 99 percent of the population is African-American and 40 percent live below the poverty line. The installation at Teen Tech Team includes both mobile and traditional desktop ICT. Field notes and interviews have provided the key insights into how well equipment is functioning to meet stated objectives.

Computing Platform

With increased storage capacity, roaming Internet access, the ability to record audio and video, to create and edit documents, spreadsheets, and even presentations, mobile computers have gained much of the functionality of laptop computers (Johnson, 2009). By 2020, it is predicted that the majority of Internet use will occur using mobile devices according to a recent survey by the Pew Internet & American Life Project (Rainie, 2008). But pricing plans for mobile devices remain high (Sadun, 2009). Further, input using the smart phone keyboard continues to limit its use for anything more than short writing exercises (Bender, 2009). While performance continues to increase, production of higher quality, edited video remains beyond the capability of mobile computers.

New ultra-mobile PC's (UMPC) or netbooks appear to provide a promising compromise between full-sized notebooks and the more limited capabilities of smart phones. These small form factor subnotebooks generally weigh less than 2.5 pounds and cost less than $400 USD. Early field testing is indicating that the model chosen should provide a hard drive (as opposed to smaller solid-state drives) for large files such as video and at least 1 GB of memory, with 2 GB preferred. The 8.9" to 10" screens and 1024x600 resolution found on most UMPCs is less than ideal for extensive video editing, but is sufficient for simple editing functions while in the field. The laptop has worked exceedingly well as a platform in field for note taking and audio recordings. In addition, where roaming Internet access is available, the laptop provides a means for supplemental field research. When combined with a GPS receiver and maps, the laptop is able to provide driving directions. In all, the small form factor provides an ideal mobile computing platform for a range of citizen science activities.

For more extensive video editing, an in-house docking station that includes an external monitor, keyboard, and mouse should be considered. Indeed, for more extensive editing, especially with special effects, a multimedia desktop should be considered. In our first full implementation within a CTC at Teen Tech Team, a more traditional lab configuration with five desktop stations, two docking stations, and a Network Attached Storage (NAS) is used to provide a mechanism for easily transferring files between devices and to allow for easy access of recorded video footage into multiple projects being developed simultaneously. This illustrates the value of a hybrid model of ICT implementation that combines traditional and mobile technologies into one configuration.

The current tested configuration includes the MSI Wind: U100-432US UMPC with Windows XP Home. Pinnacle Studio Moviebox Ultimate 12 is the primary software used for video editing, while the open source program Audacity is used for direct audio recording and editing. The open source application GIMP is provided for advanced photo editing in addition to the built-in photo editing capabilities that come with Windows XP. Both the open source application Open Office and Microsoft Office are provided for document editing. The programs Google Earth and ESRI Arc GIS workstation are provided for GIS applications.

At Teen Tech Team where a traditional CTC was combined with new MSI Wind UMPCs, 22" LCD monitors, external keyboards, and mice were also provided with the MSI Wind. A Synology DS207+ NAS with mirrored 1 TB hard drives provide a central storage for the CTC. A USB-based DVD burner provided to facilitate installation of CD-based software and access to CD-based data also allows for archiving and distribution of multimedia productions. Thse components supplemented the existing five Dell Optiplex 320 Minitower computers

running Windows Vista Ultimate. The Vista Ultimate edition had been chose chosen for its enhanced support for both office and multimedia applications.

Video and Audio Recording

Early video recordings were made using a simple-to-use flash storage camcorder with integrated USB device. Testing was performed with the Flip Video Ultra. Extensive field testing has found this device to be very easy to use by all testers because of its one button operation. Accessing video was likewise easy once the software included on the device was installed to a computer as the camcorder would appear as a storage device. Because Flip cameras produce MPEG's that can be played on any computer, it was reasoned any computer with basic video editing software (iMovie in Mac, Windows Movie Maker, Kino on Linux) could be used to create short clips. However, because not all computers provide the needed administrative access to install the included software, it was not possible to use all computers to access and edit video.

Given its ease-of-use and relatively low cost, the Flip camcorders have become a mainstay for basic training in digital storytelling and citizen journalism. For instance, while completing a project with twenty-two fourth graders at an elementary school, Flip cameras were utilized to teach the students how to record and interview each other. The students were intrigued and genuinely excited to use this type of technology. Many found the cameras self-explanatory and many needed little direction on how to use them. However, their audio recording quality is inadequate for all but the quietest recording environments. Video quality is also somewhat limited, particularly when significant edits are made or when video is to be projected to large screens.

For this reason, newer kits include a DV tape-based camcorder that includes a microphone input jack for improved audio recordings in noisy environments. For quieter environments, it provides a capable built-in stereo microphone. The DV tapes provide both a high quality video and also a tested archiving mechanism, ideal for citizen journalism and digital storytelling activities. The tested camcorder, a Canon ZR-930/950, remains relatively easy to use, although more complex than the very simple Flip Video Ultra. Transfer of video from the camcorder to computer requires a real-time transfer (10 minutes of recorded video requires 10 minutes to transfer) via firewire cable. As many UMPCs, including the MSI Wind, do not come with a firewire bus, an external Pinnacle Capture Card is included with each toolkit. As an added advantage, this capture card can accept not only firewire inputs, but also S-Video, composite video, and audio inputs to provide a mechanism for digitizing analog recordings from a range of devices in addition to the digital recordings from the camcorder.

Given the early findings emphasizing the need for high quality audio recordings for effective storytelling/citizen journalism, each toolkit includes several different microphones. A wireless microphone kit that includes both an omni-directional lapel microphone and uni-directional hand held microphone option can provide input to either the DV-based camcorder or the laptop. This is particularly useful for interviews in noisy environments. It also allows the videographer to capture not only head shots of the person being interviewed, but also surrounding images without concern for loosing audio from the interviewee. A small passive mixer and wired lapel are included in some kits to allow for simultaneous recordings of both the interviewee and the interviewer. However, complexity of setup has meant this option has as of yet been rarely used. Instead, a USB-based headset included with the toolkit is used in combination with the laptop to record voice-overs by the interviewer to add questions during video editing. This has the added advantage of allowing the interviewer to ask the question more succinctly for final production than what might be necessary to effectively inform the interviewee while in the field. A USB-based omni-directional microphone is also included in the kit to provide a mechanism for recording audio from group discussions directly to the UMPC. This microphone has also been used to facilitate group discussions using Voice-over-IP applications such as Skype.

Interestingly, Teen Tech Team has used the DV-based camcorders not only for video recordings, they have begun to use it as a portable audio-recording device. In this way, they

have been able to capture a range of unique environmental sounds that they subsequently use to enhance their multi-media productions as the Pinnacle software allows for easy disassociation of the video and audio tracks. This is a great illustration of how citizens will often find novel ways to repurpose ICT to meet their own needs from the technology.

Other Components

A number of different digital cameras have been tested to date. Initially, a Canon Powershot S3 IS was tested as a highly-rated high-end point and shoot camera. However, less expensive but more portable point-and-shoot cameras such as the Canon Powershot SD1100IS and the Panasonic LZ8 have proven more popular for most uses. Both can be easily carried in a pocket and provide excellent quality still pictures. The Panasonic LZ8 has two features that show some further promise: it has been highly rated for its ability to include simple shot modes along with manual settings to allow exploration in creativity for budding professional photographers; and it has a slide switch to turn the camera on and off which seems to reduce accidental power on when being transported in a pocket or backpack.

One additional camera that is being tested in several kits is the Nikon Coolpix P6000. This slightly larger camera includes both built-in GPS and also a copy mode recommended for archiving. High end archiving projects no longer use scanners to digitize texts because of their potential to damage book bindings, their inability to work with odd shaped and sized items, and the potential for their light source to damage items of antiquity. Instead, tripod mounted cameras are now typically used in these projects. The copy mode of the P6000 is meant to provide an easy-to-use entry system into such archival activities. Also of significant value for archiving is the RAW storage format provided by the P6000. The RAW format records the image directly as captured by sensors without any image processing (e.g., white balance, exposure compensation, color temperature). This affords iterative post-processing of the image using advanced computer software, potentially including specialists support when needed, instead of instant post-processing at the time of capture using the camera's own software.

Geotagging of data is proving valuable for a range of activities. Much of the current research builds upon work with 4-H, a youth empowerment group that teaches through hands-on experiential learning and is found in the U.S. and 80 other countries world-wide. Most toolkits include a Garmin eTrex Legend GPS receiver. These are being used for a range of geomapping activities. For instance, one middle school has been using the receivers to map the location of gravestones in a local cemetery. In another project, the receivers were used to map local information sources, including traditional sources such as libraries and non-traditional sources such as historical signs and bus stops. Some toolkits are also including the Amod AGL 3080 photo tracker. This simple GPS receiver has an on/off switch and a waypoint button. When activated, it synchronizes with satellites then begins recording location to internal flash storage every 1, 5, or 10 seconds as pre-configured. When connected to a computer, the device is available as a flash storage device, and recordings are stored as text files with data encoded using open standards, simplifying access to data. These devices were tested in Africa during summer 2009 with citizens to track their daily and weekly walking patterns to help provide valuable community development planning data.

Summary

Depending on exactly which components are included within a kit, the backpack-based mobile media toolkits cost around $1600 USD and weigh less than 16 pounds. These kits are beginning to be tested in a range of applications. Youth from the Teen Tech Team afterschool program have been using the toolkits to produce video on the topic "Violence in my Community". The adult leader of the program describes how working together to create a video production telling their own story has brought the teens together as a team in a way that working with ICT in the past hadn't. Shy students are beginning to come out of their corners

to engage with other youth. Some students who were not comfortable working with other ICT are finding the video a more comfortable technology with which to work. Together, they are finding a way to give voice to their communal understanding of the world around them. They are being rewarded for their efforts with an opportunity to use the newest version of the toolkit to begin working with the local community cable access channel as youth reporter interns. This positive result from participatory action research has been seen in other settings. When rural Chinese women began using the photovoice methods to foster better social services for health care, the participants found that "it contributed to and enhanced self-esteem and peer status…many shy participants gradually learned to express their thoughts boldly and confidently during group discussions". (Wang 1998)

By using components that can easily be taken into the field, it is proving possible to create a mobile public computing facility. In this way, the telecentre can be located wherever ICT is needed at the moment. An outdoor classroom or research laboratory is quickly created as components are unloaded from backpacks. A backpack can easily be transported to the office of an official to perform an interview, then brought back to a central telecentre for extended production using the additional facilities of a docking station and fixed desktops. Backpacks can be taken to a library or other public center when needed to supplement existing computers that might be valuable for certain types of research and text production but might not have all the needed hardware and software to enable multimedia production. Including mobile computing platforms in telecentres also provides an easy mechanism to allow for citizens to quickly supplement face-to-face dialog with information garnered during the meeting collected using ICT to perform online research. The mobile ICT also provides a mechanism for inclusion of remote participants. Yet its portability also allows it to be quickly put aside to continue the dialog without interference from ICT. Indeed, it is interesting to reflect how closely each of these examples matches the way many professional researchers work on a daily basis today using plastic technologies (Nafus, 2008).

As the initial role of telecentres and CTCs for technology diffusion is met, the need to move on to new roles for such centers emerges (Fuchs, 1998). Emerging technologies and ways in which professionals are using technology can help us understand new types of technologies and new ways of implementing existing technologies to better empower citizens in their move towards "mass amateurization" (Johnson, 2009). Considering new frameworks for public and private activities within both public and private spaces, and ways in which mobile and fixed installations can work together to provide more effective use of technologies is needed if telecentres and CTCs are to thrive as places advancing community development goals (Viseu, et al, 2006; Nafus, 2009). This paper proposes a set of mobile technologies that can be used as either a standalone or a supplemental toolkit for telecentres, CTCs, and other community centers in which ICT is provided for community use that can facilitate further mass amateurization.

References

Bender, Walter. 2009, Beyond the XO Laptop: Walter Bender on OLPC and Sugar on a Stick, Tech & Learning, Accessed July 2009 http://www.techlearning.com/article/16348

Berry, Jeffrey M., Kent E. Portney and Ken Thomson. 1993, The Rebirth of Urban Democracy. Washington DC: Brookings Institute

Bishop, A. & Bruce, B.C. 2007, Community Inquiry [Homepage of Liberating Voices! A Pattern Language for Communication Revolution], [Online]. Available: http://www.publicsphereproject.org/patterns/print-pattern.php?begin=122 [2008, 9/24] .

Bruce, B.C. & Bishop, A.P. 2008, "New Literacies and Community Inquiry" in Handbook of research on new literacies, eds. J. Coiro, M. Knobel, C. Lankshear & D.J. Leu, Lawrence Erlbaum Associates, New York.

Bruce, B.C. & Bishop, A.P. 2002, "Using the Web to support inquiry-based literacy development", Journal of Adolescent & Adult Literacy, vol. 45, no. 8, pp. 706.

Ceballos, F. et al (2006). From the ground up : the evolution of the telecentre movement. Ottawa, ON, CA: Telecenter.org / IDRC, accessed July 2009 at http://idl-bnc.idrc.ca/dspace/handle/123456789/27550.

Gurstein (2003) Effective Use: A community informatics strategy byeond the Digital Divide. First Monday, Volume 8, Number 12 - 1 December 2003

Johnson, L., Levine, A., & Smith, R. (2009). The 2009 Horizon Report. Austin, Texas: The New Media Consortium.

Fuchs, R.P. (1998), "Little Engines That Did" - Case Histories from the Global Telecentre Movement, http://www.idrc.ca/fr/ev-10630-201-1-DO_TOPIC.html.

Nafus, D. 2009, "From Multitasking to Plastic Time: The Busyness (or not) of Technology use". Seminar presented January 23, 2009, Abstract accessed July 2009 at https://apps.lis.illinois.edu/wiki/display/sp09lis590ul/Schedule

National Telecommunications and Information Administration (NTIA), US Department of Commerce, 2002. A nation online: How americans are expanding their use of the internet. Washington, DC: NTIA,

———. 2000. Falling through the net, toward digital inclusion. Washington, DC: NTIA, .

———. 2000. National telecommunications and information administration annual report 2000.

———. 1999. Falling through the net: Defining the digital divide. Washington, DC: NTIA, .

Photovoice, Cameroon, November 2004 - January 2005, Photography by disabled people in the UK, Bangladesh and Cameroon, Accessed July 2009 at http://www.photovoice.org/html/exhibitionsandevents/upcoming/bangladeshexhib.html.

Rainie, L. & Anderson, J. 2008 "The Future of the Internet III", Accessed July 2009 at http://www.pewinternet.org/Reports/2008/The-Future-of-the-Internet-III.aspx

Sadun, E. 2009 "Consumers, not providers, ready for ubiquitous cellular data", Accessed July 2009 at http://arstechnica.com/telecom/news/2009/03/going-ubiquitous-with-cellular-data.ars

Sawhney, N., "Voices Beyond Walls: The Role of Digital Storytelling for Empowering Marginalized Youth in Refugee Camps", Accessed July 2009 at http://www.cs.uiowa.edu/~hourcade/idc-workshop/sawhney.pdf.

Shields, P. 1999, "The Community of Inquiry: Insights for Public Administration from Jane Addams, John Dewey and Charles S. Peirce", Public Administration Theory Network http://ecommons.txstate.edu/polsfacp/3.

Short, K.G., Schroeder, J., Laird, J., Kauffman, G., Ferguson, M.J. & Crawford, K.M. 1996, Learning together through inquiry: From Columbus to integrated curriculum, Stenhouse, Portland, ME.

Stoecker, Randy. 2005. Research Methods for Community Change: A Project-Based Approach. Thousand Oaks, CA: Sage Publications.

Vaughan, Hague, 2007, "Citizen science as a catalyst in bridging the gap between science and decision-makers"; Citizen Science Toolkit Conference, Accessed July 2009 at http://www.birds.cornell.edu/citscitoolkit/conference/proceeding-pdfs/Vaughan%202007%20CS%20Conference.pdf

Viseu, A., Clement, A., Aspinall, J.& Kennedy, T.M. THEINTERPLAYOFPUBLICAND PRIVATESPACESININTERNET ACCESS Information, Communication & Society Vol. 9, No. 5, October2006, pp. 633–656 ISSN1369-118Xprint/ISSN1468-4462online #2006Taylor&Francis http://www.tandf.co.uk/journals DOI: 10.1080/13691180600965633

Wang, C. & Burris, G., M.A. 1997 "Photovoice: Concept, Methodology, and Use for Participatory Needs" : Health Education & Behavior

Wang, C., et. al. 1998, "Photovoice as a participator health promotion strategy", Accessed July 2009 at http://heapro.oxfordjournals.org/cgi/reprint/13/1/75.pdf

Weiser, M., 1991, The Computer for the 21st Century, Scientific American, Vol. 265, No.3 pp.94-104 Accessed 2009 July at http://www.cs.umd.edu/~bederson/classes/hci/handouts/10%20-%20weiser%20-%20ubiquitous%20computing.pdf

Wells, G. 2001, Dialogic Inquiry, Cambridge University Press, New York.

Wenger, E. C., & Snyder, W. M. (Jan/Feb2000). Communities of Practice: The Organizational Frontier. Harvard Business Review, p139-145.

Wilderman, C. 2007, Models of Community Science: design lessons from the field, Accessed July 2009 at http://www.birds.cornell.edu/citscitoolkit/conference/proceeding-pdfs/Wilderman%202007%20CS%20Conference.pdf