Inviting Success:
Lessons from public access computing experiences around the world

Ricardo Gomez
The Information School
University of Washington
Mary Gates Hall 370, Box 352840
+1 206 685 1372

rgomez@uw.edu

word count: 6,600 (excluding references)

ABSTRACT
This paper presents findings from a comparative study of libraries, telecentres, and cybercafés in 25 countries around the world (and is part of a larger study in Latin America, Africa & the Middle East, South & Southeast Asia, and Eastern Europe); it focuses particularly on the factors that contribute to the centres' success across countries and types of centres. We clustered the results into five key success factors for public access computing: (1) understand and take care of local needs first,(2) build alliances with other venues, (3) collaborate with other media and community services, (4) strengthen sustainability, (5) train infomediaries and users. Taken individually, these factors are not new, as evidenced in the literature in the field. The value of these findings is their presentation together as a result of comparative research across multiple countries and different types of public access centres. This study provides strong validation that these five success factors are critical variables to be considered in policy decisions and program implementation. They also provide valuable direction for future research to explore each of the issues in more detail.

General Terms
Human factors, Performance

Keywords
telecentres, libraries, cybercafés, public access computing, success factors, information communication technologies development (ICTD)

1. INTRODUCTION
There is no magic formula for the success of a telecentre, a public library, or a cybercafé. They are places where people go use a computer, access the Internet, look for information, communicate with friends, and play games. These centres all contribute to wider access and the use of information and communication technologies (ICT) by underserved communities around the world. Each type of venue is different, and the context and experience of each of the 25 countries studied in this paper is different, too. Understanding that equitable access to, and meaningful use of, ICT plays an important role in social and economic development, especially in underserved communities (Warschauer 2003; Unwin 2009; Castells 2007), this paper seeks to answer the question: what are the key factors that contribute to the success of venues that offer public access to computers and the Internet, especially in underserved communities? Drawing from a large, international study, this paper offers a broad perspective

The last decade has seen an exponential growth of initiatives that offer public access to ICT as part of libraries, government and community centers, schools, cafés, and other small businesses. Most of the existing literature about public access ICT focuses on case studies and evaluations of telecentres and, to a lesser degree, public libraries and cybercafés. Tracking trends and drawing common lessons across countries and different types of centers is limited by the narrow focus of most studies, and by the wildly different research approaches and methods employed; furthermore, there is a plethora of success stories and anecdotes that illustrate specific examples of individuals, groups, and organizations transformed by newly gained access to ICT, but little systematic evidence of impact (Sey and Fellows 2009; Toyama, Reddy, and Saxenian 2006; Chinn and Fairlie 2007).

Through an international study in 25 countries, the Technology & Social Change group[1] of the University of Washington's Information School gathered detailed information about the current status, challenges, and lessons of public access computing across a broad spectrum of developing countries and emerging economies. Conducted by local research teams in each country, the study used a common research design and rationale to examine how and why people use public access venues, with a particular emphasis on the information needs of underserved and marginalized populations. This project is unique in that it covers a wide variety of developing countries around the world and looks at different types of public access venues using the same research design. Although studies of telecentres in specific development contexts have been conducted, there are few studies on public access to ICT in libraries, and almost none on cybercafés; no study has been done across different types of venues, and never across this many countries (see literature review below).

[1] Formerly known as Center for Information and Society, CIS.

The success of public access venues is defined differently in each context. In this paper, we provide a detailed analysis of the success factors and recommendations that emerged from each of the 25 countries, grouped into five common themes that are the most recurring across all types of venues and across all countries. Taken individually, these success factors are not new, as discussed in detail in this paper. But taken together, and as a result of original research across multiple countries and different types of public access centres, they provide valuable guidance for policymaking and program implementation, as well as valuable direction for future research to further explore each of the issues in more detail.

2. LITERATURE REVIEW

Even though it is clear that access to ICT alone does not automatically result in human development, it does enable new opportunities for bridging the digital divide[2] . Public access to ICT has become an increasingly important tool to promote more widespread access and use of ICT in developing contexts, as evidenced in both academic and industry literature on ICT and development (Heuertz et al. 2003; Kamssu, Siekpe, and Ellzy 2004; Selwyn 2003; van Dijk 2005; Bertot, McClure, and Jaeger 2008; Kuriyan and Toyama 2007; Toyama, Reddy, and Saxenian 2006; Wilson 2004).

While there have been many previous studies about public libraries, and ICT especially, in the US (Bertot et al. 2007; Walkinshaw 2007; Rutkauskiene 2008) and about telecentres for community development (Etta and Parvyn-Wamahiu 2003; Best and Kumar 2008; Kuriyan and Toyama 2007; Colle 2000; Proenza, Bastidas-Buch, and Montero 2002; Gomez and Hunt 1999) and, to a lesser degree, about cybercafés and their contribution to social and digital inclusion (Gurol and Sevindik 2007; Haseloff 2005; Robinson 2004; Rangaswamy 2008), we found no previous studies that have done systematic comparison of different types of venues and across multiple countries, or studies that extract common factors that enable success in public access venues from a broad variety of settings, as undertaken in this study.

By public access, we do not mean access to public or government information, but that the public has access to information and technology resources, irrespective of their geographic location, age, socio-economic status, education, gender, religion, nationality, culture, or race. Furthermore, public access does not preclude access in privately owned and operated locations, or places that charge a fee for use, as is the case in most cybercafés.

While the use of information and communication technologies (ICTs) are central to information access, the issue of ICT access as a solution proves to be trickier than one would imagine. DiMaggio and Hargittai (2001) indicate that:

> In earlier work, the term "access" was used literally to refer to whether a person had the means to connect to the Internet if she or he so chose. More recently, "access" is sometimes used as a synonym for use. This is unfortunate, because studies that have measured both

> access and the extent of Internet use have found, first, that more people have access than use it; and, second, that whereas resources drive access, demand drives intensity of use among people who have access. (p. 2)

Consequently, the Technology & Social Change group study perceives ICT access in a broader sense. Convergent with Warschauer (2003), we regard access not in the narrow sense of having a computer on the premises, but rather access in the much wider sense of being able to use ICT for personally or socially meaningful ends. I'm not sure any more, and rather than trying to go back to the source to figure it out I will delete it. In recent years, two concepts have been used with regard to ICT public access: universality and usability (Vanderheiden 2000; van Dijk 2006). Universality means that all human beings are entitled to access information, and usability is the potential of a device or service to be utilized to meet users' needs. However, universal access is still an aspirational goal, not a reality in most parts of the world.

Threats to equitable ICT access also prevent equitable social and economic development. "The unequal access to technology between groups due to differences in demography, economic status, and locations has been suggested to affect worldwide globalization through Internet connectivity" (Kamssu, Siekpe, and Ellzy 2004). The findings of our study uncover distinct patterns underlying the global disparities that ICT access carries. These disparities increase in developing countries. As van Dijk (2006) observed,

> Development is uneven as well, and increasingly so, because the overwhelming majority of the population does not participate at all. It is lagging behind compared with the diffusion of new media in the nodes of their own countries, and even more as compared with the developed countries. This majority has little access even to old media such as the telephone, radio, TV and the press and to essential services such as electricity… The few computers and network connections in developing countries are barely used for applications in agriculture, health, education, public works, water resources, public transportation, public information, population planning, rural and urban land development or public utilities. (p. 252)

3. METHODOLOGY

In this section, we briefly describe the research methodology used to collect and analyze the data in this study[3]. In making the methodological choices for the global study, we took into account the need for a common structure and approach to data collection, in order to enhance the comparability of the results, as well as the need for flexibility to adapt the research process to the needs and possibilities of each specific context.

---

[2] Some authors prefer the term "digital inclusion", while others prefer "community informatics" or "ICT for development". For a discussion on these labels see Gurstein (2008).

[3] Note that the complexity of this study cannot be fully accounted for in this short description. For a detailed description of the research methodology see Gomez (2009).

3.1 Selection of countries

Of 237 possible countries and territories in the world, the final 25 countries (Algeria, Argentina, Bangladesh, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt, Georgia, Honduras, Indonesia, Kazakhstan, Kyrgyzstan, Malaysia, Moldova, Mongolia, Namibia, Nepal, Peru, Philippines, South Africa, Sri Lanka, Turkey, Uganda) were selected based on a careful process that used four successive sets of criteria to focus on a sample of developing countries with a mid-size geography and population, and with existing public library systems. The criteria for country selection were based on size, population and other demographic data[4], degree of freedom of expression[5] and political unrest[6], a measure of "needs and readiness" criteria[7], regional representation, and quality of country research teams. For a more detailed description of the country selection process and rationale see Gomez (2009).

3.2 Research Framework

An iterative research design (Barzilai-Nahon, Gomez, and Ambikar 2009) was conducted in two phases. The emergent insights and discussions from Phase 1 guided and sharpened the focus of Phase 2. From the outset, we identified a framework – Real Access – developed in South Africa by Bridges.org[8]. We adapted and refined Real Access, calling the resulting framework the Access, Capacity and Environment (ACE) Framework, and structured it as a tool to understand the range of economic, political, educational, infrastructure, cultural, organizational, and other factors that affect the way people use ICT in public access venues. The three pillars of this framework are: **equitable access**: physical access, suitability, and affordability of the venue, technology access; **human capacity**: human capacity and training (users and staff), meeting local needs, social appropriation; and **enabling environment**: socio-cultural factors, political will and legal and regulatory framework, popular support.

3.3 Data Collection

Nineteen local research teams were chosen (with some researchers representing more than one country) following an international call for proposals. Lead researchers from each team were brought together twice, at the beginning and halfway through the research process, to discuss the purpose, methodology, and emerging findings of the study. Each team conducted local research in local languages, using document reviews[9], expert interviews[10], site visits[11], user surveys[12], operator interviews[13], and, in some cases, additional data gathering activities[14]. Detailed country reports were prepared by each local research team using a data-collection template designed to help teams organize their local fieldwork in order to answer detailed questions about Access, Capacity and Environment issues in each type of venue studied. The use of a common research design and methodology helped make data more comparable, even though the specific ways in which data was collected varied from one country to another in order to make it more locally relevant.

3.4 Data Analysis

After careful reading of all reports, we did a detailed annotation of success factors as they were represented in the data. During a facilitated workshop and several group discussions, we analyzed, grouped, and categorized the different findings across countries

---

[4] Size (exclude largest and smallest), population (exclude countries with population less than 1 million, and exclude highest population (India, China)), per capita income (exclude countries with per capita income over $11,116), human development index (HDI below 0.5)

[5] Based on Freedom House index: http://www.freedomhouse.org.

[6] Based on U.S. Dept. of State travel advisories.

[7] **Needs criteria**: Income inequality based upon Gini index (2006) from United Nations Development Program; ICT usage: based upon CIA World Factbook (2007); ICT cost: based upon International Telecommunications Union's World Information Society Report (2006). **Readiness criteria**: Politics: based upon World Economic Forum Global Information Technology Report (2006), Transparency International (2007), World Bank Worldwide Governance Indicators (2006); Skills: based upon International Telecommunication Union opportunity skills index (2007); ICT infrastructure: based upon International Telecommunication Union opportunity network index (2007).

[8] Non-profit organization based in South Africa, www.bridges.org.

[9] Document reviews: identified and reviewed salient literature in the country, including existing statistical information about population, ICT penetration, public access venues, government policies, and previous studies relevant to the study. On average, 30 to 50 documents per country were reviewed.

[10] Expert Interviews: identified at least ten specialists in the areas of interest of the project and conducted in-depth interviews with them. Interview guides were prepared in each country depending on the local needs and context. On average, 10 to 15 interviews with experts were conducted per country.

[11] Site visits: identified, visited, and observed six or more venues of each type (library, telecentre, cybercafé, or other). Site visits were undertaken for a minimum of a half day, making sure to include both urban and non-urban sites (ideally three of each). In selecting sites, research teams identified typical case samples of each type of venue, including both urban and non-urban sites. On average, there were 20 visits per country, and about 500 sites visited in total.

[12] User Surveys: user information was collected via a shared survey instrument. Each country team was allowed to add questions that they felt were relevant to the local context to enrich the overall body of evidence. At each site, every second or third user exiting the venue was surveyed. Teams surveyed between 40-50 users at each venue. Total users surveyed: 720-1100 per country. Given limited time and resources, user surveys were not intended to provide statistically significant samples of the population or of the venues studied, but an exploratory indication of trends and patterns for comparison and further research

[13] Operator Interviews: identified at least one operator in each site visited and held a structured interview to provide a more in-depth understanding of the venue, users and environment. Total operators interviewed: 18-22 per country.

[14] Additional optional data gathering: focus groups with users, operators or experts, additional visits and interviews, peer consultation and review.

and venues, all of which led to the formulation of the key success factors described in this paper. After finalizing the grouping and description of these factors, we went back to the detailed country reports to re-validate and document each one with examples from different countries. This process allowed us to combine multiple visions and readings of the rich data collected in the study, and resulted in higher-level, distilled lessons and success factors grounded in the data and the context of each country and venue.

Finally, we did a detailed re-reading and discussion of the country reports to identify and group trends in the data, selecting examples that best illustrated the key trends, and to make sure we did not miss any significant insights from local research partners.

3.5 Limitations of this Study

This study is groundbreaking in its breadth and scope; no other studies have systematically looked at different types of public access venues across multiple countries. Nonetheless, the breadth of the study also means that it does not provide an in-depth analysis of a particular venue, country, or experience, and findings cannot be easily generalized without a clear understanding of the specific context and the analytic framework used.

While the flexibility to translate and adapt the data collection tools to the needs and requirements of each country makes the study more locally appropriate, variations in the way data was collected or presented also makes the comparison of results across countries more problematic. The details discussed here may not be an exact reflection of any single country, but combined across all 25 countries the results represent a meaningful source of trends and patterns about success factors for public access ICT venues.

4. FINDINGS AND DISCUSSION

The following five themes were identified as the most salient and common factors that enhance the success of public access venues, with a particular focus on meeting the needs of underserved communities:

1. Understand and take care of local needs first
2. Build alliances with other venues
3. Collaborate with other media and community services
4. Strengthen sustainability
5. Train infomediaries and users

Each one is described and illustrated below, with examples from the study of libraries, telecentres and cybercafés in all 25 countries.

4.1 Understand and take care of local needs first

All 25 country reports noted the need for attention to the specific needs of underserved and rural populations. Successful implementation and maintenance of public access computing initiatives require a solid understanding of the information needs and resources of the communities they intend to serve. Most successful initiatives typically offer concrete solutions for specific issues of local contexts (i.e. their information needs) and the ability to build on existing practices in these communities. Community-needs assessment and social-development orientation are especially important if the public access initiatives are intended to reach underserved communities.

As stated by Schneiderman (2002), many people cannot benefit from technology "because of high cost, unnecessary complexity, and lack of relevance to their needs." This assessment is convergent with recent literature in the development field, where the concepts of participation, empowerment, and social capital are now fully integrated into development work (Cooke and Kothari 2001; Servaes and Malikhao 2005; Cadiz 2005). Meeting local needs is also a cornerstone of community approaches in the field of library and information science (Long 2001; Cooper 1993; Hillenbrand 2005; Aabo 2005; Worcester and Westbrook 2004), as well as the field of information and communication technologies for development (ICT4D) (Heeks 2009; Raiti 2007; Unwin 2009; Gurstein 2000).

The critical importance of understanding and serving local needs first is clearly reflected in the findings and recommendations of the researchers in the majority of the countries we studied. They show that for successful implementation of public access venues that serve local development it is important to have accurate data about the user community, their information needs, and the information systems already in use, as described in the following examples. Nearly all 25 country results echoed the results from the research teams in Algeria, Ecuador, and Namibia, who reported that while government efforts to expand ICT services are commendable, these efforts do not succeed if the ICT services fail to meet the needs of the local community (Bakelli 2008; Bossio and Sotomayor 2008; James and Louw 2008). Furthermore, researchers in former Soviet Republic countries, such as Georgia and Kyrgyzstan, noted that the extensive-yet-decrepit public library system in these countries no longer serves the community's actual needs (Ariunaa 2008; IPM 2008).

Knowing the current distribution of information systems and practices in a community is an important consideration as well. The researchers in Honduras, for instance, stressed the need to avoid duplication of efforts (Arias and Camacho Jiménez 2008). Malaysia's research team reported success in the distribution of venues throughout the country, including rural areas where the venues are incorporated into post offices, libraries, or health clinics, i.e. "places where local communities can access them easily" (Kushchu 2008).

In response to the need for specific requirements that will address local needs, suggestions from many of the country reports included building websites with local content information (health, environment, and agriculture) and websites for youth (focusing on education and knowledge building). Many countries, including Bangladesh, Sri Lanka, Peru, Namibia, South Africa, and Kazakhstan, deal with multiple languages spoken throughout the country. Georgia's research team, for instance, noted that information portals should disseminate information in both Armenian and Azerbaijani (IPM 2008). For certain regions in Peru, the team recommended online information should be more readily available in Quechua, an indigenous language spoken by a large proportion of the population (Bossio and Sotomayor 2008).

In addition to local-needs assessments, the local community needs to take ownership of the development of ICT programs and content, using them into create practical solutions that improve the lives of the individuals in the community. This idea of social appropriation of ICT services stands out across the 25 countries. Researchers in Sri Lanka recommended community involvement in order to "give ownership to the project and prevent it from

being a purely top down exercise" (Wanasundera 2008). In Argentina and the Dominican Republic, research teams reported that the population wanted to incorporate ICT use into their local reality and to leverage building community partnerships (Rozengardt and Finquelievich 2008; Alfaro, Molina, and Camacho Jiménez 2008). In Honduras, for example, community input has shown the potential to transform telecentres and libraries into spaces for knowledge exchange – meeting places not only for literacy training but also for "discussion, action and struggles" (Arias and Camacho Jiménez 2008).

Several research teams pointed out that ICT success could come from tapping the energy and skills of unemployed youth, who are more likely than others to use ICT services at cybercafés or community centers. In Uganda, the majority of ICT users were students and youth, with illiterate parents often relying on their children to fulfill their information needs (Ndaula 2008). Researchers in Sri Lanka, Namibia, and South Africa also recommended capitalizing on this untapped resource (James 2008; James and Louw 2008; Wanasundera 2008). By instructing unemployed youth in web-building and database maintenance, the local council could, in turn, employ them to increase and strengthen ICT services in their local community.

Many of the research teams emphasized that for ICT to reach and effectively serve local communities, they need to promote a positive information culture that includes constructive attitudes to information sharing and public awareness of ICT services. Public libraries in particular, are undermined by perceptions that they service students only, produce old and outdated information, or simply are not "cool" to visit. Mongolia's team described traditional libraries as places "where study happened, intellect was developed and newspapers were read" (Pact Mongolia 2008). Since people traditionally consider public libraries as a place to go for reading and accessing print materials, this public awareness campaign could start with creating a new image of public libraries. To address current perceptions of libraries as places strictly for students, other adult groups need to be made aware of the library's information services. Library outreach activities should also align with patrons' cultural and entertainment practices. The Dominican Republic's team, for instance, suggested that library coordinators should develop "fun" activities, such as organizing chess tournaments to draw people into the library (Alfaro, Molina, and Camacho Jiménez 2008).

Creating a positive-awareness campaign and taking calculated risks might revive public libraries from the "current state of decay, lack of capacity, and tired mentality" observed by researchers in Mongolia (Pact Mongolia 2008) and elsewhere. Moreover, public access venues need to address people's perceptions of information. The former Soviet republics have an extensive network of public libraries, but in Georgia, researchers found that many people believed they could not find high-quality information at the library because the building was poorly maintained (no heat, no funding). In addition, a widespread belief exists that the information provided at public libraries is outdated and of low quality (IPM 2008).

While libraries in these countries need to get additional funding, they also need to launch public relations campaigns to improve their image. For example, the Kazakhstan team recommended that the library system study the tactics used by banks in that country, which have been successful in raising public awareness of their

mission and services (Pact 2008). In the same way, Moldova's researchers suggested that local public authorities, such as the mayor or local councils, get involved in the publicity campaigns. The involvement of local authorities would also help local governments become aware of the needs of underserved populations (OPINIA 2008).

4.2 Build alliances with other public access venues

Most research teams indicated that collaboration among and between different public access venues is limited but can yield powerful results if collaboration is promoted and strengthened. Networks of libraries, telecentre associations, and collaboration between cybercafés, all enhanced by partnerships between these venues in any particular location, will make public access to ICT stronger and more effective at serving the needs of local populations.

The collaborative model is convergent with current trends in understanding the power of networks as a distinctive characteristic of the information society. "Actors are no longer independent…They are dependent on each other. In networks, actors make agreements and more or less freely engage in associations. They cooperate on the basis of complementary strengths and they become *inter*dependent" (van Dijk 2006).

Most research teams in our study noted that collaboration can take many forms and lead to a variety of social impacts. Although this trend was noted across all countries, it was especially prevalent in Latin American countries. The Peruvian success factors for ICT included collaboration among similar venues: the "rich practice of association and networking of special libraries… linked by a common theme: AIDS, agriculture, forestry… [they] may have different goals, but they share some common problems and may share learning" (Bossio and Sotomayor 2008).

In Costa Rica, some telecentres have partnered successfully with libraries. Telecentres organized within libraries benefit from an established infrastructure and the ability of librarians to teach ICT literacy; in turn, libraries that host telecentres can use the Internet to supplement out-of-date library resources and better serve their communities (Sanchez González and Camacho Jiménez 2008). Likewise, Brazilian researchers suggested some innovative solutions to creating new visions of public libraries – the creation of libraries in telecentres and vice versa. For example, a library in the state of Bahia bought computers with support from Identidade Digital, a program that supports telecentres (Voelcker 2008).

From a different angle, Nepal's research team reported the use of a public/private partnership model where private, urban cybercafés serve "as capacity building and supporting partners for [public] telecentres in rural areas" (SAP International 2008).

4.3 Collaborate with other media and community services

Public access venues tend to be more successful if they extend partnerships and collaboration beyond public access venues to include other community services and media important to the community. Most notably, these collaborations include successful partnerships with community radio stations, health clinics, community organizations and government offices, as well as creative uses of mobile phones in combination with public access

venues. This model is convergent with current research in other domains of public services, and not limited to information alone. "Public services are now often provided by a complex network of partnerships, contracts, and alliances between government agencies, nonprofit organizations, and businesses, rather than by hierarchical government bureaucracy" (Huang and Provan 2007).

The networking and collaboration theme includes creative networking of existing resources of all types: human, equipment, connectivity, and experience. Namibia's research team, for example, encouraged further utilization of established information kiosks in Community Information Resource Centers for different community development activities (James and Louw 2008). Researchers in South Africa noted the potential for leveraging an existing program: "The scoping of the HIV/AIDS centers strongly suggests that there is an opportunity to explore a programmatic intervention by ICT funders in partnership with one or more of the HIV/AIDS programs discussed" (James 2008).

Similarly, researchers from several of the 25 countries offered innovative, concrete suggestions of technological communication devices other than computers, most notably radio and mobile phones. As Kazakhstan's team explained, "Combining various media types allows maximizing the impact and ensuring all groups involved are covered. Radio may not be appealing to young Internet users while rural elderly population will never choose [a different] option" (Pact 2008). Teams studying the Philippines and Argentina both observed that these countries have greater access to cell phones than computers and, therefore, recommended expansion of government services through cell phones. The Philippines' research team, with its list of six "mobile phone applications" recommendations, specifically advocated for the expansion of text messaging services with development-oriented information (Ideacorp 2008; Rozengardt and Finquelievich 2008). Two other research teams proposed ideas for integrating these "other" existing technologies into communities: Uganda's researchers argued for "strategic establishment of a community radio at every Public Library (PL) facility per district" (Ndaula 2008); while Mongolia's team promoted "the range of information vectors (including radio, TV and mobile phone) that can be developed at community level" (Pact Mongolia 2008). Our study did not explore the interaction of ICT in public access venues with other technologies such as community radio or mobile phones; additional research would be warranted to get a better understanding of the opportunities presented by better collaboration with other media.

4.4 Strengthen Sustainability

Sustainability of public access venues is a critical issue that touches on multiple dimensions: financial, technical, social, and cultural. Government funding and support for public libraries has been declining in many countries, and donors' interest in telecentres has declined as well, threatening the financial sustainability of these public access venues. Successful telecentres have found creative ways to generate revenues, and popular libraries have found creative ways to build strong community support. But local community involvement alone cannot ensure the sustainability of public access ICT. Governments must also work to create an environment that strengthens and sustains public access to information and ICT resources if they are to meet the needs of underserved communities.

Challenges to sustainability have been extensively reported in the literature about public access to ICT, especially for the telecentres (Delgadillo, Gomez, and Stoll 2002; Bailey 2009; Best 2008; Gordon, Moore, and Gordon 2004; Gurstein 2005; Jensen and Esterhuysen 2001; Proenza 2001; Stoll and Menou 2003; Toyama et al. 2005). Many telecentre projects have simply failed after the original donors have left. Mayanja (2006) observed, "financial and social sustainability of telecentres remains one of the key challenges of the digital inclusion programming more than a decade after."

In an editorial of the *Journal of Community Informatics* dedicated to telecentre sustainability, Michael Gurstein (2005) suggests:

> *What is meant by "sustainability" in the ICT context is less a matter of a broad "configuration of civilization" and more to do with day to day slogging by community members in meeting the payroll and keeping the machines running amidst the wear and tear of daily life (both physical and electronic) while always keeping in mind how the technology could be used to respond to the needs (and opportunities) of their local communities. ... When we are speaking of "sustainability" in the context of ICTs we should perhaps be speaking of "sustainabilities" rather than "sustainability", for there are many dimensions of this issue which go much beyond the simple economic and the meeting of weekly payrolls.*

As succinctly summed up by researchers in Costa Rica, the "digital divide is only a small part of the economic divide" (Sanchez González and Camacho Jiménez 2008). When governments plan and implement ICT services, they should be mindful of the needs of disenfranchised and marginalized communities. Kazakhstan's research team advocated "affirmative action" to serve the needs of marginalized groups in order to create a more inclusive information society (Pact 2008). The country's Program on Reduction of Information Inequity has so far failed to identify vulnerable groups, such as the homeless or the disabled. These groups in particular need extra assistance to access information, including finding government services.

In our study, most research teams pointed out the importance of having government departments devoted to ICT development. Collaborating with other governmental units – a "Ministry of ICT," as it is called in Colombia (Universidad de los Andes 2009) – could oversee the provision of online content regarding citizens' rights and governmental services. Argentina's research team argued for the adoption of a transparent e-government concept: "Public information venues could become privileged places of training citizens to participate in E-Government and E-Democracy processes" (Rozengardt and Finquelievich 2008). Namibia's team advocated for more venues where citizens could access government information free of charge, such as information kiosks at Community Information Resource Centers (James and Louw 2008).

In addition to financial and political sustainability, technological sustainability needs to be ensured by making technology work in low-resource environments. Public access venues aimed at underserved communities frequently face particular technical limitations of working in low-resource environments: poor electricity, connectivity, and outdated technology make it

especially hard to operate effectively. Making ICT sustainable anywhere obviously requires basic infrastructure: electricity, equipment, and Internet connections. This infrastructure also includes support systems − technical support, troubleshooting, networks − to maintain information systems and ensure that they function efficiently, even in environments where resources are scarce.

Many countries highlighted the need for electricity and basic infrastructure to support ICT. Researchers in Bangladesh credited the relative success of urban (as opposed to rural) ICT venues to the availability of an uninterrupted power supply. The reports from Algeria, Ecuador, Georgia, Kyrgyzstan, and Peru all called for increased support of basic infrastructure in rural areas (Ariunaa 2008; Bakelli 2008; Bossio and Sotomayor 2008, 2008; IPM 2008). Even where buildings, electricity, and computers were available, Internet access and bandwidth were problematic. The Bangladesh research team noted that "the performance of the venues with Internet connection is way better than the venues without Internet connection" (Development Research Network 2008). In Brazil, researchers identified infrastructure in the form of "updated equipment (adequate computers, Internet bandwidth)" as a key success factor for ICT (Voelcker 2008).

Beyond basic infrastructure, further analysis of the success factors and recommendations revealed that many of the research teams addressed additional issues of sustainability. The Costa Rican team attributed the failure of many rural telecentres to the challenges beyond installation, including maintenance of the equipment and software updates. Because only government technicians are permitted to repair equipment or address software problems and viruses at these telecentres, many of them have only two out of six computers working at any given time while they await technical support (Sanchez González and Camacho Jiménez 2008). The Bangladesh team expressed this problem as a need to "strengthen the support system (technical, know-how, and operational) for the public access venues" (Development Research Network 2008).

Maintenance is only part of the true cost of sustainable infrastructure. Ongoing costs must be considered in addition to initial investment. Researchers in Namibia declared that "the cost of computers and their software is limiting their availability. Government should therefore have a policy to support the use of Free and Open Source software (FOSS)" (James and Louw 2008). In Bangladesh, where the availability of electricity in rural areas is "dismal" and unlikely to change soon, the recommendation is for an investment in "low power consuming device[s] with higher battery life" in order to bring ICT services to the public (Development Research Network 2008). These recommendations point to the need for forethought and planning in order to make technology work in low-resource environments.

4.5 Train users and infomediaries

The fifth and last theme in the success factors that emerged from our study in 25 countries has to do with training users and operators of the public access venues. If communities are to benefit from public access to ICT, both users and operators need to have the basic training and know-how in order to use and operate the services. Building this capacity starts with basic literacy (reading and writing) training and includes basic digital literacy (use of computer, its basic applications and features).

Strengthening the training and capacities of librarians and other operators of public access venues is also critical to the operator's success, especially if they are to provide guidance, training, and support services to users, directly or indirectly. Trained and motivated librarians and operators make better information brokers, or "infomediaries," who help make information resources more meaningful to the local communities, and help bring local knowledge and information resources to the public access venues.

Formal infomediaries include librarians and operators of telecentres and cybercafés. As part of a broader literature review on ICT impact, Sey & Fellows point out that infomediaries "have been found to be important contributors to the viability and sustainability of a public access venue" (Sey and Fellows 2009) and critical to the success of telecentres in particular (Bossio 2004; Best and Kumar 2008; Gomez and Hunt 1999; Parkinson 2005; Whyte 2000).

Extending the notion beyond the formal role of librarians or telecentre operators, other informal infomediaries play a critical role as well. Abrahamson & Fisher (2007) describe this informal role as lay information mediary behavior (LIMB), for example a person who finds information for another member of the family or for a friend or neighbor. Expanding out further, social networks also play a crtical role in information facilitation. Schilderman (2002) suggests that "social networks are the foremost source of information of the urban poor" (p. 4) and that the poor tend to believe people they trust rather than perhaps more informed contacts with which they do not have close ties. He then develops the concept of "key informants" (aka "infomediaries") defined as "people inside, or sometimes outside, a community who are knowledgeable in particular livelihoods aspects, and are willing to share that knowledge" (Schilderman 2002). In order to tap into this resource to help serve the information needs of this underserved population, he cited a number of success factors, including: involvement of the poor themselves as equal partners, building on local knowledge, the use of community-based communication methods, and building the capacity of community-based organizations and key individuals within them. He then identified seven key characteristics of effective key infomediaries (Schilderman 2002):

- o their capacity to provide information in an accessible format
- o their willingness to share information rather than hold onto it
- o their ability to get hold of information and adapt it to a local context
- o their experience, education, knowledge and reliability
- o their accessibility, proximity and helpfulness
- o their social sensitivity and capacity to involve residents
- o their leadership qualities, influence and moral authority

Training of users and, more importantly, of infomediaries (both formal and informal) is a strong common success factor across all 25 countries in our study. Honduras researchers described ICT training as "elemental" to success. They also suggested that the success of cybercafés ought to be passed along to society by taking responsibility for training the population in the use of ICT, thereby "boosting the capacities of the individuals and generat[ing] a major communal impact" (Arias and Camacho Jiménez 2008). Researchers in Indonesia took the call for

increased digital literacy a step further, advocating universal free ICT training for all, especially for underserved populations, as critical to success (Kushchu 2008). The Argentina team pointed out that information literacy training for users should encompass their real interests and needs in order "to make a real appropriation of ICTs" (Rozengardt and Finquelievich 2008). Similarly, the Ecuador team called for the development of ICT training programs that address the needs of special groups, such as "women, illiterates, non-Spanish speakers and older people" (Bossio and Sotomayor 2008).

Researchers in Georgia extended the call for training to include venue operators, who should learn more about searching for health and education information (IPM 2008). The Malaysia research team listed centralized training for venue operators as one of its main success factors. Along these lines, researchers in Kyrgyzstan noted the need to "renew training and education curriculum of the ICT specialists to meet requirements of fast growing industry" (Ariunaa 2008). Another group who could benefit from training is local businesses; Indonesia's team recommended that the government should support local e-commerce by training "small to medium businesses to enable them to upload their products to the Warmasif [telecentre] website" (Kushchu 2008). The Moldova team argued that librarians and venue operators should be trained in both fundraising and grant proposal development in order to acquire more financial support for ICT programs (OPINIA 2008).

These different kinds of "infomediaries" − venue operators, librarians, government and community leaders, businesspeople, etc. − take part in a developing system of ICT knowledge training that would ideally extend throughout the whole population. Identifying the need to "train and deploy digital information facilitators to create and meet local information needs," Mongolia's team envisioned an investment in human resources that would benefit the whole country (Pact Mongolia 2008). Researchers in Kazakhstan reported a lack of human capital and a market demand for IT specialists (such as venue operators), which is five to seven times higher than current capacity due mostly to a lack of qualified teachers and quality education in schools and universities (Pact 2008).

5. CONCLUSIONS

We have presented five key factors that contribute to the success of venues that offer public access to ICT: understand and take care of local needs first, build alliances with other venues, collaborate with other media and community services, strengthen sustainability, and train infomediaries and users. These five factors are not new. What is new is to see them confirmed as they emerge from a broad empirical study of libraries, telecentres and cybercafés in 25 countries. This kind of validation constitutes a solid statement to policymakers and practitioners to help focus their efforts where they can make the most difference to the communities they intend to serve. Furthermore, our findings provide clear direction for future research on public access to ICT. Future research can help provide a better understanding of the local manifestations of each of the success factors we analyzed, and of the implications of these trends for measuring the impact of public access to ICT for underserved communities around the world.

6. REFERENCES

[1]   Aabo, Svanhild. 2005. The role and value of public libraries in the age of digital technologies. *Journal of Librarianship and Information Science* 37 (4):205-211.

[2]   Abrahamson, J., and K. E. Fisher. 2007. What's past is prologue: Towards a general model of lay information mediary behaviour. *Information Research* 12 (4).

[3]   Alfaro, Francia, José Pablo Molina, and Kemly Camacho Jiménez. 2008. Public access to information & ICTs: Dominican Republic. In *Public Access Landscape study final report*. Seattle: presented by Sulá Batsú to University of Washington Center for Information & Society (CIS).

[4]   Arias, Melissa, and Kemly Camacho Jiménez. 2008. Public access to information & ICTs: Honduras. In *Public Access Landscape Study final report*. Seattle: presented by Sulá Batsú to University of Washington Center for Information & Society (CIS).

[5]   Ariunaa, Lkhagvasuren 2008. Public access to information & ICTs final report: Kyrgyzstan. In *Public Access Landscape Study final report*. Seattle: University of Washington Center for Information & Society (CIS).

[6]   Bailey, Arlene. 2009. Issues affecting the social sustainability of telecentres in developing contexts: A field study of sixteen telecentres in Jamaica *The Electronic Journal on Information Systems in Developing Countries* 36 (4):1-18.

[7]   Bakelli, Yahia. 2008. Public access to information & ICTs final report: Algeria. In *Public Access Landscape Study final report*. Seattle: presented to University of Washington Center for Information & Society (CIS).

[8]   Barzilai-Nahon, Karine, Ricardo Gomez, and Rucha Ambikar. 2009. Conceptualizing a Contextual Measurement for Digital Divide/s: Using an Integrated Narrative. In *Overcoming Digital Divides: Constructing an Equitable and Competitive Information Society*, edited by E. Ferro, Y. Dwivendi, G. Ramon and M. Williams: Idea Group Inc.

[9]   Bertot, John C., Charles R. McClure, Susan Thomas, Kristin M. Barton, and Jessica McGilvray. 2007. Public Libraries and the Internet 2007: Report to the American Library Association. Tallahassee, FL: College of Information, Florida State University.

[10] Bertot, John Carlo, Charles R McClure, and Paul T Jaeger. 2008. The impacts of free public Internet access on public library patrons and communities. *Library Quarterly* 78 (3):285-301.

[11] Best, Michael and Rajendra Kumar. 2008. Sustainability Failures of Rural Telecenters: Challenges

from the Sustainable Access in Rural India (SARI) Project. *Information Technologies & International Development* 4 (4):14.

[12] Best, Michael, and Rajendra Kumar. 2008. Sustainability Failures of Rural Telecenters: Challenges from the Sustainable Access in Rural India (SARI) Project. *Information Technologies & International Development* 4 (4):14.

[13] Bossio, Juan Fernando. 2004. Social Sustainability of Telecentres from the Viewpoint of Telecentre Operators: A Case Study from Sao Paulo, Brazil, Economics, London School of Economics, London.

[14] Bossio, Juan Fernando, and K. Sotomayor. 2008. Public access to information & ICTs final report: Ecuador. In *Public Access Landscape Study final report*. Seattle: presented by Alfa-Redi toUniversity of Washington Center for Information & Society (CIS).

[15] ———. 2008. Public access to information & ICTs final report: Peru. In *Public Access Landscape Study final report*. Seattle: presented by Alfa-Redi to University of Washington Center for Information & Society (CIS).

[16] Cadiz, C.M. . 2005. Communication for empowerment: The practice of participatory communication in development. In *Media and glocal change: Rethinking communication for development*, edited by O. Hemer and T. Tufte. Göteborg, Sweden: NORDICOM.

[17] Castells, M. 2007. Communication, power, and couter-power in the network society. *International Journal of Communication* 1:238-266.

[18] Chinn, D.M., and W.R. Fairlie. 2007. The determinants of the global digital divide: A cross-country analysis of computer and internet penetration. *Oxford Economic Papers* 59 (1):16-44.

[19] Colle, Royal D. . 2000. Communication Shops and Telecentres in Developing Countries. In *Community Informatics: Enabling Communities With Information*, edited by M. Gurstein. Hershey: Idea Group Inc.

[20] Cooke, B., and U. Kothari, eds. 2001. *Participation: The new tyranny?* London: Zed.

[21] Cooper, S. M. 1993. *Community analysis methods and evaluative options: The CAMEO handbook.* Richmond, VA: VA State Library and Archives.

[22] Delgadillo, Karin, Ricardo Gomez, and Klaus Stoll. 2002. Community telecentres for development : lessons from community telecentres in Latin America and the Caribbean. IDRC, Ottawa.

[23] Development Research Network. 2008. Public access to information & ICTs final report: Bangladesh. In *Public Access Landscape Study final report*. Seattle: presented to University of Washington Center for Information & Society (CIS).

[24] DiMaggio, P.J., and E. Hargittai. 2009. *From the digital divide to digital inequality: Studying internet use as penetration increases* 2001 [cited September 09 2009]. Available from http://www.princeton.edu/~artspol/workpap.html.

[25] Etta, Florence, and Sheila Parvyn-Wamahiu. 2003. *Information and communication technologies for development in Africa: volume 2. The Experience with Community Telecentres*. Ottawa/Dakar: International Development Research Centre (IDRC) /Council for the Development of Social Science Research in Africa.

[26] Gomez, Ricardo. 2009. Structure and Flexibility in Global Research Design: Methodological Choices in Landscape Study of Public Access in 25 Countries. In *CIS Working Paper no. 8*. Seattle: University of Washington.

[27] Gomez, Ricardo, and Patrik Hunt, eds. 1999. *Telecentre Evaluation: A Global Perspective*. Ottawa: IDRC.

[28] Gordon, Margaret T., Elizabeth J. Moore, and Andrew C. Gordon. 2004. Sustainability in First Ten States to Receive Gates Awards: Most Libraries Maintaining Public Access Computing Programs, but 25% Are Still Fragile. Seattle, WA: Evens School of Public Affairs of the University of Washington.

[29] Gurol, Mehmet, and Tuncay Sevindik. 2007. Profile of Internet Cafe users in Turkey. *Telematics and Informatics* 24 (1):59-68.

[30] Gurstein, M. . 2000. Community informatics: Enabling communities with information and communications technologies. In *Community informatics: Enabling communities with information and communications technologies* edited by M. Gurstein. Hershey, PA: Idea Group.

[31] ———. 2005. Editorial: Sustainability of community ICTs and its future. *The Journal of Community Informatics* 1 (2):2-3.

[32] ———. 2008. *What is community informatics (and why does it matter)?* Milan, Italy: Polimetrica.

[33] Haseloff, Anikar M. 2005. Cybercafes and their Potential as Community Development Tools in India. *The Journal of Community Informatics* 1 (3):13.

[34] Heeks, Richard. 2009. The ICT4D 2.0 Manifesto: Where next for ICTs and International Development? Manchester, UK: Institute for Development Policy and Management.

[35] Heuertz, L., A. C. Gordon, M. T. Gordon, and E. J. Moore. 2003. The impact of public access computing on rural and small town libraries. *Rural Libraries* 23 (1):51-79.

[36] Hillenbrand, C. 2005. Librarianship in the 21st century - crisis or transformation? *Australian Library Journal* 54:164-181.

[37] Huang, K., and G. K. Provan. 2007. Resource tangibility and patterns of interaction in a publicly funded health and human services networks. *Journal of Public Administration Research and Theory* 17 (3):435-454.

[38] Ideacorp. 2008. Public access to information & ICTs: Philippines. In *Public Access Landscape Study final report*. Seattle: presented to University of Washington Center for Information & Society (CIS).

[39] IPM. 2008. Public access to information & ICTs final report: Georgia. Seattle: University of Washington Center for Information & Society (CIS).

[40] James, Tina, et al. 2008. Public access to information & ICTs final report: South Africa. Seattle: University of Washington Center for Information & Society (CIS).

[41] James, Tina, and Milton Louw. 2008. Public access to information & ICTs final report: Namibia. Seattle: University of Washington Center for Information & Society (CIS).

[42] Jensen, Mike, and Anriette Esterhuysen. 2001. *The Telecentre Cookbook for Africa: Recipes for self-sustainability*. Paris: UNESCO.

[43] Kamssu, J.A., S.J. Siekpe, and A.J. Ellzy. 2004. Shortcomings to globalization: Using Internet technology and electronic commerce in developing countries. *The Journal of Developing Areas* 38 (1):151-169.

[44] Kuriyan, Renee, and Kentaro Toyama. 2007. Review of Research on Rural PC Kiosks. http://research.microsoft.com/research/tem/kiosks/.

[45] Kushchu, Ibrahim. 2008. Public access to information & ICTs final report: Indonesia. Seattle: University of Washington Center for Information & Society (CIS).

[46] ———. 2008. Public access to information & ICTs final report: Malaysia. Seattle: University of Washington Center for Information & Society (CIS).

[47] Long, S. A. 2001. Libraries Build Community. *Jiao yu zi liao yu tu shu guan xue = Journal of educational media & library sciences = EMLS*. 39:15-22.

[48] Mayanja, M. . 2006. Rethinking telecentre sustainability approaches How to implement A social enterprise approach: Lessons from India and Africa. *The Journal of Community Informatics* 2 (3).

[49] Ndaula, Sulah. 2008. Public access to information & ICTs final report: Uganda

[50] Seattle: University of Washington Center for Information & Society (CIS).

[51] OPINIA, Independent Sociological and Information Service. 2008. Public access to information & ICTs final report: Moldova. Seattle: University of Washington Center for Information & Society (CIS).

[52] Pact. 2008. Public access to information & ICTs final report: Kazakhstan. Seattle: University of Washington Center for Information & Society (CIS).

[53] Pact Mongolia. 2008. Public access to information & ICTs final report: Mongolia. Seattle: University of Washington Center for Information & Society (CIS).

[54] Parkinson, Sarah. 2005. Telecentres, Access and Development: Experience and Lessons from Uganda and South Africa. IDRC.

[55] Proenza, Francisco. 2001. Telecenter Sustainability - Myths and Opportunities. *Journal of Development Communication* 12 (2, Special Issue on Telecentres):15.

[56] Proenza, Francisco, Roberto Bastidas-Buch, and Guillermo Montero. 2002. Telecenters for Socioeconomic and Rural Development in Latin America and the Caribbean. Inter-American Development Bank. http://www.iadb.org/sds/itdev/telecenters/exsum.pdf.

[57] Raiti, Gerard C. 2007. The lost sheep of ICT4D research. *Information Technologies and International Development* 3 (4):1-7.

[58] Rangaswamy, Nimmi. 2008. Telecenters and Internet Cafes: the Case of ICTs in Small Businesses. *Asian Journal of Communication* 18 (4):22.

[59] Robinson, Scott. 2004. Cybercafés and national elites: constraints on community networking in Latin America. London: Community practice in the network society.

[60] Rozengardt, Adrián, and Susanna Finquelievich. 2008. Public access to information & ICTs final report: Argentina. Seattle: University of Washington Center for Information & Society (CIS).

[61] Rutkauskiene, Ugne. 2008. Impact measures for public access computing in public libraries. Vilnius University.

[62] Sanchez González, Adriana, and Kemly Camacho Jiménez. 2008. Public access to information & ICTs final report: Costa Rica. Seattle: University of Washington Center for Information & Society (CIS).

[63] SAP International. 2008. Public access to information & ICTs final report: Nepal. Seattle: University of Washington Center for Information & Society (CIS).

[64] Schilderman, Theo. 2002. Strengthening the knowledge and information systems of the urban poor. Dept. for International Development (DFID).

[65] Selwyn, N. 2003. ICT for all? Access and use of public ICT sites in the UK. *Information, Communication & Society* 6 (3):350-375.

[66] Servaes, J., and P. Malikhao. 2005. Participatory communication the new paradigm. In *Media and glocal change: Rethinking communication for development* edited by O. Hemer and T. Tufte. Göteborg, Sweden: NORDICOM.

[67] Sey, Araba, and Michelle Fellows. 2009. Literature Review on the Impact of Public Access to Information and Communication Technologies. In *Working Paper No. 6*. Seattle: Center for Infromation & Society, Univ. of Washington.

[68] Shneiderman, B. . 2002. *Leonardo's laptop: Human needs and the new computing technologies*. Cambridge, MA: MIT Press.

[69] Stoll, Klaus, and Michel Menou. 2003. Basic principles of community public internet access point's sustainability. In *Community networking and community informatics: Prospects, approaches and instruments*, edited by M. Gurstein, M. Menou and S. Stafeev. Saint Petersburg.

[70] Toyama, Kentaro, K. Kiri, D. Menon, J. Pal, S. Sethi, and J. Srinivasan. 2005. PC kiosk trends in rural India. In *Freedom, Sharing and Sustainability in the Global Network Society Conference*. University of Tampere, Finland.

[71] Toyama, Kentaro, Raj Reddy, and Anna Saxenian. 2006. An Introduction to the Best ICTD 2006 Conference Papers. *ITID* (1), http://www.mitpressjournals.org/doi/pdf/10.1162/itid.2007.4.1.1.

[72] Universidad de los Andes. 2009. Public access to information & ICTs final report: Colombia. Seattle: University of Washington Center for Information & Society (CIS).

[73] Unwin, Tim, ed. 2009. *ICT4D: Information and Communication Technology for Development*. Cambridge: Cambridge University Press.

[74] van Dijk, A.G.M.J. 2005. *The deepening divide: Inequality in the information society*. Thousand Oaks, CA: Sage.

[75] ———. 2006. *The network society*. 2nd ed. Thousand Oaks, CA: Sage.

[76] Vanderheiden, G. 2000. Fundamental principles and priority setting for universal usability. *CUU 2000: Proceedings on the 2000 Conference on Universal Usability*:32-38.

[77] Voelcker, Marta. 2008. Public access to information & ICTs final report: Brazil. Seattle: University of Washington Center for Information & Society (CIS).

[78] Walkinshaw, Brady P. 2007. Why Do Riecken Libraries Matter for Rural Development? A Synthesis of Findings from Monitoring and Evaluation. Riecken Foundation, Wash. D.C.

[79] Wanasundera, Leelangi. 2008. Public access to information & ICTs final report: Sri Lanka. Seattle: University of Washington Center for Information & Society (CIS).

[80] Warschauer, M. 2003. *Technology and Social Inclusion: Rethinking the Digital Divide*. Cambridge, MA: MIT Press.

[81] Whyte, Anne. 2000. Assessing Community Telecentres: Guidelines for Researchers. Ottawa: International Development Research Centre. http://www.idrc.ca/en/ev-9415-201-1-DO_TOPIC.html (accessed July 3, 2008).

[82] Wilson, Ernest J. 2004. *The Information Revolution and Developing Countries*. Massachussets: The MIT Press.

[83] Worcester, L., and L. Westbrook. 2004. Ways of Knowing: Community Information-Needs Analysis. *Texas library journal.* 80:102-107.

[84]

[85]