Valuation of Public Access to Information and Communication Technology:

A Benefit-Cost Analysis Approach

Tyler Blake Davis

In spite of advances in evaluation approaches . . . most librarians are unable to determine the impact of library services or answer the key evaluation question—What has changed as a result of our work?
(Durrance & Fisher-Pettigrew, 2002)

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ABSTRACT

This report is an attempt to quantify the value that individuals in five countries place on public access to three types of information and communication technology (ICT). I use two types of benefit cost analysis, stated preference and revealed preference, to estimate these values from users, and non-users of the ICT venues. I draw upon data from four surveys in five countries conducted in 2010 and 2011, with data from over 5,000 users, over 1,000 non-users, and over 1,000 random digit dial cell phone surveys in Chile. From these data, I provide generalizations about how demographic and geographic characteristics predict differences in the value that both users and non-users, in both rural and urban settings, place on access to libraries, internet cafés, and telecenters. I find consistently higher travel cost revealed preference than stated preference in Bangladesh, Brazil, Chile and Ghana. I find greatest willingness to pay for internet cafés in the lower per capita income countries of the Philippines, Ghana, and Bangladesh, and greatest willingness to pay for libraries in the higher per capita countries of Chile and Brazil. In Chile I find libraries valued the greatest at $48 (USD PPP), then internet cafes at $17, and telecenters at $7. Women have greater average willingness to pay than men across all venues. These findings are the first effort to quantify the benefits of public access to ICT across multiple contexts, as well as the first to use mixed methods to bound estimates of value. The objective of this report is to inform the allocation of support for public access to ICT by governmental and non-governmental policy makers.

KEYWORDS

public access, information and communication technologies, ICT, ICTD, libraries, cybercafes, telecenters, benefit cost analysis, travel cost method, stated preference, revealed preference, contingent valuation

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Contents

Introduction

This report is an attempt to quantify the value that individuals in five countries place on public access to three types of information and communication technology (ICT). I use two types of benefit cost analysis, stated preference and revealed preference, to estimate these values. I draw upon data from four surveys in five countries conducted in 2010 and 2011. From these data, I provide generalizations about how demographic and geographic characteristics predict differences in the value that both users and non-users, in both rural and urban settings, place on access to libraries, internet cafés, and telecenters. These findings are the first effort to quantify the benefits of public access to ICT across multiple contexts, as well as the first to use mixed methods to bound estimates of value. The objective of this report is to inform the allocation of support for public access to ICT by governmental and non-governmental policy makers.

1.1 Research Questions

The objective of this research is to collect and analyze data to answer the following broad research question: ***What are the costs and benefits of public access to information and communication technology, and how do they differ among demographic, geographic, and venue characteristics?*** Alone, this research question is intractable. To systematize the inquiry, I simplify specify the types of venues, and the characteristics that predict value:

1) *What are the benefits of public access to information and communication technology to users, non-users, and the general public?*
2) *How do benefits differ across venues, countries, urban or rural settings, gender, income levels, education levels, and information and communication technology usage histories?*
3) *What are the operational costs of providing access to information and communication technology in libraries, telecenters, or internet cafés?*
4) *How do those costs differ between countries, and in urban and rural settings?*

In this report, I conduct an analysis on four original data sets to independently answer portions of the research questions, and then I combine the findings to show how these data reveal the relationship between value and venue type, location, and demographic characteristics.

1.2 Organization of this Report

This report is organized into four sections. The first section is an introduction and overview. In Section 2, Literature Review and Context, I contextualize my work in four streams of literature. These literatures include ICT theory, trends in law, library accountability, and benefit cost analysis in libraries. In Section 3, Methods and Measures, I present the survey methods, measures, and sampling frame, as well as potential sources of bias for each of the four surveys. In Section 4, Findings, I summarize the data from the four surveys and show how these data establish bounds for benefits of public access to ICT. Finally, in Section 5, Discussion and Future Research, I present a summary of my findings and necessary caveats, and I suggest a future research agenda to build upon this work. The appendices contain the portion of the research instruments relevant to this work.

1.3 Contribution

The objective of this research is to offer policy-relevant findings to governments, donor agencies, and ICT venues. Additionally, this work represents a new methodological approach to analysis of public access ICT by quantifying non-use benefits for both non-users and users.

To local governments and development institutions, this project identifies demographic groups that most value public access. This research differentiates the value place on public access by rural and urban location, and by public access venue type, thus enabling policy makers to better predict the value of types of venues in types of locations. Understanding the distribution of value across demographic characteristics allows policy makers to fund programs to create public value for target demographics.

This research informs future work on valuing public access to ICT by showing mixed methods of benefit cost analysis to triangulate benefits across user and non-users of public access to ICT. It also shows the challenges presented by the use of each methodology, and informs future researchers of potential pitfalls. Finally, existing research on the benefits and costs of public access to ICT has focused on developed nations, while this work is unique in that it is the first attempt to use benefit cost methods the examine public access to ICT in developing countries (Aabø, 2009; Aabø & Audunson, 2002; Holt & Elliott, 1998, 2002, 2003; Holt, Elliott, & Dussold, 1996).

1.4 Limitations

The limitations of this report include the failure to collect accurate and complete data on costs to operate libraries and any venue in rural settings. Secondly, this report cannot claim unbiased samples in some cases. Finally, this report does not create a general model for estimating benefit cost ratios across venue types, countries, and geographic characteristics of settings. Instead, this report is a baseline that can inform policy makers and future research.

Section 2: Literature Review and Context

Four independent threads of literature and legal precedent intersect to suggest multicontext quantitative analysis to estimate benefits of public access to ICT. First, I review the literature on the potential types of benefits of public access to ICT. Second, I follow the movement for greater quantitative accountability within the library community over the past 90 years, showing the complexity of estimating value for public access venues. Third, I show a legal trend toward quantitative methods of accountability. For this review, I explore examples in the United States and Chile. Finally, I follow the existing literature that suggests the use of benefit cost analysis. I also provide an introduction to the use of benefit cost analysis in libraries as a conclusion to the literature review.

2.1 ICT Literature

Three separate phenomena within the ICT literature motivate this research: the multitude of claims on the potential impact of public access to ICT, the want of defensible quantitative generalizations about the benefits of ICT to target user groups, and the challenge of defining a common measure of benefit.

The breadth of research on the impacts of access to ICT for development is daunting. The potential of ICT has inspired academics, policy makers, and practitioners to cite case studies engendering changes ranging from economic development, social equality, gender equality, problem-solving achieved via gameplay, and disaster relief, to popular protest of government (Best et al., 2007; Celedon et al., 2012; Garrett, 2006; Gurumurthy, 2006; Parkinson & Lauzon, 2008; van Niekerk, Pillay, & Maharaj, 2011; von Ahn, 2006). However, some of these very studies conclude that ICT may contribute to patterns of exclusion, be accessed rarely and randomly, be used solely for personal entertainment, and become a conduit for inflammatory misinformation (Garrett, 2006, p. 204; Gurumurthy 2006, p. 615; Parkinson & Lauzon, 2008, p. 36; von Ahn, 2006, p. 94). These contradictions present a challenge for policy makers or non-governmental organizations who wish to evaluate the costs and benefits of investment in ICT.

Second, complicating the task of evaluating ICT is the challenge of discovering sufficient evidence to make defensible quantitative predictions, or even generalizations. A recent review of the existing ICT literature states that “there is both an abundance of commentary on public access ICTs, and a relative dearth of empirical evidence upon which such commentaries are based” (Sey & Fellows, 2009, p. 3). Though many outcomes are possible, these authors state that “governments, non-governmental institutions, and business entrepreneurs have invested significant amounts of human and financial resources in libraries, telecenters, internet cafés and other forms of public access, without clear evidence on what the ultimate outcomes will be” (ibid., p. 1). These authors suggest that policy makers would benefit from broad-based evidence of types of impacts upon types of populations. The work in this paper follows their suggestion.

Third, the benefit of public access to ICT faces the same challenge as quantifying the benefits of libraries or museums: no definitive method exists to quantify “value” or “benefit” (Dana, 1920; Rea, 1916; Smith, 1994; Van House et al., 1987; Weech, 1988). Complicating the ability to predict outcomes are diverse types of public access venues, diverse impacts by demographic characteristics, and varying geographic characteristics of the venues. Policy makers would benefit from access to research on impacts by ICT venue types and geographic contexts.

In sum, the ICT literature has identified a wide variety of potential positive and negative outcomes in diverse case studies, and these examples have led to generalizations about the benefits of public access to ICT. These claims, and government and non-governmental action to realize the potential benefits, would be bolstered by broad quantitative analysis of benefits by both user group and public access venue type. The work of this paper is, in part, an effort to address the need for multi-context and multi-venue quantitative estimates of benefits.

2.2 Increased Accountability for Libraries

The move toward quantitative accountability is not new within library sciences. At least four methods for identifying the benefits of libraries have been developed over the past century. These methods can be characterized as 1) worth, 2) output, 3) social audit and the related social impact, and 4) benefit cost analysis.

Worth

At the turn of the century, the measure of value of a library or museum was recognized as the sum of the monetary value of the collections. John Cotton Dana, the founder and director of the Newark Museum from 1909 to 1929, gave a paper at the American Association of Museums 1916 meeting on the methods of assessing the value of public institutions. Dana railed against the assessment of the value of libraries and museums through summing the "cost of its building . . . and the rarity, [or] auction-value or money cost of its collections." Instead, Dana stated an alternative measure: "a museum is good only in so far as it is of use" (Rea, 1916, p. 83). However the measure of "use" was more challenging. The measure suggested was that "the highest and best influence of the library may be summed up in that much-abused word 'culture'" (Dana, 1920, p. 9). Dana rejected the contemporaneous benefit analysis, but his suggestion of the measure of "culture" was not accompanied by a methodology for the assessment of culture weighed against public budget expenditures. The "use" component of Dana's charge is more readily analyzed, and efforts turned to quantifying "use" of a venue, instead of the resultant "culture."

Output

The effort to quantify the impact of libraries led to a focus on "output" measures. The use of static outputs allows researchers to use quantifiable metrics that may be "summed." The sum of these disparate measures is then used to assess library performance (Van House et al., 1987). The question, therefore, becomes "What are the outputs?" Van House et al. establish a typology, including library use, material use, material access, reference services, and programming. These five types of output, they argue, can be used to assess the benefit of a library.

Social Audit and Social Impact

Not surprisingly, the reliance upon outputs of a public venue was followed by the criticism that simply scoring and summing outputs is insufficient to capture the true value of a public access venue (Smith, 1994; Weech, 1988). In 1998, at the General Conference of the International Federation of Library Associations and Institutions, presenters Usherwood and Linley declared "soft measures" of library outputs equally important to the "hard measures" used as part of the output method (Usherwood & Linley, 1998). To develop this alternative theory into a replicable methodology, Usherwood and Linley advocated for a "social audit" method of assessing libraries.

This approach has three objectives:

1. To develop a tool for measuring the social impact of library activities in relation to stated objectives;
2. To investigate the social and economic impact of public libraries; and
3. To investigate how far a library's activities, in practice, contribute toward the achievement of its social objectives (ibid.).

This additional assessment tool follows from a desire for greater accountability in public endeavors. The social audit is intended to improve the way the value of the service is reported to policy makers, and to enable stakeholders to judge the service. The second of Usherwood and Linley's objectives, social and economic impacts, foreshadows early metrics borrowed from other benefit cost measures and applied to libraries (Elliott et al., 2007; Holt & Elliott, 2002, 2003; Holt, Elliott, & Dussold, 1996).

A further wave of assessment of libraries arrived in the late 1990s. This work reviewed the social measures of library success from the preceding decade with a focus on assessment methods (Debono, 2002). Debono's review of the existing case studies concludes that "the public library community may now want to consider if it is worthwhile to develop a set of standard approaches to the assessment of social impacts or whether research will continue in an uncoordinated way" (ibid., p. 92). This was a call for standardization of assessment across libraries, for a common assessment tool. Debono concludes that the field of research calculating benefits from libraries should focus on social measures of benefits, but that social measures are underdeveloped and unsatisfactory.

Benefit Cost Analysis

Parallel to the development of library assessment tools was a growing dissatisfaction with existing practices, and a realization that funders were increasingly demanding improved assessment of the programs they fund. Durrance and Fisher-Pettigrew (2002) articulate this theme in two ways. First, they link a government-inspired trend to greater accountability with libraries. The authors write that "federal initiatives in particular are driving interest in outcome measurement in governmental agencies: the Government Performance and Results Act (GPRA) of 1993 and the Government Accounting Standards Board Concepts Statement 2 in 1994" (ibid., p. 44-45). Secondly, they identify that the environment is ripe for "measures that will be able to determine the impact of library services" (ibid., p. 43.).

This stream of literature on evaluation methods for libraries shows the struggle to define a quantified and common definition of value within institutions that have traditionally relied upon soft measures. A variety of methods have been proposed to collect data and communicate the benefit of these institutions, but no single metric has been universally adopted. The library literature motivates this original research to partially answer the following question: What benefit do users and non-users of libraries derive from these public institutions, and what are the associated costs?

2.3 Trends in Law

Legal trends toward greater quantitative accountability parallel efforts in the library community. In the United States, accountability of public funds began at least 80 years ago, including executive, legislative, and judicial advocacy for benefit cost analysis. In a landmark change, the Federal Navigation Act of 1936 dictated that federal flood projects be undertaken only if the economic benefits exceeded the costs. This trend of quantitative (especially monetary) accounting grew. Beginning in 1981, U.S. Presidents have broadened the definitions of benefits and costs, mandated the consideration of distributional effects, and expanded the use of benefit cost analysis in federal activities through executive orders and engineering circulars (*Executive Order No. 12,291*, 1981; *Executive Order No. 12,866*, 1993; *Executive Order No. 13,497*, 2009; *OMB Circular A-4*, 2003).

These expansions have precipitated the development of benefit cost analysis (BCA) methods that take into consideration qualitative and quantitative costs, as well as distributional effects, including income, race, gender, industry, and geographic distribution. The legislature has followed executive actions with additional demands for greater accountability in the form of performance goals for agencies, such as the Government Performance and Results Act (GPRA) of 1993. Additionally, Congress has mandated that the values that are realized by individuals who do not use the resource, the "non-use" benefits, be included in assessments of damages to public goods in the Oil Pollution Act (1990). Finally, the D.C. Court of Appeals has found that benefit cost analysis is an appropriate tool for estimating the value of non-market goods, including non-use values (see *Ohio v. U.S. Dept. of the Interior*, 1989, 880 F.2d 432; Swords, 1991). The Court also found that estimations of value which were calculated by surveys asking how individuals value a public resource are acceptable means of assessing non-use values. In sum, all three branches of the U.S. Federal government have advocated the use of benefit cost analysis for publicly funded projects and programs, have explicitly

demanded impacts be identified by demographic and geographic characteristics, and have recognized values that are realized by both users and non-users.

Chilean law has anticipated and paralleled the U.S. trend toward greater use of benefit cost analysis. The Chilean government is required by the Ministry of Planning to conduct benefit cost analysis of public investment projects (Aranciba, 2006; Fontaine, 2004; Marcel, 2004). In 1975, Chilean Federal law established the National System of Investments to review the costs and benefits of public expenditures. These assessments were assigned to the Ministry of Planning, but the program is currently administered jointly with the Ministry of Finance. The Ministry of Planning currently performs appraisals for all public-investment projects using the economic tool of cost benefit analysis. The ministry conducts analyses within a clearly specified methodology, including a shadow social price system with a social rate of discount. By 2006, this effort had compiled a database of over 300,000 entries (Ley, 2006). Chilean law mirrors U.S. policy in that it mandates benefit cost analysis for publically funded programs, of which public access ICT is one.

2.4 Benefit Cost Analysis in Assessing Public Access Venues

A trend toward the quantification of benefits and costs has developed in the field of library effectiveness analysis since the late 1990s. This growing field of literature explores the use of existing benefit cost analysis methods, including contingent valuation (CV; including both willingness to pay [WTP] and willingness to accept [WTA] survey methods), travel cost methods, and return on investment (Aabø, 2005; Chung, 2008; Holt & Elliott, 1998).

In 1998, Holt and Elliot published novel findings from a three-year study of the St. Louis public library system. These researchers used results from a survey of 320 library cardholders from the population of 39,444 registered users, which elicited responses for three types of valuation methods: consumer surplus, “asking library patrons to place a dollar value on a specific service or offering”; contingent valuation, “asking how much money patrons would be willing to accept in reimbursement to voluntarily give up certain library services”; and opportunity cost, “asking patrons to estimate the amount of money it costs them—in terms of time spent and transportation—to use the library“ (Holt & Elliott, 1998, p. 42). These researchers, one an academic and the other a library administrator, worked together to offer some of the first efforts to use benefit cost analysis for libraries (Holt & Elliott, 1998; Holt, Elliott, & Dussold, 1996).

The early benefit cost analysis efforts were not without their challenges. Notably, the Holt and Elliott study found that 89% of their survey respondents (drawn exclusively from library card holders) refused to consider closing the St. Louis libraries ***at any cost*** (Holt & Elliott, 1998, p. 43; emphasis added). That nearly 9 out 10 respondents refused to consider any amount of money as a substitute to a library may be evidence of their preference for library services, but it does not suggest that the respondents were conducting a rational economic analysis. The researchers may have, instead, encountered a principle criticism of the stated preferences “willingness to accept” (WTA) method of assessing preferences for library services: the over-estimation of value.

Since then, the field of benefit cost analysis for libraries has begun to adopt more standard benefit cost analysis methods. In a doctoral dissertation from 2005, Aabø used a random sample of 999 individuals who were asked about their willingness to pay (WTP) to continue to receive library services, or their willingness to accept (WTA) the discontinuation of library services (Aabø, 2005). Aabø used two forms of elicitation: dichotomous choice, where survey respondents were asked to choose between two options, and multiple bounded discrete choice, where respondents were asked to choose between discrete options, and then were asked follow-up questions. Elicited responses to dichotomous choice valuation questions are standard practices in benefit cost analysis (among many, see Cameron & Quiggin, 1994; Mitchell & Carson, 1989). Recent years have seen efforts to use libraries as test cases for developing new benefit cost analysis tools. In a test case study of valuation tools for a library in Korea, Chung (2008) developed a stated preference survey drawing upon contemporary approaches to minimize bias identified in works by contingent valuation expert

and Nobel Prize laureate Kenneth Arrow (Arrow et al., 1993; Chung, 2008). Chung used three types of methods to comply with existing theory on bias in valuation tools. First, Chung assuaged existing criticisms of stated preference contingent valuation methods for evaluating good or services by adopting survey design insights from Blamey, Bennett, and Morrison (1999), and Ready, Whitehead, and Blomquist (1995). These design efforts included adopting a dissonance minimizing survey format where yea-saying and protest answers are theoretically reduced.[1] Chung combined the dissonance minimizing survey format with a new information-bias minimizing format and contrasted the findings from each method in a study of 399 respondents. Chung found different stated preferences for library services, and higher response rates using the dissonance minimizing and information-bias minimizing questionnaire formats (Chung, 2008). Chung concluded that valid stated preference contingent valuation of the benefits of libraries could be accomplished when including them within bias minimizing and non-response minimizing survey structures.

At least three other studies have been completed on the benefits and costs of libraries in recent years. The British Library Study in 2004, its successor in 2013 (Pung, Clarke, & Patten, 2004; Tessler, 2013), a study of the economic impact of public libraries in South Carolina (Barron et al., 2005), and a study of the Florida public libraries return on investment (Griffiths et al., 2004) are all attempts to measure the value of libraries. These studies addressed the challenges identified by Arrow et al. and Chung in varying degrees, but they do show that the field is moving toward adopting benefit cost analysis as a standard tool.

The four literatures summarized in this section, the ICT literature, library accountability, governmental mandates, and benefit cost analysis in libraries, suggest the use of benefit cost analysis to identify benefits of public access to users and non-users, and identify differences in benefits by demographic, geographic, and public access venue characteristics in multiple contexts. In Section 3, Methods and Measures, I give more context on the methods of benefit cost analysis, and then detail the instruments I used to collect data on benefits and costs of public access to ICT.

[1] Yea-saying is a common source of error where respondents reply “yes” to questions in an effort to please the survey administration, and protest answers are common responses to valuation questions when the respondent dislikes the way the question is asked, not the content of the question.

Section 3: Methods and Measures

In this section, I give an overview of benefit cost analysis and describe the methods and measures used to collect data for this report. The overview of benefit cost analysis includes market and non-market goods, use and non-use values, and users and non-users. Second, I introduce the stated preference approach to estimate value, and detail the methods and measures for both a stated preference survey on public access to ICT in Chile and a survey of individuals who do not use public access ICT in five countries. Third, I introduce the revealed preference approach to estimating value and detail the methods and measures for a revealed preference survey of ICT users in five countries. Finally, I detail the survey methods for estimating costs of operating public access ICT venues in five countries.

3.1 Benefit Cost Analysis

Benefit cost analysis is an accounting concept applied to scenarios where decision makers wish to reduce the complexity of many types of costs and benefits to like terms and compare them to one another. Most simply, benefit cost analysis is the "calculation of value for all inputs into and outputs from a project and then the subtraction of the first from the second" (Zerbe & Bellas, 2006, p. 1). A well-executed benefit cost analysis may inform a decision making process by providing hard numbers to inform decision makers. Conversely, these "hard" numbers will mislead if they are the result of poor quality work or inaccurate data, or if they are misconstrued to comprise the decision.

The concept of contrasting values is simple; the challenge is in execution. Benefit cost analysis relies upon two related concepts. The analysis must first quantify the costs and convert these into monetary terms. In instances where inputs and outputs are commonly assessed in monetary terms, the analysis relies upon readily available data. In instances where the costs are not commonly assessed in monetary terms, such as fouling of air or water, then the analyst must estimate costs. The same is true for the quantification of benefits: In instances where the inputs and outputs have a known monetary value, the analyst uses these estimates; when no known value exists, the analyst must estimate the value of the benefits. These two types of goods may be characterized as market goods when a market value can be established, and as non-market goods when no market exists to signal the value. In the case of public access ICT, the greater challenge is in the quantification of non-market benefits. The second challenge is to identify to whom the related benefits and costs accrue. As economists view the challenge, there are two components of benefit to conceptualize: the value that users of the resource place upon the resource, and the value that non-users place upon the resource (Portney, 1994; see also Krutilla, 1967, for one of the first explicit treatments of non-use values). These two types of values are termed use and non-use values.

Use values may be estimated in a wide variety of ways, including using market pricing to hedonically estimate the total value for the good or service, or travel cost to estimate expenditures that facilitate consumption. Each of these examples is a method where individuals reveal their preferences for the good or service through their actions. These methods are called revealed preference methods (Brown & Mendelsohn, 1984; Clawson, 1959; Clawson & Knetsch, 1966). Non-use values are more difficult to estimate because no market exists to establish prices for hedonic estimates. In many cases, the good or service to be valued is a public good or a common property resource. Examples include national defense, national parks, and a clean environment. One classic example of a non-use value is the value of the health and cleanliness of Prince Rupert Sound held by individuals with no intention of visiting (Pierce, 1994). In the case of libraries or public access ICT venues, the non-use value is the value that individuals in society place on the abilities of others to access ICT. In these cases, the value placed upon the resource is measured by how individuals say they value the resources. These methods are called stated preference methods.

3.2 Method 1: Stated Preference

Within stated preference estimate methods, one stands out as the most researched, most used, and most widely accepted: contingent valuation. Contingent valuation meets the standard of legitimacy of the Supreme Court of the United States (see *Ohio v. United States Department of the Interior*, 1989), and is accepted by the U.S. Congress as a method for quantifying values of non-market goods (Oil Pollution Act of 1990; Comprehensive Environmental Response, Compensation, and Liability Act of 1980). As with every evaluation method, contingent valuation has strengths and weaknesses (Diamond & Hausman, 1994; Hanemann, 1994; Portney, 1994). One of the advantages of the contingent valuation method is that, over the past 20 years, methodological responses have been developed to address some challenges. Contingent valuation is not a perfect tool, but it may be the best-known tool for valuing non-market goods (among many others, see Arrow et al., 1993; Mitchell & Carson, 1989).

The most authoritative review of contingent valuation methods was commissioned by the U.S. Congress in the wake of the 1989 *Exxon Valdez* oil spill. Congress convened a blue ribbon panel of experts, including two Nobel laureates, to assess the viability of contingent valuation for use in assessing non-market goods. In their subsequent report, the panel concluded that "contingent valuation studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values" (Arrow et al., 1993, p. 43). This recommendation came with qualifications: "Proponents of the contingent valuation technique acknowledge that its early (and even some current) applications suffered from many of the problems critics have noted, but believe that more recent and comprehensive studies have already or soon will be able to deal with these objections" (ibid., p. 5). The challenges include inconsistency with budget constraint, inconsistency with rational choice theory, incomplete understanding of the good or service being valued, acceptance of the "scenario" that researchers present to survey participants, and the tendency to answers survey questions to achieve the satisfaction of the "warm glow" (ibid.). The authors give seven recommendations for research design to overcome the known challenges to contingent valuation, including survey design, context, survey methods, and characterization of contingencies.

1) Where possible, contingent valuation should rely upon personal interviews, rather than telephone surveys.
2) Contingent valuation surveys should elicit willingness to pay to prevent a loss, rather than willingness to accept compensation for an existing loss.
3) Payment options should be presented in referendum format, not as open-ended questions.
4) Contingent valuation surveys must begin with an accurate and understandable scenario.
5) Contingent valuation surveys must remind respondents of budget constraints.
6) Contingent valuation surveys must include reminders of the substitutes.
7) Contingent valuation surveys should include questions to ensure that respondents understand the choice they are being asked to make.

Though the possibility for inaccurate measure exists, the report concludes the following:

> [C]ontingent valuation studies convey useful information. We think that it is fair to describe such information as reliable by the standards that seem to be implicit in similar contexts, like market analysis for new and innovative products and the assessment of other damages normally allowed in court proceedings. As is on all such cases, the more closely the guidelines are followed the more reliable the result will be. It is not necessary, however, that every single injunction be completely obeyed; inferences accepted in other contexts are not perfect either. (Arrow et al. 1993, 43)

Thus, the preferred method of estimating non-use, non-market values for individuals with standing is contingent valuation. All of the methods used for eliciting information on non-market valuation for non-users in this report use one of two variants of contingent valuation, either dichotomous choice, or open-ended

questions. Dichotomous choice questions present the respondent with a referendum to which they may agree or disagree. Typically, the referendum asks, "If X service were to diminish by Y percent, would you be willing to pay Z amount to prevent the loss of service?" This question may be posed in many ways, including a vote for a tax levy, or agreeing to send a check to an organization, or even a hypothetical payment. The advantage of asking respondents if they agree or disagree with a referendum is that it allows individuals to respond to a question, as opposed to needing them to synthesize their value without a point of reference. The disadvantage is that the estimation of their true value is only bounded by the single bid amount of the referendum.

To address this challenge, a researcher may add a follow up question, e.g., "Since you said no/yes to paying Z, would you pay half/double Z?" This doubles the number of bounds that a researcher may put around the preferences of the individual, allowing for a more efficient estimate of value over a population. Following the recommendations of Arrow et al., these surveys should be asked in person; should ask for a willingness to pay; should be asked in a referendum format, within a contextualized scenario, and with reminders to respondents of their budgets and substitutes to the good or service; and should confirm that respondents understand their options. A well-designed survey that conforms to these standards must still be tested before implementation. A second type of contingent valuation is an open-ended question. This method replaces the referendum with a question asking the respondent to state how much they would be willing to pay to prevent the loss or diminishment of service. Typically, the question is, "How much would you be willing to pay to prevent the loss of X service?" The advantage is that the individual states their value, as opposed to merely identifying the bounds around their value, as is the case with dichotomous choice surveys. The disadvantage is that respondents often have difficulty stating their willingness to pay for a good that they have never considered paying for before. For example, the question, "How much would you pay for clean air?" is more difficult to answer than, "Would you pay $100 a year for clean air?"

For this work, I employed two types of stated preference surveys. The first, a cell phone survey, was a contingent valuation survey conducted in Chile. The second, an open-ended stated willingness to pay survey of non-users, was conducted in five countries.

Survey 1: Cell phone survey of Chile

The objective of the cell phone survey was to elicit responses from a representative sample of individuals to estimate the willingness to pay for three types of public access venues.

Method

I gathered data using a contingent valuation survey conducted by a market research company in Santiago, Chile. I drafted my survey using the best practices, including assurances of confidentiality, contextualization, a simple scenario, budget constraint reminders, information on substitutes, checks on comprehension, stated willingness to pay (as opposed to accept), a referendum as opposed to an open-ended question, and an opportunity to articulate provision point bias (Arrow et al., 1993; Chung, 2008). Directions for the survey team are included in Appendix A, and the complete text of the survey is included in Appendix B.

First, I introduced the University of Washington as the research group and explained the rationale for the survey: to collect information to inform public access to information and communication technology. Next, I contextualized the contingent valuation questions by providing background information on public access ICT:

> *Differences exist between the three types of venues: Public libraries are non-commercial organizations usually supported by public funds, where people can borrow books and other materials. They may also*

provide access to computers and the internet. The average one hour cost of using computers at libraries is Z.[2]

Telecenters are non-commercial organizations usually supported by public or donor funds where people can use computers and other technology equipment. The average one hour cost of using computers at telecenters is Z.

Finally, internet cafés are private businesses where people can purchase (or buy) access to computers and the internet. The average one-hour cost of using computers at internet cafés is Z.

Next, I described the contingent valuation scenario to provide the format for the stated preference referendum:

Imagine this situation: The public access venues that I just described have financial problems and therefore they will reduce the hours of use available to the public by X.[3] *For example, if a library was able to provide 100 people each one hour of access before, now they would only be able to provide (100-X) people one hour of access.*

After describing the scenario, I included a check of comprehension by asking if the respondent understood the scenario. If they did, then the survey continued. If they did not, then the survey administrator would review the scenario with them, asking what was not clear; review that element; and ask if that clarified the scenario. In my sample of 1,104 respondents, 98.8% replied that they understood the scenario when queried.

After describing the scenario, I reminded respondents of their budget constraints and included the dissonance minimization questions to reduce bias of responses (Chung, 2008).

Bearing in mind your own budget, can you tell me if you agree, disagree, or are neutral on each of the following four statements?

a. *I support public access to computers connected to the internet, and I would consider making a contribution to keep it available. (agree, disagree, neutral)*
b. *I support public access to computers connected to the internet, but I would not consider making a contribution to keep it available. (agree, disagree, neutral)*
c. *I support public access to computers connected to the internet depending on the situation. (agree, disagree, neutral)*
d. *I oppose public access computers connected to the internet. (agree, disagree, neutral)*

Next, I reinforced the scenario and employed provision point bias reduction language by assuring respondents that, in the hypothetical scenario, they would be refunded any donations if the minimums were not met (Chung, 2008).

Next, I am going to ask four questions about your willingness to pay to continue to provide public access to information and communication technology. There are two important points I want to first share:

***First**, if not enough people pay for the referendum to keep the venue open, then nobody will make any contribution. That means than anyone who made a contribution would get a complete refund.*

***Second**, if more than enough money is raised to pay to keep the venue open, then people will receive a rebate proportional to their contribution. This means that if we collect 10% more than needed, you will get 10% back.*

[2] I relied upon existing data to calculate the country specific average cost for each venue to replace the variable *Z*.

[3] This variable *X* was varied randomly between 25%, 33%, and 50%.

After the introduction to provide opportunity to express preferences, and language to reduce bias, I again checked the comprehension of the scenario. After this introduction and contextualization, I asked the four contingent valuation questions. The contingent valuation questions used stated willingness to pay, as opposed to willingness to accept; i.e., the questions were phrased, "Would you be willing to pay some amount to prevent a loss of public access ICT?", as opposed to, "How much would you have to be paid to accept the loss of public access ICT?"

*Would you be willing to make a one-time payment of **BID #1** to keep public libraries open, meaning internet cafés and telecenters would reduce their hours by X?*

a. *(If yes) Would you be willing to pay BID#1a to them open?*
b. *(If no) Would you be willing to pay BID#1b to keep them open?*

*Would you be willing to make a one-time payment of **BID #2** to keep telecenters open, meaning internet cafés and libraries would reduce their hours by X?*

a. *(If yes) Would you be willing to pay **BID#2a** to them open?*
b. *(If no) Would you be willing to pay **BID#2b** to keep them open?*

*Would you be willing to make a one-time payment of **BID #3** to keep internet cafés open, meaning telecenters and libraries would reduce their hours by X?*

a. *(If yes) Would you be willing to pay **BID#3a** to them open?*
b. *(If no) Would you be willing to pay **BID#3b** to keep them open?*

*Would you be willing to make a one-time payment of **BID #4** so that ALL THREE of these venue types do not reduce their hours by X? In this case, all three would stay open.*

a. *(If yes) Would you be willing to pay **BID#4a** to them open?*
b. *(If no) Would you be willing to pay **BID#4b** to keep them open?*
c. *(if no) Would you be willing to make a contribution of $0.25 (or some very small sum)?*

The bid values in the follow-up questions increased if the respondent replied "yes" to the first bid, and decreased if the respondent replied "no" to the first bid. The result is data where respondents could answer "yes" to the first bid and "yes" to the second, "yes" to the first and "no" to the second, "no" to the first and "yes" to the second, or "no" to the first and "no" to the second. These four types of responses may be written as four bins: YY, YN, NY, and NN. Finally, in an effort to distinguish between protest responses and low valuations, I added a final question, which was only asked of individuals who had rejected every bid for every venue type. A protest response is when an individual is protesting the question or the method of stating their preference, as opposed to rejecting the bid because it is too expensive (Chung, 2008). The protest bid amount for the final survey asked if an individual would be willing to pay $0.25 to prevent the reduction of hours for all three venues.

Pretesting

I conducted four (n=30) surveys, for a total of 120 pretests, where I calibrated the bid amounts by venue to ensure variance in the responses. I adjusted the starting bid values over the four pretests and follow-up bid values until roughly 25% of the respondents were in each of the YY, YN, NY, and NN bins in the pretest sample. The table below is a summary of the bid values used in the pretests and final survey. The units are in purchasing power parity (PPP) U.S. Dollars.

		Test 1	Test 2	Test 3	Test 4	Final
Library Bids	Bid 1	$ 24.60	$ 36.90	$ 19.68	$ 17.22	$ 17.22
	Bid 2 (Yes)	$ 86.09	$ 98.39	$ 61.49	$ 36.90	$ 36.90
	Bid 2 (No)	$ 12.30	$ 18.45	$ 9.84	$ 9.84	$ 9.84
Telecenter Bids	Bid 1	$ 24.60	$ 12.30	$ 8.61	$ 4.92	$ 4.92
	Bid 2 (Yes)	$ 110.69	$ 24.60	$ 17.22	$ 12.30	$ 12.30
	Bid 2 (No)	$ 12.30	$ 6.15	$ 3.69	$ 2.46	$ 2.46
Internet Café Bids	Bid 1	$ 24.60	$ 12.30	$ 7.38	$ 2.46	$ 2.46
	Bid 2 (Yes)	$ 86.09	$ 24.60	$ 14.76	$ 4.92	$ 4.92
	Bid 2 (No)	$ 12.30	$ 6.15	$ 3.69	$ 1.23	$ 1.23
All-Venue Bids	Bid 1	$ 36.90	$ 29.52	$ 24.60	$ 22.14	$ 22.14
	Bid 2 (Yes)	$ 172.18	$ 98.39	$ 61.49	$ 49.19	$ 49.19
	Bid 2 (No)	$ 19.68	$ 14.76	$ 9.84	$ 7.38	$ 7.38
Protest	Protest Test	$ 0.74	$ 0.74	$ 0.37	$ 0.25	$ 0.25

I contracted a professional survey firm to conduct the surveys. To select a firm with experience in assessment of willingness to pay, I solicited bids from four companies with references and membership in the Chilean Association of Market Investigators (*Asociación Investigadores de Mercado*). From these four, I selected Adimark GfK.

Sample Frame

The Adimark framing included weighed representation across gender, urban/rural settings, age, and income. Briefly, the sample included 500 men and 500 women. Of these, residents of high, medium, and low socioeconomic groups were proportionately included, resulting in a sample of 400 residents drawn from the capital (Santiago), 160 from the north of Chile, 170 from the central region, and 270 from the south. The sample was scaled by age to include 233 individuals between 18 and 23 years of age, 300 individuals between 25 and 39, 300 between 40 and 54, and 167 over 55 years of age. Adimark states that the full sample (n=1,000) framing was representative of Chile with a margin of error of +/- 3.1% at the 95% confidence interval.

Sources of Bias

At least three sources of bias should be discussed: contact method, sample frame, and stated preference. The method is a survey carried out over a cell phone, as opposed to an in-person survey. Though the gold standard has long been in-person surveys, survey theorists recognize the validity of phone interviews (Arrow et al., 1993; Dillman, 2002). Second, the use of random digit dial faces the challenge of exclusion of cell-phone only individuals (Lee et al., 2010). This survey uses only random cell phone numbers, thus providing a bias against individuals who have land lines, or no phones, and an oversampling of individuals that have cell phones. Chile, with a population of 17.2 million people, has 22.4 million cell phones, making a ratio of 1.3 cell phones per citizen (CIA, 2013). The high ratio of cell phones per person does not eliminate selection bias against individuals that do not have cell phones. Finally, stated preference work suffers from "yea-saying," or respondents stating that they would be willing to pay a level higher than they would if actually presented with the option to buy.

Survey 2: Non-User Survey in Five Countries

The second stated preference survey was of non-users in five countries: Bangladesh, Brazil, Chile, Ghana, and the Philippines. The objective of this survey was to elicit responses from individuals who did not use public access ICT to test the hypotheses that non-users valued public access for others. Any stated willingness to pay

for others to have access to ICT represents non-use value, and would be a contribution to the literature on the total value of public access to ICT.

Survey Questions

I designed a survey for the field teams to collect data on non-users' stated preferences for public access ICT. This survey was a portion of a larger survey conducted by the Technology and Social Change (TASCHA) research group at the University of Washington. All surveys were face-to face and researcher-administered. For more detailed information on the non-user survey methodology, see the survey methodology report (Survey Working Group, 2012). The survey questions used for this analysis are reproduced in Appendix C. The development of the non-user survey was iterative. The original draft was created by the TASCHA researchers at the University of Washington, and then reviewed by the collaborating experts in public access to ICT, and finally reviewed by research partners in each country. Typically, the local research partners were universities with whom the Global Impacts group worked.[4] Each survey was translated into local languages, including Bangla, Tagalog, Spanish, and Portuguese.

The survey begins by providing the context and states the research objective:

> *These next questions are designed to help estimate the value people place on public libraries, telecenters and internet cafés. The following questions ask you about your opinion on the value of services provided by public access venues. This research project is interested in the value you place on other people's access to these venues, even though you may not use them.*

Next, I summarize the differences between the types of venues, including which are commercial or publically funded, and I provide the related costs:

> *Differences exist between the three types of venues: Public libraries are non-commercial organizations usually supported by public funds, where people can borrow books and other materials. They may also provide access to computers and the internet. The average one hour cost of using computers at libraries is X.[5] Telecenters are non-commercial organizations usually supported by public or donor funds where people can use computers and other technology equipment. The average one hour cost of using computers at telecenters is X. Finally, internet cafés are commercial organizations where people can get access to computers and the internet. The average one-hour cost of using computers at internet cafés is X.*

Next, I followed the introduction with a simple scenario for the respondent:

> *Imagine this scenario: The public access venues that I just described have financial problems and therefore will close. The next questions are designed to assess how much you would be willing to pay to keep the venues open for all people to use.*

The next two questions asked the respondent to choose a statement about their support for public access to ICT. The statements range from strong support for public access to ICT and willingness to pay for public access, to rejection of both public access and payment for public access. These two questions are designed to reduce provision point bias and nay-saying. Finally, the respondents are asked to state an amount that they would be willing to pay annually to keep each libraries, internet cafés, and telecenters open (the other two would close), and also about their willingness to pay to keep all three open.

[4] See the TASCHA website for a list of these collaborators (http://tascha.uw.edu/people/).

[5] Local average costs were added for each country.

4.3 How much would you be willing to pay per year so the public could have access to computers with internet connections in each of these three venues?

a. *Just public libraries – meaning internet cafés and telecenters would close*
b. *Just internet cafés – meaning libraries and telecenters would close*
c. *Just telecenters – meaning libraries and internet cafés would close*

4.2 When considering only the overall value of public access to computing with internet, how much would you be willing to pay per year so that all three of these venue types do not close? In this case, all three would stay open.

The survey administrators simply recorded the stated willingness to pay as a continuous variable for each of the venue types independently, as well as for all three venue types together.

Pretesting

We employed two types of pretesting: cognitive and field testing. The cognitive testing included interviewing and debriefing a minimum of five randomly selected potential survey subjects. These subjects were administered the survey, and the survey team were instructed to carefully note interruptions, requests for clarification, qualified answers, inadequate or illogical answers, and responses of "don't know" or refusal to answer. These observations were used to improve the survey. Following the administration of the survey, the respondents were given a debriefing session in which they were asked to confirm the validity of some portions of the survey, and interviewers could probe additional problems that emerged during the interview. The field testing included identifying opportunities to correct problems with the flow of questions, any skip patterns that emerged, the subject's ability to articulate between choices, and the accuracy of the responses.[6]

Sample Frame

The sample for the surveys was framed at the county level and within the country. Selection of the countries was strategic and opportunistic. Countries were selected for existing relationships with the TASCHA, and for regional distribution. An additional rationale for selecting these countries was a history of implementing public access ICT programs. These factors led to the choice of Bangladesh, Brazil, Chile, Ghana, and the Philippines for inclusion in this survey. In Chile and Bangladesh, the surveys were conducted in every region, and TASCHA claims that these survey responses may be considered national (Survey Working Group, 2012). The responses from Brazil, Ghana, and the Philippines were not conducted nationally, and cannot be claimed to represent national findings. The non-user survey had a sample size of 400 observations, though rural households were oversampled. TASCHA claims a sample of 400 results in a finding with a +/- 5% margin of error (ibid., p. 5). The sample frame by gender and age is shown below.

[6] For a more complete methodological description, please see Global Impacts Study Surveys: Methodology and Implementation (http://tascha.uw.edu/publications/global-impact-study-surveys-methodologies-and-implementation/).

		Bangladesh	Brazil	Chile	Ghana	Philippines	Total
Gender	Male	200	202	154	172	200	928
	Female	200	197	245	223	200	1065
Age	12–15	41	25	25	18	54	163
	16–19	80	34	42	49	32	237
	20–24	73	50	43	73	44	238
	25–34	92	91	58	118	68	427
	35–49	76	90	113	88	87	454
	>50	38	110	103	54	115	420
	Unknown age	N/A	N/A	16	N/A	N/A	16

Sources of Bias

Findings from the non-user survey are subject to caveats due to various types of bias. First, findings have only regional validity for Brazil, Ghana, and the Philippines, because a non-random, and non-representative, sample of regions were included in the non-user survey for these countries. Second, because the researchers were interested in how perceptions of value differ between users and non-users, the non-user survey was only conducted in households "located in vicinities around a sub-sample of already surveyed venues" (ibid., p. 5). The intent of the sample frame was not to enable valid assertions for the general population. Instead, these findings, and all findings drawn from the non-user population, must be limited to individuals who live in communities that have public access venues, but who do not use the venues.

3.3 Method 2: Revealed Preference

One method of estimating non-market valuations for use values is the travel cost method. The travel cost method was developed by Clawson and Knetsch to systematically address the question of how people value public goods or resources for which there is an arbitrarily low price of access, or no price to access the resource (Clawson & Knetsch, 1966). Under more common circumstances, access to a good or service is subject to market forces, with increases in price resulting in decreases in quantity demanded, and decreases in price resulting in increases in quantity demanded. However, in circumstances where a good or service has a price ceiling, or is provided without user fees, the challenge is to identify the demand for a good or service for which there is no operational market.

Clawson and Knetsch propose that a minimum value to assert that an individual places on a good or service may be identified by the costs incurred through access. For example, the first application of the travel cost method was an assessment of the non-market good of a park, where the minimum benefit was the sum of all the costs an individual incurred to visit the destination that had below market, or free, admission. Clawson and Knetsch developed a methodology to categorize the distances individuals traveled to reach the destination, taking into consideration the frequency of visits, the demographic characteristics of the respondent, and the travel time incurred. The travel cost method estimates a demand schedule to show the relationship between the quantity demanded and the price by asking individuals about the costs they incur to visit their destination. Costs related to travel are broken into three components: time, distance, and money. The question of the value of travel time has been raised, and though many options have been identified, the general consensus is that time is accepted to cost half of the hourly rate that the individual earns in his or her profession, or minimum wage if the person is not employed (McConnell & Strand, 1981; Nichols, Bowes, &

Dwyer, 1978; Ward & Loomis, 1986). The schedule of demand may be sub-divided by demographic characteristics to achieve greater accuracy within that group (Clawson & Knetsch, 1966, p. 53). In such a case, the demand schedules are aggregated independently, and then the values across demographic group are summed to give the total minimum value placed on access to the resource.

Travel cost methods of establishing value are not without challenges. Drawbacks to the travel cost method include subjective response bias, recommendations that stated responses establish a minimum willingness to pay and should be coupled with a second estimation method, and that travel models better estimate willingness to pay when hedonic methods for characterizing the features of the destination are included in the model (Bowes & Loomis, 1980; Brown & Mendelsohn, 1984; Cameron, 1992; Randall, 1994). In this case, I paired travel cost methods with stated preference models to establish a range of values.

Survey 3: User Survey in Five Countries

I created a travel cost survey to collect data on the total costs that users of public access ICT incur in travel. The motivation was to use these data to estimate the minimum value placed on public access ICT by users through estimating their travel costs to reach a public access ICT venue. My survey included questions on travel distance, means of transport, duration of travel, transportation cost, and frequency of trips to visit the venue. The survey included questions on demographic characteristics to control for differing demand schedules across the population. The travel cost survey was a small part of a larger survey of public access ICT users. Please see Appendix D for the full travel cost survey questions, and see the Global Impacts website for the full User Survey (TASCHA, 2010).

Method

From the travel cost data, I estimate the time and money an individual uses to access a venue that provides ICT. The time estimate is monetized as a function of income, and the travel costs are aggregated to estimate the total monetary costs. These two monetized estimates are summed, and then multiplied by the total number of trips to visit the venue per year. This value represents the minimum that an individual is willing to spend to use public access venues, because users may have been willing to travel further, or to incur higher costs than they were observed to have incurred.
The simplified model below yields total costs of travel, where T is travel time, H is hourly wage, C is cost of transportation, and F is frequency of usage. As an estimate of the cost of time, I used 50% of the individual's hourly income. For individuals with no employment, including students, I set the travel cost of time as 50% of the minimum wage. Finally, I converted all wages and costs to purchasing power parity (PPP) U.S. Dollars to enable international comparisons.

$$\textit{Total Cost of Travel} = ((T*50\%*H) + C) *F$$

The result is an estimate of the total costs of travel incurred by an individual *just to reach* a public access venue. I use this measure as a minimum value of public access, which may be contrasted with stated preference willingness to pay, an upper bound of value.

Survey Questions

The travel cost section of the user survey begins with questions about how frequently the respondent uses the ICT venue. This is followed with questions on the features that the user rates as important in choosing which venue he or she chooses. The questions that result in the travel cost data are:

3.14 How long does it take you to travel to that venue?

3.15 How much money does it cost for transportation to that venue?

3.16 How many times did you visit that venue in the last month to use computers?

The respondents gave their responses to these open-ended questions, and were presented with the option of stating that they did not know. Finally, at the conclusion of the User Survey, the respondents were asked about their demographic characteristics. These questions included occupation, educational attainment, age, gender, and income. The full set of questions is available on the TASCHA website.[7]

Sample Frame

The data for travel costs of users of public access ICT draws from a survey of approximately 1,000 users from each of 250 public access locations throughout each country. Users were selected from locations in which the venue survey took place. Users above the age of 12 were interviewed, and interviewers attempted to stratify the sample to capture an equal number of males and females. The sample was also dispersed by day of the week and time of day (morning, afternoon, evening/night). The survey team in each country developed its own locally relevant strategy for selecting individual users, although, in general, the typical approach was selecting every *nth* person. All surveys were face-to face and researcher-administered. For more detailed information on the user survey methodology, see the survey methodology report (Survey Working Group, 2012). The sample frame by gender, age, and country is shown below.

		Bangladesh	Brazil	Chile	Ghana	Philippines	Total
Gender	Male	786	587	540	754	572	3239
	Female	218	373	455	246	466	1758
	Other	0	4	1	0	6	11
Age	12-15	52	198	82	84	238	654
	16-19	227	271	254	228	384	1364
	20-24	322	222	222	350	263	1379
	25-34	285	177	211	265	106	1044
	35-49	102	72	155	60	47	436
	>50	16	17	73	10	4	120
	Unknown age	0	8	0	3	2	13

3.4 Method 3: Costs Reporting

The final method concerns the collection of data to estimate costs of operating a venue for public use. For these estimates, I relied upon the existing data from the TASCHA venue survey (TASCHA, 2010). The value in estimating costs to operate a public access venue is in the ability to contrast benefits accrued to users and non-users with the cost of provision. In informative benefit cost analyses, the benefits are weighed by the costs, and these research findings provide an opportunity to contrast the costs of creating benefits by venue, location, and target user group.

Survey 4: Venue Survey

To explore the costs of public access venues, I rely upon self-reported cost data gathered through a survey of public access ICT venues. In this survey, two types of cost questions were included: total costs and itemized costs. The survey team asked operators of public access ICT venues to quantify the typical expenditures per month, including internet connection, software/licenses, hardware, staff, training, rent, utilities, and others expenses. Respondents were also asked to estimate the total monthly expenses. Additionally, respondents were asked about other characteristics, including staffing, internet speed, hours of operation, and number of

[7] http://tascha.uw.edu/publications/global-impact-study-user-survey-data-spsssav-format/

computers available to the public. The response rate for the costs questions was very low, and in many countries, there were no data for either venues in rural settings or libraries.

Sample Frame

The sample frame was limited by a lack of national inventories of public access venues. Without such a database, the survey team used a geographic approach to select venues. For each of the five countries, the research team selected cities based upon size, then districts within the cities, and venues within the districts (TASCHA, 2010, p. 8). Constraints of travel time and expenses, as well as a necessity to group venues to enable the survey team to reach several venues during a single field trip, resulted in additional compromises in a representative sample. Using this method, the team selected roughly 250 venues per country. A more complete treatment of the sample frame is contained within the TASCHA report on survey methodology.

	Internet Café	Library	Other	Telecenter	Total
Bangladesh	99	4	0	148	251
Brazil	181	5	0	38	224
Chile	102	68	16	57	243
Ghana	220	4	0	26	250
Philippines	229	18	0	14	261
Total	**831**	**99**	**16**	**283**	**1,229**

Survey Questions

Section 4 of the venue survey was dedicated to the costs of operating the venue. The questions relevant to estimating the total cost of the venue were divided into total costs and itemized costs. Venue operators were asked:

> *4.5 How much of a typical month's expenses for public access computing operations are for each of the following?*
>
> - *Internet connection*
> - *Software/licenses*
> - *Buying and repairing computers/hardware*
> - *Staff salary*
> - *Training for staff*
> - *Rent variable expenses (i.e. electricity, water)*
> - *Other*
>
> *4.6 What are the center's total expenses for public access computing operation in a typical month?*

Unfortunately, these questions are extremely broad, and very often difficult for even a competent manager to answer accurately. The result was inconsistency between the sum of the itemized costs and the total costs, as well as a high rate of unanswered questions.

Sources of Bias

Though the challenges of the sample frame may be overcome, there were too few libraries and internet cafés surveyed to make valid statistical inferences. Secondly, the complexity of the questions should raise serious doubts about the accuracy of the data generated through this survey. The findings from the survey of costs should be examined as anecdotal and incomplete.

Section 4: Findings

In this section, I present the findings from the four research methods in Section 3. These findings address the systematized research questions:

1) *What are the perceived benefits of public access to information and communication technology to users, non-users, and the general public?*
2) *How do benefits differ across countries, urban or rural settings, gender, income, education, and information and communication technology usage history?*
3) *What are the operational costs of running a library, telecenter, or internet café?*
4) *How do those costs differ among countries, and in urban and rural settings?*

This section is organized into the following parts: Section 4.1 presents findings from the contingent valuation survey of cell phone users in Chile. Section 4.2 presents findings from the stated preference survey of non-users of public access ICT venues in five countries. Section 4.3 presents findings from the travel cost survey of ICT venue users in five countries. Finally, Section 4.4 presents the findings from the venue survey of public access ICT venue costs.

In each section, I show values in both local currency and standardized units. For the standardized units, I convert to Purchasing Power Parity (PPP) dollars. I use the World Bank definition of PPP for conversion: the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as a U.S. Dollar would buy in the United States.[8] Thus, these tables may be contrasted with one another because the units are in like terms.

4.1 In-depth Study: Contingent Valuation Survey

For the analysis in this report, I estimated total willingness to pay as a linear extrapolation of the percentage of reduction of hours. For example, I estimated willingness to pay for the prevention of loss of the entire venue by doubling the willingness to pay for an individual who stated his willingness to pay to prevent a reduction of half of the hours of service. For this report, I use the midpoint of the value range that is bounded by the bid amounts, and then treat the valuation responses as continuous variables. This allows me to test the differences in responses for our independent variables of interest: gender, location, and usage history. An analysis allowing for correlated errors associated with responses to the first and second question would improve the efficiency and accuracy of estimates of these data.

The in-depth study was the only study exclusively designed to solicit valuation of public access to ICT. This research was designed to answer the systematized research questions 1 and 2:

1) *What are the perceived benefits of public access to information and communication technology to users, non-users, and the general public?*
2) *How do benefits differ across countries, urban or rural settings, gender, income, education, and information and communication technology usage history?*

Hypotheses

From these questions, I generated the following hypotheses to test:

- *Males value public access to ICT more than females.*
- *Individuals in urban settings value all venues more than individuals in rural settings.*

[8] Source: http://data.worldbank.org/indicator/PA.NUS.PPP

- *Previous usage of public access venues predicts higher value than no prior usage.*
- *Individuals with greater incomes value libraries over other venues.*
- *Individuals with higher levels of educational attainment value libraries over other venues.*
- *Individuals with higher levels of educational attainment value all venues more than individuals with lower educational attainment do.*

Findings

In this study, I found statistically significant differences in the willingness to pay by venue type and the willingness to pay for all venues by gender and usage history. I found no significant differences in willingness to pay by location.

The respondents stated that they were willing to pay an average of $7.14 to prevent the reduction of hours of internet cafés, $16.92 for telecenters, $48.93 for libraries, and $59.99 for all venues. Every one of these values is statistically significantly different from a willingness to pay of zero at $p < .001$ level or greater. Respondents were internally consistent in their assessment of the value of all three venues as greater than any single one. Additionally, 30% of the population refused all bids to support public access venues, suggesting that respondents were willing to accept and reject bid values. Finally, each of these valuations differs from every other valuation at $p < .0001$ level or greater. I conclude that the Chilean general public is sensitive to the differences between venue types, places different value by venue types, and is willing to pay to prevent the closure of libraries more than telecenters, and telecenters more than internet cafés.

Table 4.1.1: Estimated willingness to pay by venue

		Internet Café	Library	Telecenter	All Venues
Chile	Mean	$7.14****	$48.93****	$16.92****	$59.99****
	s.d.	18.57	52.63	26.48	72.19
	N	1104	1104	1104	1104

**** $p < .001$

To test my hypothesis that gender predicts a difference in the benefits for public access to ICT, I tested the difference in the mean valuations by gender across venue types. I found no statistical difference between the valuation of men and women for the valuation by the individual venues of internet cafés, libraries, or telecenters. However, women stated that they would be willing to pay $64.16 to prevent the reduction of all services, whereas men stated that they would be willing to pay $55.79. Thus, there is a difference between men and women that is significant at the $p < .05$ level or greater for the valuation of all three venues. See Table 4.1.2.

Table 4.1.2: Estimated willingness to pay by gender

		Internet Café	Library	Telecenter	All Venues
Female	Mean	$7.54	$50.50	$17.91	$64.16**
	s.d.	17.05	54.86	26.12	79.38
	N	554	554	554	554
Male	Mean	$6.75	$47.35	$15.92	$55.79**
	s.d.	20	50.29	26.82	63.93

N	550	550	550	550

** $p < .05$

My second hypothesis was that urban users place a higher value on public access than rural users. To test this hypothesis, I tested the mean valuations between respondents in Chile's capital city of Santiago and those respondents outside the city. I found no significant difference in the valuation for internet cafés, libraries, or telecenters, nor in value of all three venues. This may reflect the particular population distribution of Chile. Over 10 million people, the majority of the 17 million-person population of Chile, live in the capital city or surrounding metropolitan area of Santiago. Furthermore, 89% of the population is urbanized, making tests of differences in willingness to pay less generalizable.[9] See Table 4.1.3.

Table 4.1.3: Estimated willingness to pay by location

		Internet Café	Library	Telecenter	All Venues
Outside Santiago	Mean	$7.18	$47.38	$16.78	$57.86
	s.d.	19.05	54.7	25.8	73.43
	N	666	666	666	666
Santiago	Mean	$7.08	$51.28	$17.14	$63.23
	s.d.	17.85	49.29	27.5	70.21
	N	438	438	438	438

My third set of hypotheses concerned users and non-users of public access venues. To test these hypotheses, I tested the willingness to pay in three ways. First, I contrasted the willingness to pay of users of public access venues with that of people who did not use public access venues. Second, I contrasted the value a user placed on the venue he or she used against the value that all others, both users and non-users of public access venues, placed on that venue. Finally, I contrasted the value that an individual who only used one venue placed on that venue with the value that public access venue users who did not use that venue placed on it. For example, I tested the value that individuals who only used libraries placed on libraries against the value that users of only internet cafés or telecenters placed on libraries.

The first test is between individuals who use public access ICT and those who do not use it. I find that non-users value internet cafés and telecenters with no statistical difference from users. However, I do find that users of any public access venue value libraries and all venues more than non-users. This finding shows that users of public access venues only differ from non-users when valuing libraries and all venues, not when valuing internet cafés or telecenters. See Table 4.1.4.

[9] In 2010, the most recent numbers available, 89% of the Chilean population was urban. See https://www.cia.gov/library/publications/the-world-factbook/geos/ci.html

Table 4.1.4: Estimated willingness to pay by users' behavior

		Internet Café	Library	Telecenter	All Venues
Non-users	Mean	$6.71	$42.65****	$15.99	$52.44***
	s.d.	17.9	50.38	26.61	70.56
	N	470	470	470	470
Users	Mean	$7.47	$53.58****	$17.61	$ 65.59***
	s.d.	19.07	53.81	26.38	72.92
	N	634	634	634	634

*** $p < .01$, **** $p < .0001$

Second, I test the value a user placed on the venue they used against the value that all others, both users and non-users of public access venues, placed on that venue. The results are in Table 4.1.5. For example, people who reported using internet cafés valued internet cafés at $8.21, but people who did not use internet cafés valued them at $6.39. I find that users of internet cafés are willing to pay more, as are users of libraries.

Finally, I find that people who use any venue at all are more willing to pay for all venues than people who use no venues at all. Users of any public access venue are willing to pay $65.59, whereas people who do not are willing to pay, but only $52.44. This finding shows that users are willing to pay for access, but that non-users are also, and that even non-users perceive differences between venues.

Table 4.1.5: Estimated willingness to pay by respondent's use of venue

		Internet Café	Library	Telecenter	Any/All Venues
Non-users	Mean	$6.39*	$46.55**	$16.90	$52.44***
	s.d.	15.87	51.55	26.22	70.56
	N	647	709	1059	470
Users	Mean	$8.21*	$53.20**	$17.43	$65.59***
	s.d.	21.81	54.33	32.33	72.92
	N	457	395	45	634

* $p < .10$, ** $p < .05$, *** $p < .01$

The final test is of the value that an individual who only uses one venue placed on that venue compared with the value that public access venue users who did not use that venue placed on it. For example, I examined the difference between the value that users of internet cafés and telecenters place on libraries and the value that library users place on libraries. Here, I find that exclusive users of internet cafés value them significantly more than users of libraries and telecenters. I do not, however, find that exclusive users of libraries differ in their valuation of libraries from exclusive users of internet cafés and telecenters. ***This finding suggests that even public access users who are non-users of libraries understand the heightened value of public access to libraries and are willing to pay to continue the provision of this service***. The findings are in Table 4.1.6.

Table 4.1.6: Estimated willingness to pay by respondent's use of venue

		Internet Café	Library	Telecenter
Only use this venue	Mean	$9.82***	$49.75	$22.43
	s.d.	24.96	53.74	21.98
	N	228	168	5
Only use other venues	Mean	$5.40***	$52.78	$17.58
	s.d.	8.032	53.88	26.5
	N	213	273	623

*** $p < .01$

Conclusion

The cell phone survey of Chile allowed me to test differences in preferences for public access ICT by gender, usage history, location, and venue type. The findings show that individuals support public access ICT, and that they have higher willingness to pay for libraries than other venue types. The estimated value placed on public access ICT differs by gender, venue type, and usage history. I cannot conclude that differences in urban or rural settings impact the perception of value. The survey method used for this research, contingent valuation, is characterized as establishing a high value, and should be contrasted with alternative benefit costs methods to establish a bounded range of values. This research also strongly suggests the need for additional research within country and with a sample frame updated to respond to the challenges identified in this report, as well as the baselines established by the findings.

Next Steps

This research is not without substantial caveats and next steps. It offers unambiguous support for public access ICT, but not without bounds. The value that I have estimated by venue and demographic characteristics must be contrasted with public expenditures on these venues to inform decision makers, users, and potential users. Policy makers must contrast costs with benefits, and include benefits not captured in this study to best maximize public value.

Finally, next steps must include testing the final three hypotheses for this research, as well as estimating the willingness to pay that is related to all the independent variables in a multivariable analysis. Testing the final hypotheses is a straightforward task, but it will offer less insight than a multivariate model. The second step will require two additional elements. First, future analysis must allow correlated errors between bid responses to better estimate willingness to pay (among many, see Cameron & Quiggin, 1994). This will allow a better estimate of the dependent variable and will improve all future analyses. Second, two types of multivariate models should be fit to the data. The first should predict a binary variable of protest respondents out of the general population. The second should be a multivariate regression to estimate willingness to pay by the full suite of independent variables.

4.2 User Study: Travel Cost Survey

The next findings concern the minimum benefit that users perceive from access to ICT. This research is designed to establish the minimum value that users of public access ICT place on access by estimating the total costs they incur to reach the venue, and to predict how this value changes by country, venue type, urban or rural settings, and demographic characteristics of the users. This research was designed to answer the systematized research questions:

1) *What are the perceived benefits of public access to information and communication technology to users, non-users, and the general public?*
2) *How do benefits differ across countries, urban or rural settings, gender, income, education, and information and communication technology usage history?*

Hypotheses

From these questions, I generated the following hypotheses to test:

- *Individuals incur the greatest travel costs to access libraries, and the lowest to reach internet cafés.*
- *Individuals in rural settings incur greater travel costs than individuals in urban settings.*
- *Males incur lower travel costs than females.*
- *Individuals with lower educational attainment incur lower travel costs.*
- *Individuals with greater income incur lower travel costs.*

Travel Cost Data

Estimating costs is contingent on having information for observations on each venue type, for every country, in both urban and rural settings. Table 4.2.1 shows the number of users surveyed by venue type, by country.

Table 4.2.1: Distribution of User Survey by venue, country, and location

	Internet Café		Library		Telecenter		Total		
	Urban	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Both**
Bangladesh	296	100	8	8	240	352	544	460	**1004**
Brazil	756	8	24	0	153	4	933	12	**945**
Chile	438	4	274	32	72	0	784	36	**820**
Ghana	768	112	16	0	40	16	824	128	**952**
Philippines	879	37	68	4	20	32	967	73	**1,040**

This table establishes limits to the valid inferences about differences between urban and rural populations, and which venues I can analyze in which countries. The user survey returned a large number of observations of cafés for all countries, and a large number of telecenters for Bangladesh and Brazil, but few observations for libraries for countries other than Chile. To a great extent, this will limit discussion to venues in countries where data are most plentiful. Furthermore, this is an incomplete picture of the data, as I can only use observations where I have data on travel costs.

Table 4.2.2: Travel time to public access ICT venues

Travel Time	Internet Café			Library			Telecenter		
	mean	N	s.d.	mean	N	s.d.	mean	N	s.d.
Bangladesh	22.14	173	67.5	11.25	12	5.833	23.17	452	115.8
Brazil	19.84	169	24.67	31.43	7	19.52	15	34	10.5
Chile	14.9	161	20.45	13.29	134	12.85	11.69	35	9.931
GHANA	17.34	417	24.46	38.78	9	41.99	29.53	17	21.11
Philippines	11.02	367	11.74	18.83	41	32.41	11.65	23	8.752

Table 4.2.3: Mean travel times

	Internet Café		Library		Telecenter	
	Male	Female	Male	Female	Male	Female
Bangladesh	10.279	5.292	7.700	9.667	17.329	18.646
Brazil	**3.715****	**5.594****	8.750	10.000	2.829	3.707
Chile	5.063	5.853	5.027	6.573	4.500	7.057
Ghana	**7.320****	**11.244****	25.000	18.625	6.897	13.706
Philippines	3.992	4.950	13.485	8.385	5.708	4.679

** $p < .05$

First, I show travel time by venue (see Table 4.2.2). Second, I show travel time by gender, country, and venue. Table 4.2.3 is a summary of findings, with the mean travel time in minutes by gender, venue, and country. Using a difference of mean test, I find significant differences in travel time between men and women for travel to internet cafés in Brazil and Ghana. While there are other differences in mean travel times, such as travel to internet cafés in Bangladesh, only 25 of the 173 observations that had cost data were made of women. Therefore, though the mean difference is great between the two populations, a difference of mean test does not reveal a statistical difference. These are the data that I use for the variable for travel time (***T***).

Table 4.2.4: Monthly personal income ($)

Urban PPP Wages	**Male Wages**	**Female Wages**
Bangladesh	**337.17****	**224.60****
Brazil	**297.83****	**222.04****
Chile	**457.91****	**325.79****
Ghana	**65.35****	**34.87****
Philippines	115.15	123.06
Rural PPP Wages		
Bangladesh	**255.28****	**167.17****
Brazil	99.44	177.43
Chile	**520.48****	**221.02****
Ghana	44.64	14.88
Philippines	165.28	111.28

**$p < .05$

Third, I use the reported monthly wages, assuming a 40-hour work week, for individual wages as an estimate for hourly wage (***H***). Individuals do not usually have a set hourly rate that they estimate their time is worth, except for employment. I assume that individuals value their time at 50% of their hourly income. For individuals that are not employed, I assign the reported minimum wage as their cost of time. Table 4.2.4 is a summary of these data, expressed in purchasing power parity dollars.

The next variable is the cost of using the public access ICT (***C***). While the travel cost is most often used for establishing non-market values for destinations where there is no cost of admittance, it may also be used to estimate the value that an individual places on access to the venue *in addition to the admittance cost*. Table 4.2.5 shows the number of observations where venue cost data is available. This table reflects a sparse response rate. The implication for this model is that income, travel time, and frequency will be more heavily weighted in establishing the travel cost than the venue costs.

Table 4.2.5: Count of observations with data on venue cost

	Internet Café	Library	Telecenter	Total
Bangladesh	77	2	53	132
Brazil	66	5	17	88
Chile	70	18	3	91
Ghana	121	4	9	134
Philippines	195	25	11	231

The final variable is the frequency of trips (***F***). The summary statistics are below, in Table 4.2.6.

Table 4.2.6: Mean, standard deviation, and count of frequency of trips

		Internet Café		Library		Telecenter	
		Male	Female	Male	Female	Male	Female
Bangladesh	mean	11.55	10.44	14.8	14.33	15.43	12.38
	s.d.	9.148	9.503	5.203	5.75	27.59	8.671
	N	310	39	10	6	399	144
Brazil	mean	11.83	9.672	10.29	7.5	10.32	14.65
	s.d.	9.624	8.546	7.13	5.394	6.587	8.325
	N	310	174	14	6	56	51
Chile	mean	9.713	8.122	9.074	8.591	9.69	11.61
	s.d.	8.828	6.777	6.753	6.547	6.118	7.822
	N	188	164	121	132	29	31
Ghana	mean	11.39	7.865	13	6.667	12.12	7.6
	s.d.	9.578	7.607	9.165	3.512	9.197	7.781
	N	566	148	6	3	26	15
Philippines	mean	13.87	10.68	8.679	9	8.478	9.231
	s.d.	10.62	8.491	7.799	7.328	7.273	7.095
	N	466	362	28	34	23	26

Travel Cost Findings

In the travel cost method analysis of public access venue user behavior, I sought to test four hypotheses. These were to test difference of travel costs by gender, education, income, and venue type. I find annual expenditures ranging from a high of $83 for Brazilian users of internet cafés, to a low of $15 for Ghanaian users of internet cafés. These expenditures establish a minimum annual value for users of each venue. Table 4.2.7 below shows the mean annual travel cost for individuals that use each of the public access venues, for each country, in purchasing power parity dollars. Cells in gray have a sample size of less than 29 observations, and therefore have less generalizable findings.

Table 4.2.7: Mean annual travel cost in PPP dollars by country

	Internet Café	Library	Telecenter
Bangladesh	$38.60	$23.71	$38.50
Brazil	$82.69	$13.56	$31.18
Chile	$32.75	$43.45	$35.85
Ghana	$15.24	$7.37	$41.92
Philippines	$34.30	$49.18	$23.04

One surprising finding is that travel costs are roughly equal between venues in every country for which I have consistent data (excluding grey cells). The two inter-country comparisons of interest are the greater costs incurred by users of libraries than internet cafés in Chile and the Philippines. Due to a smaller sample size and high variance in the data, these differences were not found to be statistically significant. However, as an effort to characterize the benefits, this finding suggests that end users are willing to forgo more to reach a library in Chile and the Philippines than they are to reach an internet café.

Second, in Brazil, I find that users incur the greatest travel costs of any venue for any country. These findings suggest either that Brazilians have a strong preference for internet cafés, or that these are the only venues available for their use. This finding fits within the context of the landscape findings (see Chapter 3) that the majority of public access venues in Brazil are independent, stand-alone facilities. Given limited options, Brazilians are incurring the greatest travel costs to access internet cafés, the most commonly available venue. To test the hypothesis that individuals incur greater travel costs to access ICT in rural areas than in urban areas, I divided the estimated average cost by venue location. However, the only country with data on travel cost in rural areas was Bangladesh. Table 4.2.8 is a summary of the travel costs incurred by users. I find that the travel costs of users to access internet cafés remain the same between rural and urban users, but the cost of accessing telecenters is different. With sample sizes of 255 and 152, these two costs are statistically significantly different at the $p < .001$ level. These findings imply that urban users in Bangladesh are either willing to incur greater costs to access telecenters because they value the services over internet cafés, or that telecenters are more abundant, and the frequent use of a single type of venue drives the annual travel costs.

Table 4.2.8: Mean travel costs by location in Bangladesh

	Internet Café	Library	Telecenter
Bangladesh: Rural	$37.38	$21.62	$27.16****
Bangladesh: Urban	$39.09	$26.63	$57.53****

**** $p < .0001$

My third hypothesis concerned gender. I hypothesized that gender would predict a difference in the travel costs to access ICT. I found no discernible differences in the travel costs between genders to access any venue in any country. Table 4.2.9 shows the mean travel costs incurred by men and women for each venue type and for each country. I find no significant difference in the travel cost by gender.

Table 4.2.9: Mean travel costs by gender

	Internet Café		Library		Telecenter	
	Male	Female	Male	Female	Male	Female
Bangladesh	$36.88	$47.83	$15.51	$35.19	$39.51	$36.21
Brazil	$80.24	$84.91	$13.56	-	$31.58	$30.94
Chile	$33.31	$32.15	$43.02	$43.80	$29.03	$40.02
Ghana	$15.01	$15.97	$13.33	$1.40	$65.62	$18.23
Philippines	$34.96	$32.94	$42.14	$55.78	$32.29	$12.63

Conclusion

The travel cost data collected and analyzed represents a first effort to quantify the travel costs incurred by users in diverse settings and for three types of venues. I was able to test hypotheses on differences in travel cost by venue type, gender, and location. My findings provide insights to policy makers, in that they establish a minimum public value for users of the public access venues. The summary tables above are tools for policymakers to contrast the tradeoffs between providing or subsidizing types of public access venues.
This analysis suffers from low participation rates from surveys. The challenge with low participation rates is twofold: First, a smaller sample limits the power of detection in differences between groups. Second, a low participation rate precludes the ability to generalize to the entire sample population, as participation in the question is by self-selection and may reflect bias. One lesson would be to reduce confusion about the travel and cost questions by testing the questions more thoroughly. A second lesson may be that the use of the same survey in many diverse countries, while having the benefit of consistency, may also have the drawback of not being customized for local understanding. This will be a continuing challenge in larger surveys that seek to establish common measures between countries, especially those that seek to address multiple research agendas.

These findings, and the challenges to generalizable findings, inform future in-depth analysis. It may well be that the theoretical profile of individuals that travel to reach public access ICT is inconsistent with the reality in the countries surveyed. If this is the case, then these data can be used to update the framework researchers apply studying public access ICT, and to inform policy makers about behavioral patterns to access ICT.

Next Steps

The next steps for this research are clear. First, conduct tests on education and income to predict travel cost by venue. Second, as with the in-depth study, a substantial addition must be a multivariate model to predict

travel costs by all the independent variables of interest. Third, I would suggest a country-level, fixed effect model to use data from all of the countries. This would allow insights into preferences across countries, not just within countries. Fourth, to the extent that it is possible, including venue costs from existing data collected from the venues would diminish the number of missing values in the venue costs characteristic. Including these costs would provide a clearer picture of the real total cost and inform each of the tests and models above. Finally, multivariate models will suffer from having too few observations if they drop any observation that has a missing value. Therefore, the best approach to estimating the true relationships would include data resampling.

4.3 Non-User Study: Stated Preference Survey

The third attempt to quantity total value of public access to ICT was to estimate the benefit to individuals who do not use public access to ICT. Establishing a willingness to pay in non-users who live in developing countries would be a novel finding, so my second objective was to contextualize willingness to pay within the landscape of these countries. This research is designed to address the questions:

1) *What are the benefits of public access to information and communication technology to users, non-users, and the general public?*
2) *How do benefits differ across venues, countries, urban or rural settings, gender, income, education, and information and communication technology usage history?*

Hypotheses

To address these larger questions, I established the following hypotheses:

- *Non-users will state that they are willing to pay some non-zero amount to prevent the closure of existing public access ICT venues.*
- *Non-users will have a higher willingness to pay for libraries than for other public access venues.*
- *Males will have a higher willingness to pay for all venues than females will.*
- *Individual income will be positively correlated with willingness to pay.*
- *Education will be positively correlated with willingness to pay.*

Findings

For this portion of the research, I give the estimated mean willingness to pay, test the hypotheses, and contextualize findings by venue type. My analysis returned evidence of widespread willingness to pay by the non-user population to keep public access venues open for the general public. Willingness to pay ranged from a high of $101.30 (PPP) in the Philippines for all venues to a low of $2.02 in Bangladesh for libraries.

Respondents were internally consistent in their willingness to pay more to keep all venues open than to keep any one venue open, lending internal validity to these data. These findings are evidence of wide perception of the benefit of public access ICT, and should inform policy makers' assessments of the importance of providing public access facilities. These findings are particularly important because they come from the population of non-users; in many countries, this population is the vast majority. To the extent that the households in communities that have public access ICT venues represent the entire population, these findings may be used to generalize to the non-users in each country.

Table 4.3.1 is a summary of the mean stated willingness to pay by venue type and country. For example, I have data on 299 Brazilian non-users, and their average willingness to pay to prevent the closure of all three types of public access venue was $33.38. These values represent a high estimate of the perceived public value of public access venues, and may be contrasted with the travel costs of users to bound estimates of the public value of ICT. I caution readers that these are not a perfect match; the estimates for users are an annual measure, and the stated willingness to pay from non-users is a one-time stated preference. Every value is statistically significantly different from zero at a $p < .05$ or greater level.

Table 4.3.1: Mean willingness to pay by country and venue

	Internet Café	Library	Telecenter	All Venues
Bangladesh	$6.59	$2.02	$6.24	$9.34
Brazil	$10.83	$12.89	$11.56	$33.38
Chile	$11.78	$14.15	$12.43	$17.34
Ghana	$13.23	$11.32	$10.93	$21.75
Philippines	$64.14	$51.10	$42.28	$101.30

Respondents' willingness to pay differed by venue, indicating an understanding of the differences in the types of institution each public venue represents, and in the type of services offered in each venue. The internal raking of public value by venue type could be explained, at least partially, by familiarity with the venues. For example, in Bangladesh and the Philippines, two countries with low numbers of libraries and high numbers of internet cafés, the public value of internet cafés strictly dominated that of libraries. This table addresses the first two hypotheses. I find that non-users do have a willingness to pay, and that it does differ by venue type. Next, I test the hypothesis that willingness to pay could be predicted by gender. I find statistically significant differences in men's and women's willingness to pay for internet cafés and telecenters in both Brazil and Ghana. In each of those four cases, men stated a higher willingness to pay than women. Second, for Bangladesh, Brazil, and Ghana, I find a higher willingness to pay for all venues by men over women. These findings are also interesting for what I do not find. In no country did I find a difference in men's and women's willingness to pay for libraries. Table 4.3.2 summarizes the findings.

Table 4.3.2: Non-user willingness to pay by gender

	Internet Café		Library		Telecenter		All Venues	
	Male	Female	Male	Female	Male	Female	Male	Female
Bangladesh	$7.09	$5.90	$2.31	$1.60	$6.57	$5.83	$11.11*	$7.65*
Brazil	$12.03*	$9.53*	$13.73	12.02	$12.82*	$10.36*	$40.20**	$26.23**
Chile	$10.58	$12.42	$13.21	$14.66	$12.44	$12.42	$12.79	$20.10
Ghana	$17.45**	$8.89**	$12.88	$9.74	$14.51*	$6.81*	$27.42**	$16.68**
Philippines	$66.58	$61.86	$46.83	$55.08	$42.64	$41.95	$115.90	$86.84

* $p < .1$, ** $p < .05$, *** $p < .01$, **** $p < .001$

Third, I characterize our general findings in the landscape of the countries, and find some preliminary correlations between income, connectivity, and preferences for public access venues by venue type (World Bank, 2012; CIA, 2012).

Libraries

Countries with greater per capita income ranked libraries above alternative public access venues. Non-users in Brazil and Chile placed libraries higher than internet cafés and telecenters, whereas in Bangladesh, Ghana, and

the Philippines, respondents placed internet cafés above libraries. One hypothesis would be that public services, including libraries, are greater in countries with higher per capita income, and as such, individuals value them higher. In countries with lower per capita income, the private sector is providing public access in the form of internet cafés, and the increased familiarity with these services predicts a higher public valuation.

Table 4.3.3: Gross domestic product per capita

	2007	2008	2009	2010	2011	Average 2007–2011
Bangladesh	$475	$547	$608	$675	$735	$608
Brazil	$7,197	$8,629	$8,392	$10,993	$12,594	$9,561
Chile	$10,406	$10,695	$10,179	$12,640	$14,394	$11,662
Ghana	$1,085	$1,226	$1,090	$1,319	$1,570	$1,258
Philippines	$1,685	$1,925	$1,836	$2,140	$2,370	$1,991

Another characteristic that Brazil and Chile share is a high percentage of total population that uses the internet. Chilean internet usage in 2009 was estimated at 41%, while it was 38% in Brazil. One hypothesis is that individuals in a culture familiar with ICT services value public access highly, even if they do not use the venue.

Table 4.3.4: Population, internet users, and percentage of the population online

	Population	Internet Users	Year	% Users
Bangladesh	161,083,804	617,300	2009	.4%
Brazil	199,321,413	75,982,000	2009	38%
Chile	17,067,369	7,009,000	2009	41%
Ghana	24,652,402	1,297,000	2009	5%
Philippines	103,775,002	8,278,000	2009	8%

Bangladeshi libraries were, by far, the least valued public access venue, with a stated willingness to pay of $2.02 PPP. The low valuation may more reflect the population's low level of familiarity with the services that a library provides, as Bangladesh had an internet usage rate of only .4% in 2009. In conclusion, the low willingness to pay for library services can be interpreted as bolstering the internal validity of the survey, since unknown services resulted in low willingness to pay.

Internet Cafés

In countries with low per capita income, internet cafés are perceived by non-users to have greater value, relative to other public access venues. To the extent that per capita GDP is a predictor of the provision of social services such as libraries, a working hypothesis would be that lower-income countries tend to value internet cafés over libraries, and that this preference is due, in part, to familiarity. These data also suggest research into the relationship between the revenue model for public services, the provision of social services, and the stated willingness to pay for public services. In instances where paying for social services is not a

norm, the end user may simply reject the payment vehicle, as opposed to rejecting the provision of the service.

In summary, the non-user data provided valuable insights into the creation of public value through public access venues. First and foremost, non-users understood that public access was valuable, understood differences between venue types, and were willing to pay to prevent the loss of the public value. In countries with higher per capita income and internet usage, libraries were valued more highly than internet cafés and telecenters. In countries with lower per capita income and internet usage, internet cafés were valued more highly than libraries. Finally, with the exception of Chile's case, men expressed greater willingness to pay for others to use public access venues than women did.

Looking Forward/Lessons Learned

The substantial challenges facing the use of the non-user research are the response rate, and the clarity of interpreting missing values and zero willingness to pay. These are substantial challenges in that there are many missing data. In some cases, these missing data result in only 7% of the respondents being included within the multivariate models. Such a low response rate casts doubt upon the randomness of responses and limits the valid inferences to the entire population of non-users. Low response rates generally indicate an unclear question, an unwieldy length of survey, or a question that may be inappropriate for the respondent. Questions should have been better pre-tested, using respondents similar to the target sample.
A second lesson concerns the survey design. The length of a survey can be concerning, especially if the respondents are chosen randomly and not compensated for their participation. In such a case, it is possible that the survey team may feel compelled to go through the survey quickly in order to complete the survey before the respondent quits.

Next Steps

There are several ways to improve this analysis. One next step would be to conduct difference of mean tests to test hypotheses about the predictive power of education and income on stated willingness to pay for public access ICT. Second, employing a country-level fixed effect model to use data from all of the countries would allow insights into preferences across countries, not just within countries. Finally, to address the missing data, one could resample the existing data and infer missing values.

4.4 Costs

The final area of research is to estimate the cost of providing public access ICT. The existing findings of benefits by demographic and geographic characteristics would be contextualized with the cost of providing these services. This portion of the findings concerns the final research questions:

3) *What are the operational costs of providing access to information and communication technology in a library, telecenter, or internet café?*
4) *How do those costs differ between countries, and in urban and rural settings?*

I narrow these broad research questions to the following testable hypotheses:

- *Internet cafés cost less per user than libraries and telecenters.*
- *Urban venues cost more to operate than rural venues, across all venue types.*

Data to estimate costs come from the venue survey described in Section 3.4. These data are subject to three challenges: the distribution of completed surveys across venue type, the rate of participation on cost questions, and the distribution of surveys across the urban-rural dichotomy. Table 4.4.1 shows the number of observations by country by venue:

Table 4.4.1: Venues by country

	Internet Café	Library	Missing	Telecenter	Total
Bangladesh	99	4	0	148	251
Brazil	181	5	0	38	224
Chile	102	68	16	57	243
Ghana	220	4	0	26	250
Philippines	229	18	0	14	261
Total	**831**	**99**	**16**	**283**	**1,229**

Out of 1,229 total observations, we have only 99 libraries, and those are mostly in Chile. For Bangladesh and Ghana, I have only four observations of libraries. This will limit inferences to only internet cafés and telecenters.

Second, the availability of cost data from these surveys is limited. Table 4.4.2 is a count of the number of venues where data on costs exist.

Table 4.4.2: Surveys with total expenditures greater than zero

	Internet Café	Library	Telecenter	Total
Bangladesh	99	3	145	247
Brazil	72	1	2	75
Chile	61	5	6	72
Ghana	129	1	17	147
Philippines	189	4	6	199
Total	**550**	**14**	**176**	**740**

The second method for estimating costs was to sum the itemized costs in the venue survey. Table 4.4.3 shows the count of venues where these summed costs were greater than zero.

Table 4.4.3: Venues where itemized costs are greater than zero

	Internet Café	Library	Telecenter	Total
Bangladesh	95	4	146	245
Brazil	54	0	4	58
Chile	80	13	12	105
Ghana	176	3	19	198
Philippines	198	6	10	214
Total	**603**	**26**	**191**	**820**

These two previous tables show that the venue survey returned only 14 observations for libraries where the operators stated their estimate of the total cost of running the venue, and only 26 observations for libraries where the operators stated their itemized costs. The very limited response rate results in very little information on the costs of public access ICT in a library. Second, while the survey returned little information on the costs of telecenters, the response rate was higher for information on the costs of running an internet café. In this section, I show the estimates of the costs of operating internet cafés. Table 4.4.4 shows the sample size by the urban-rural dichotomy.

Table 4.4.4: Urban-rural dichotomies by country

	Rural	Urban	Total
Bangladesh	115	136	251
Brazil	2	222	224
Chile	11	232	243
Ghana	38	212	250
Philippines	26	235	261
Total	**192**	**1,037**	**1,229**

The total number of rural observations differs between countries, with Bangladesh as the lone one with many observations from rural venues. However, examining the cases where cost data is available presents another limit.

Table 4.4.5: Urban-rural sample with data on total expenditures

	Rural	Urban	Total
Bangladesh	113	134	247
Brazil	0	75	75
Chile	1	71	72
Ghana	23	124	147
Philippines	17	182	199
Total	**154**	**586**	**740**

Table 4.4.6: Urban-rural sample with itemized expenditures

	Rural	Urban	Total
Bangladesh	112	133	245
Brazil	0	58	58
Chile	1	104	105
Ghana	32	166	198
Philippines	23	191	214
Total	**168**	**652**	**820**

As the preceding tables show, the venue survey did not return any data on rural venues in Brazil and Chile, and very little on rural venues in Ghana and the Philippines. Therefore, I cannot make distinctions between costs of venues in urban and rural settings, with the possible exception of those in Bangladesh. Finally, these data do not identify differences between the types of costs between venues in urban and rural settings. Despite the intention of the venue survey to identify costs along the three axes of venue, location, and cost type, I will only be able to characterize costs in internet cafés and telecenters, and with the exception of Bangladesh, only in urban settings.

Country-Level Analysis

The table below is a summary of the costs data returned by the venue survey. It provides the total costs in purchasing power parity dollars by venue, and by country. I included the sample size and the standard deviation to better summarize the data for critical review.

Table 4.4.7: Self-reported total costs

Country	Venue Location	Internet Café			Library			Telecenter		
		PPP	s.d.	N	PPP	s.d.	N	PPP	s.d.	N
Bangladesh	Urban	$ 980.40	617.1	74	$ 176.90	201.8	2	$ 511.80	519	60
	Rural	$ 350.00	300.7	25	$ 218.70	222.3	2	$ 338.70	506.8	86
	ALL	$ 821.20	617.8	99	$ 197.80	175	4	$ 409.80	517.2	146
Philippines	Urban	$ 1,168.00	1200	190	$ 2,811.00	5742	6	$ 875.30	1310	3
	Rural	$ 482.10	381	15	$ 363.00		1	$ 715.90	1062	7
	ALL	$ 1,118.00	1173	205	$ 2,461.00	5323	7	$ 763.70	1067	10
Brazil*	Urban	$ 1,273.00	1069	88	$ 277.80		1	$ 852.10	718.6	5
	Rural	N/A								
	ALL	N/A								
Ghana	Urban	$ 443.00	366.7	160	$ 157.40	101.2	3	$ 319.20	200	11
	Rural	$ 487.40	782.9	24				$ 183.70	170.8	10
	ALL	$ 448.80	440.5	184	$ 157.40	101.2	3	$ 254.70	194.7	21
Chile	Urban	$ 1,365.00	1432	84	$ 1,029.00	1293	14	$ 823.70	537.1	13
	Rural	$ 295.20		1	$ 1,636.00		1			
	ALL	$ 1,353.00	1428	85	$ 1,069.00	1256	15	$ 823.70	537.1	13

*Brazil had no observations with cost data for any rural venues.

Next Steps

Several points emerge from this table that offer opportunities to improve future research on costs. First, for each country, I have contrasted the reported individual expenditures with the reported total expenditures. Ideally, the sum of the itemized expenditures would equal the total expenditures; however, this is rarely the case. This challenge of self-reported cost data is magnified when estimating costs for so large an institution as a library, telecenter or internet café. My suggestion would be to either ask for self-reported information on items that are less complex; provide additional internal controls; or work with the accountants of the institutions, as opposed to the venue operators.

Second, the low response rates suggest that a survey is not the correct vehicle for collecting information on institutional costs. My own field experience gathering cost data from for-profit institutions, and the paucity of these data, lead me to suggest that building relationships with a smaller number of institutions, establishing trust over time, and working with these institutions to identify their costs (rather than asking them to suddenly and unexpectedly summarize their costs), will result in both higher response rates and more reliable data. In a complex area of research, such as costs, I believe that a survey is less accurate than an in-depth interview with a trusted informant. Building trust with the informant over time, scheduling meetings well in advance, and preparing the informant with the questions in advance are more likely to return a smaller sample of more accurate information. The lesson from the venue survey is that fewer, but more accurate, cost data would be more valuable. Gathering these data requires field time of researchers who can easily communicate and build trust with key informants.

Third, I believe that the matching of research method to sample framing with respect to cost data should be updated. The research objectives of identifying cost from three types of venues in two types of locations were not reflected in the sample framing; researchers knew the number of libraries was small, but they used a research tool, a survey, that is more appropriate for large-*n* studies. The result was that survey teams sampled heavily on internet cafés and telecenters, and almost not at all on libraries. This was a function of the reality that there are few libraries. Instead of using a uniform research tool, a common survey on costs, a more appropriate method would have been to match the survey tool to the known number of venues; using small-*n* methods for cases of libraries, and large-*n* methods for more plentiful venue types.

Finally, the survey teams sampled very heavily in urban contexts, but very little in rural contexts. This is the same challenge as the distribution of the venue types: If there are few rural venues, then we need greater certainty that their cost estimates are accurate.

In conclusion, the venue survey was not an optimal research tool for collecting costs data. It was not designed exclusively for collecting cost data; rather, it was designed for a great number of objectives. Thus, the survey length grew, and the sample framing optimal for any one research objective was muddled by competing interests. This is the nature of compromise within the context of time and fiscal constraints. Possible solutions include adopting the in-depth survey approach to specific research areas, including relying heavily upon in-depth tools when working with small-*n* samples. Limiting a survey to only one research topic will enable optimal sample framing, survey design, and internal checks on consistency. If the intention of the venue survey was to identify areas ripe for research, then qualitative work on process tracing and theory generation will compliment quantitative work on hypothesis testing and generalization.

Section 5: Discussion and Future Research

This research was able to estimate some bounds on the values that users and non-users place on public access to ICT by country, venue type, gender, and geographical characteristics. Efforts to estimate costs were unproductive. In this section, I summarize findings, contextualize the contribution of this work, and suggest how future research may be informed by this work.

My analysis of users provided evidence that public access users incur annual travel costs between $15 (Ghanaians to internet cafés) and $83 (Brazilians to internet cafés). This finding shows the minimum annual benefit for users. In tests of preferences between venue types, I found that, for the two countries where I had reliable travel cost information for libraries, Chile and the Philippines, travel costs were highest for libraries. In tests of differences between travel costs for men and women, I found few that were statistically significant. Evidence of differences in travel costs between urban and rural settings were minimal. Within Bangladesh, the only country to have travel costs in both urban and rural areas, I found greater travel costs for telecenters in urban areas than in rural areas. These findings may establish a minimum annual benefit to users of public access venues, and can inform policy makers interested in weighing the costs of providing access and the benefits to users of such a project.

My analysis of non-users resulted in evidence of widespread willingness to pay for others to have public access to ICTs. The willingness to pay ranged from $2 (libraries in Bangladesh) to $64 (internet cafés in the Philippines). I found differences in willingness to pay for libraries and internet cafés, which suggests familiarity and preferences for venue depending upon type. In Brazil and Chile, the highest willingness to pay was for libraries; in Bangladesh, Ghana, and the Philippines, it was for internet cafés.[10] Second, I found significant differences in the willingness to pay for venues by gender, suggesting that men and women value venues differently. This work is the first multi-country willingness to pay study for public access, and my findings can inform policy makers' assessments of the value of public access venues that is perceived even by individuals who do not use the venues. I cannot disprove the hypothesis that the public at large understands the value of public access venues and supports provision for the general populace.

In the in-depth study of the benefits of public access venues in Chile, I found overwhelming support for public access ICT venues. I found a mean individual willingness to pay for libraries of $49, and a mean for all venues of $60. The in-depth study found lower support for internet cafés, with a willingness to pay of $7, and moderate support for telecenters, with a willingness to pay of $17. I found differences in willingness to pay by gender: Women were willing to pay more for all venues. I found no significant differences of willingness to pay between respondents within Santiago and those outside the capital city. These findings should suggest to policy makers in Chile, and similar countries, that the public understands and has preferences for libraries as public access venues above telecenters and internet cafés.

Finally, my efforts to generalize and predict the costs of providing public access venues by type and location were not successful. The stated costs methods did not result in generalizable data.
The table below, Table 5.1.1, represents a summary of my findings from the user, non-user, and in-depth research. The table may be interpreted in the following ways: Estimates of the non-users should be considered a high estimate of perceived benefits for the general public, estimates for users should be considered minimum annual benefits for users, and the in-depth study results include both users and non-users.

[10] My analysis also showed that respondents were internally consistent and rational; willingness to pay for all venues was always greater than for any one venue.

Table 5.1.1: Summary of findings

		Internet café		Library		Telecenter		All Venues	
		Male	Female	Male	Female	Male	Female	Male	Female
Bangladesh	Non-users: Stated WTP	$7.09	$5.90	$2.31	$1.60	$6.57	$5.83	$11.11	$7.65
	Users: Travel Cost	$36.88	$47.83	$15.51	$35.19	$39.51	$36.21		
Brazil	Non-users: Stated WTP	$12.03	$9.53	$13.73	12.02	$12.82	$10.36	$40.20	$26.23
	Users: Travel Cost	$80.24	$84.91	$13.56	N/A	$31.58	$30.94		
Chile	Non-users: Stated WTP	$10.58	$12.42	$13.21	$14.66	$12.44	$12.42	$12.79	$20.10
	Users: Travel Cost	$33.31	$32.15	$43.02	$43.80	$29.03	$40.02		
	In-Depth: WTP	$6.75	$7.54	$47.35	$50.50	$15.92	$17.91	$55.79	$64.16
Ghana	Non-users: Stated WTP	$17.45	$8.89	$12.88	$9.74	$14.51	$6.81	$27.42	$16.68
	Users: Travel Cost	$15.01	$15.97	$13.33	$1.40	$65.62	$18.23		
Philippines	Non-users: Stated WTP	$66.58	$61.86	$46.83	$55.08	$42.64	$41.95	$115.90	$86.84
	Users: Travel Cost	$34.96	$32.94	$42.14	$55.78	$32.29	$12.63		

Interpreting Table 5.1.1 is best explained with an example: If a policy maker in a community in Bangladesh wished to estimate the benefits of providing a public access venue using the data from this report, he or she would do the following: If the population were 100, of which 45 are male non-users and 45 are female non-users, then the non-user public value of a public access internet café would be (45 x $7.09) + (45 x $5.90) = $583.20. In contrast, the benefit to the users represents an annual minimum value. Therefore, in this same community, if there were 5 male users of internet cafés and 5 female users of internet cafés, then, combined, they would place a minimum annual value of a public access internet café at (5 x $36.88) + (5 x $47.83) = $423.55.

These findings are a simplification, and they represent extrapolations from the data I collected and analyzed. The findings are subject to all the caveats discussed in Section 3, Methods and Measures, as well as to the limitations to valid inferences discussed in the findings. My analysis of benefits is not intended to be a formulaic substitute for policy makers. It serves as a complementary tool to be used alongside the other methods of analysis in this report to offer one method of valuing public access to ICT. Furthermore, the estimates in the tables below are midpoints of ranges, not point estimates. Thus, these data provide ranges of values, and should be interpreted as such.

5.1 Conclusion

To local governments, this project identifies the characteristics of the population that are accessing ICT, what their personal expenditures are to access ICT, and how non-users value public access to ICT. The travel cost analysis shows which demographic groups are getting use value from venues, while the contingent valuation analysis shows how the general population values public access to ICT. With demographic information on use and non-use values, the local government may identify population groups that are not accessing ICT, as well as populations that are disproportionately accessing ICT. My report identifies geographic and demographic areas where individuals receive higher minimum benefits when accessing ICT. This information may be coupled with geographic information on national library costs to identify areas where additional public access ICT venues are more likely to pass benefit cost analyses.

This study has the potential for policy implications for better creating public value. The travel cost method identifies population groups that use or do not use public access to ICT, and thus have the most to gain from the location of public access ICT venues closer to their communities. The contingent valuation study contributes to an understanding of the difficult to measure non-use value of public access ICT venues. This information is especially important to a government with a legal mandate to apply benefit cost analysis to public projects, such as libraries.

For NGOs, my work to identify rates of usage while controlling for demographic and geographic characteristics has development policy implications, funding implications, and advising implications. For NGOs working in development, the identification of user groups with high minimum benefits of access to public ICT venues leads directly to targeted development policy. This research identifies demographic and geographic user groups that may reap the greatest benefit from closer public access to ICT, or for whom a specific group of characteristics of public ICT access is most important. Second, for NGOs that fund public access to ICT, this research helps to identify the type of ICT venue with lowest costs within the limitations of the cost findings in Section 4.4. Coupling this information with minimum benefits, in the form of travel cost to access ICT, informs targeted funding decisions to impact target demographic and geographic groups. Finally, for NGOs partnering with governments or advising governments, this research allows more specific advice for impacting targeted demographic groups with the types of venues and services for which they have the highest minimum benefit. Public access ICT venues may find the findings relevant. The large sample across venues, demographics, and geographic settings allows me to identify the characteristics of public access ICT with greater statistical power than the individual venue operator. The individual operators may better know the characteristics of their customer/users, but their sample is limited to a single venue type and a single venue. For operators of series of venues, such as public libraries, this research identifies what the most demanded public access ICT services are for that type of venue with the characteristics of the local demography.

Finally, I have identified the types of past benefit cost analyses for libraries in the United States, Australia, the UK, and some European nations. All of these examples come from developed countries, and all the methods used to perform cost benefit analysis are variants of *stated preference* contingent valuation (Aabø, 2005, 2009; Aabø & Audunson, 2002; Holt & Elliott, 1998, 2002, 2003; Holt, Elliott, & Dussold, 1996). Stated preference has been controversial due to high stated willingness to pay for resources, but low revealed payment for these same resources, leading two scholars to state that "contingent valuation surveys do not measure the preferences they attempt to measure" (Diamond & Hausman, 1994). This research addresses some of those challenges. I have added a level of robustness to my findings by checking those findings from the contingent valuation portion of this research with information from the travel cost method portion of this research. The travel cost analysis relies upon the *revealed preference* method, and thus allows a complement to the *stated preference* method of contingent valuation. The travel cost methods does not rely upon the theoretical willingness to pay for a service, nor on the theoretical willingness to accept compensation for loss of a good or service. Instead, I identify the actual costs incurred by individuals to use public access ICT. The successes and failures of the multiple methods I used will inform future research.

5.2 Future Research

The next steps for estimating the benefits and costs of public access to ICT venues must include testing the untested hypotheses from the in-depth study, the user study, and the non-user study. The in-depth data must be modeled allowing for correlated errors, and multivariate models must be fit to the data. The non-user data must also be fit to multivariate models, and the best practice would be to resample the data. The user data must be resampled to allow better use of existing data. I believe it is essential that these analyses be done, and done to a high standard. The massive costs of collecting these data vastly outweigh the additional costs of performing a full analysis of the relevant information. While the findings that I have offered are insightful in an emerging field, the potential of these data to both inform public policy and development policy, and improve the lives and livelihoods of millions of people must not be neglected.

Works Cited

Aabo, S. (2009). Libraries and return on investment: A meta-analysis. *New Library World*, *110*(7), 311–324.

Aabø, S. (2005). Are public libraries worth their price?: A contingent valuation study of Norwegian public libraries. *New Library World*, *106*(11/12), 487–495. doi:10.1108/03074800510634973

Aabø, S., & Audunson, R. (2002, March 1). Rational choice and valuation of public libraries. *Journal of Librarianship and Information Science*, *34*(1), 5 –15. doi:10.1177/096100060203400102

Aranciba, H. (2006, November 7). Cost-benefit analysis of investment in the budget process: The experience of Chile [Paper presented at the World Bank]. Washington, DC: The World Bank.

Arrow, K., Solow, R., Portney, P. R., Leamer, E. E., Radner, R., & Schuman, H. (1993). *Report of the NOAA panel on contingent valuation*. Washington, DC: Federal Register. Also available at http://www.cbe.csueastbay.edu/~alima/courses/4306/articles/NOAA%20on%20contingent%20valuation%201993.pdf

Barron, D., Williams, R., Bajjaly, S., Arns, J., & Wilson, S. (2005). *The economic impact of public libraries on South Carolina*. Columbia, SC: University of South Carolina. Also available at http://courseweb.lis.illinois.edu/~katewill/spring2011-502/502%20and%20other%20readings/barron_2005_EconmicImpactLibrariesSC.pdf

Best, M. L., Kolko, B., Thakur, D., & Aitieva, M. (2007). Assessment of economic growth impact of the eCenters project in Kyrgyzstan. Academy for Educational Development. Retrieved from http://mikeb.inta.gatech.edu/uploads/papers/Kyrgyzstan.eCenters.pdf

Blamey, R. K., Bennett, J. W., & Morrison, M. D. (1999, February). Yea-saying in contingent valuation surveys. *Land Economics*, *75*(1), 126–141. doi:10.2307/3146997

Bowes, M. D., & Loomis, J. B. (1980, November). A note on the use of travel cost models with unequal zonal populations. *Land Economics*, *56*(4), 465–470.

Brown, G., & Mendelsohn, R. (1984, August). The hedonic travel cost method. *The Review of Economics and Statistics*, *66*(3), 427–433.

Cameron, T. A. (1992, August). Combining contingent valuation and travel cost data for the valuation of nonmarket goods. *Land Economics*, *68*(3), 302–317.

Cameron, T. A., & Quiggin, J. (1994, November). Estimation using contingent valuation data from a "dichotomous choice with follow-up" questionnaire. *Journal of Environmental Economics and Management*, 27(3), 218–234. doi:10.1006/jeem.1994.1035

Celedon, A., Pequeno, A., Carrido, M., & Patin, B. (2012). *El rol de los telecentros y bibliotecas en situación de catástrofe: El caso Chileno* [The role of telecenters and libraries in a disaster situation: The Chilean case]. Research Brief. Seattle, WA: Technology and Social Change Group (TASCHA), University of Washington Information School.

Central Intelligence Agency (CIA). (2012). *World factbook*. Washington, DC: CIA. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/rankorder/2153rank.html

Central Intelligence Agency (CIA). (2013). *World factbook*. Washington, DC: CIA. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/ci.html

Chung, H-K. (2008, June 1). The contingent valuation method in public libraries. *Journal of Librarianship and Information Science*, *40*(2), 71–80. doi:10.1177/0961000608089343

Clawson, M. (1959). *Methods of measuring the demand for and value of outdoor recreation*. Washington, DC: Resources for the Future.

Clawson, M., & Knetsch, J. (1966). *Economics of outdoor recreation*. Baltimore, MD: Published for Resources for the Future & Johns Hopkins University Press.

Dana, J. C. (1920). *The new museum: A plan for a new museum*. Woodstock, VT: Elm Tree Press.

Debono, B. (2002). Assessing the social impact of public libaries: What the literature is saying. *Australasian Public Libraries and Information Services*, *15*(2), 80–95.

Diamond, P. A., & Hausman, J. A. (1994). Contingent valuation: Is some number better than no number? *Journal of Economic Perspectives*, *8*(4), 45–64.

Dillman, D. A. (2002). Presidential address. *Public Opinion Quarterly*, *66*(3), 473–494. doi:10.1086/342184

Durrance, J., & Fisher-Pettigrew, K. (2002). Toward developing measures of the impact of library and information services. *Reference & User Services Quarterly*, *42*(1), 43–53.

Elliott, D. S., Holt, G., Hayden, S., & Holt, L. (2007). *Measuring your library's value: How to do a cost-benefit analysis for your public library*. ALA Editions.

Executive Order No. 12,291. (1981). *46 FR 13193, 3 CFR*. Retrieved from http://www.archives.gov/federal-register/codification/executive-order/12291.html

Executive Order No. 12,866. (1993). *58 FR 51735, 3 CFR*. Retrieved from http://www.archives.gov/federal-register/executive-orders/pdf/12866.pdf

Executive Order No. 13,497. (2009). *74 FR 6113, 3 CFR*. Retrieved from http://www.gpo.gov/fdsys/pkg/FR-2009-02-04/pdf/E9-2486.pdf

Fontaine, E.R. (2004, October 27). Project evaluation and the national system of public investment in Chile. Paper presented at the World Bank, Washington, DC.

Garrett, R. K. (2006, April). Protest in an information society: A review of literature on social movements and the new ICTs. *Information, Communication and Society*, *9*(2), 202–224. doi:10.1080/13691180600630773

Griffiths, J.-M., King, D., Tomer, C., Lynch, T., & Harrington, J. (2004). *Taxpayer return on investment in Florida public libraries: Summary report.* Tallahassee, FL: Florida Deptqrtment of State, State Library and Archives.

Gurumurthy, A. (2006). Promoting gender equality? Some development-related uses of ICTs by women. *Development in Practice*, *16*(6), 611–616. doi:10.1080/09614520600958298

Hanemann, M. (1994). Valuing the environment through contingent valuation. *Journal of Economic Perspectives*, *8*(4), 19–43.

Holt, G. E., & Elliott, D. (1998, November 11). Proving your library's worth: A test case. *Library Journal*, *123*(18), 42–44.

Holt, G. E., & Elliott, D. (2002). Cost benefit analysis: A summary of the methodology. *The Bottom Line: Managing Library Finances*, *15*(4), 154–158. doi:10.1108/08880450210450915.

Holt, G. E., & Elliott, D. (2003). Measuring outcomes: Applying cost-benefit analysis to middle-sized and smaller public libraries. *Library Trends*, *51*(3), 424–440.

Holt, G. E., Elliott, D., & Dussold, C. (1996). A framework for evaluating public investment in urban libraries. The *Bottom Line: Managing Library Finances*, *9*(4), 4–13.

Krutilla, J. V. (1967). Conservation reconsidered. *The American Economic Review*, *57*(4), 777–786.

Lee, S. J., Brick, M., Brown, E. R., & Grant, D. (2010). Growing cell-phone population and noncoverage bias in traditional random digit dial telephone health surveys. *Health Services Research*, *45*(4), 1121–1139. doi:10.1111/j.1475-6773.2010.01120.x

Ley, E. (2006). Appraisal of public investment: Chile. Washington, DC: World Bank. Retrieved from http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2007/09/06/000310607_20070906091921/Rendered/PDF/406180CL0Publi1b1OFFICIAL0USE0ONLY1.pdf

Marcel, M. (2004, October 27). Public expenditure evaluation and growth – Country experiences: Chile. Paper presented at the World Bank, Washington, DC.

McConnell, K., & Strand, I. (1981). Measuring the cost of time in recreation demand analysis: An application to sportfishing. *American Journal of Agricultural Economics*, *63*(1), 153–156.

Mitchell, R. C., & Carson, R. T. (1989). *Using surveys to value public goods: The contingent valuation method*. Washington, DC: Resources for the Future.

Nichols, L. M., Bowes, M., & Dwyer, J. F. (1978). Reflecting travel time in travel-cost-based estimates of recreation use and value. *Forestry Research Report, 78*-12.

OMB Circular A-4. (2003). Retrieved from http://www.whitehouse.gov/omb/circulars_a004_a-4#e

Parkinson, S., & Lauzon, A. C. (2008). The impact of the Internet on local social equity: A study of a telecenter in Aguablanca, Colombia. *Information Technologies & International Development*, 4(3). Also available at http://itidjournal.org/itid/article/viewArticle/300

Pierce, R. M. (1994). Valuing the environment: NOAA's new regulations under the Oil Protection Act of 1990. *Pepperdine Law Review*, *22*, 167.

Portney, P. R. (1994, October 1). The contingent valuation debate: Why economists should care. *The Journal of Economic Perspectives*, *8*(4), 3–17.

Pung, C., Clarke, A., & Patten, L. (2004). Measuring the economic impact of the British Library. *New Review of Academic Librarianship*, *10*(1), 79–102. doi:10.1080/13614530412331296826

Randall, A. (1994, February). A difficulty with the travel cost method. *Land Economics*, *70*(1), 88–96.

Rea, P. (Ed.). (1916). *Proceedings of the American Association of Museums*, Vol. 10. Charleston, SC: Waverly Press.

Ready, R., Whitehead, J., & Blomquist, G. (1995). Contingent valuation when respondents are ambivalent. *Journal of Environmental Economics and Management*, *29*(2), 181–196.

Sey, A., & Fellows, M. (2009). Literature review on the impact of public access to information and communication technologies. CIS Working Paper No. 6, University of Washington Global Impact Study. Retrieved from http://cis.washington.edu/depository/publications/CIS-WorkingPaperNo6.pdf

Smith, N. (1994, July). State agency use of planning and role setting for public libraries and output measures for public libraries. *Public Libraries*, *33*(4), 211–212.

Survey Working Group. (2012). Global impact study surveys: Methodologies and implementation. Technology & Social Change Group, University of Washington Information School. Retrieved from http://tascha.uw.edu/publications/global-impact-study-surveys-methodologies-and-implementation

Swords, D. (1991, July 1). *Ohio v. United States Department of the Interior*: A contingent step forward for environmentalists. *Louisiana Law Review*, 51(6). Retrieved from http://digitalcommons.law.lsu.edu/lalrev/vol51/iss6/8

Technology and Social Change Group (TASCHA). (2010). Global impact study user survey instrument. TASCHA, University of Washington Information School. Retrieved from http://library.globalimpactstudy.org/doc/user-survey-instrument

Tessler, A. (2013). Economic valuation of the British Library. Oxford, UK: Oxford Economics. Retrieved from http://www.bl.uk/aboutus/stratpolprog/increasingvalue/britishlibrary_economicevaluation.pdf

Usherwood, R., & Linley, R. (1998). *New library – New measures: A social audit of public libraries*. Amsterdam, The Netherlands: IFLA. Also available at http://archive.ifla.org/IV/ifla64/054-94e.htm

Van House, N., Lynch, M. J., McClure, C., Zweizig, D., & Rodger, E. J. (1987). *Output measures for public libraries : A manual of standardized procedures*, 2nd ed. Chicago, IL: American Library Association.

van Niekerk, B., Pillay, K., & Maharaj, M. (2011). Analyzing the role of ICTs in the Tunisian and Egyptian unrest from an information warfare perspective. *International Journal of Communication*, *5*, 1406–1416.

von Ahn, L. (2006). Games with a purpose. *Computer*, *39*(6), 92–94. doi:10.1109/MC.2006.196

Ward, F., & Loomis, J. B. (1986, December). The travel cost demand model as an environmental policy assessment tool: A review of literature. *Western Journal of Agricultural Economics*, *11*(2), 164–178.

Weech, T. (1988). Validity and comparability of public library data: A commentary on the output measures for public libraries. *Public Library Quarterly*, *8*(3/4), 7–18.Zerbe, R. (2007). The legal foundation of cost-benefit analysis. *Charleston Law Review*, *2*(1), 93–184.

World Bank (2012) Gross domestic product per capita. World Bank. Retrieved from http://data.worldbank.org/indicator/NY.GDP.PCAP.CD

Zerbe, R., & Bellas, A. (2006). *A primer for benefit-cost analysis*. Cheltenham, UK: Edward Elgar Publishing.

Zerbe, R., & Dively, D. (1994). *Benefit-cost analysis in theory and practice*. New York, NY: Harper Collins.

Appendices

Appendix A: In-Depth Survey Instructions

Directions for the Pre-Test

1) **Information for the team**

The objectives of the survey

We designed this survey to solicit information on how individuals value access to information and communication technology. Because access to information and communication technology is not bought and sold in a market I cannot observe the price that people are willing to pay for the service. Instead I must ask them how much they *would* pay to *prevent the loss* of the service. In this case I ask the respondent about three types of access to the internet, via: computers in libraries, computers in telecenters, and computers in internet cafés. We will analyze and then publish the data that we gather in this survey. We believe it will inform policy makers in Chile to best choose where to place public access venues.

The scenario described in the survey

To get information on how people value a service not traded in the open market we ask how much they *would be willing to pay to prevent the loss of the service*. For this survey this means that we must communicate a hypothetic scenario where each of the three venue types (libraries, internet cafés and telecenters) would reduce their hours of operation. We want to communicate that this scenario is hypothetical, not that it is happening in Chile, but we want to ask the respondents to reply as if the scenario were real. For this survey we randomly vary the percentage reduction in the service hours from 25%, 33% and 50%. We do this to see if individuals would pay more to prevent a greater reduction in hours of service.

How the bids will rotate randomly

Once we have established the scenario and have told the individual how much the service will decrease we present them with a "bid". The bid put in the form of a referendum, for example: *Would you be willing to pay $20,000 to prevent the reduction of service of libraries by 25%*? If the individual says yes, then we increase the bid amount and ask them again. For example: (if yes) *Would you be willing to pay $30,000*? If the individual says no to the first question, then we reduce the amount: (if no) *Would you be willing to pay $10,000*?

Demographic questions

After we finish the valuation portion of the survey we ask demographic questions so that we can see if their demographic and geographic characteristics predict their willingness to pay for public access to information and communication technology.

1) **Assessing the respondents' understanding of the scenario**

For the pre-test we are trying to get a sense of the understanding of the scenario that we are using. For the pre-test we are asking those surveyed to confirm that they understand the questions. If they do not understand the questions then we ask them what is confusing. It is essential that our pre-test confirms that the scenario is understood by the respondents. We cannot conduct the full survey without assurances that we are collecting the data we think we are collecting. Adimark must send all comments from the pre-test questions so we can update the survey as needed.

2) Establishing a range of values for the valuation bids

Finally, in the pre-test we are attempting to establish a range of bids that people will accept. If everyone says no to both bids then we have collected no data. If everyone says yes to both bids then we have collected no data. We need to establish a range of values where some people will say they are willing to pay, and others will say that they are not willing to pay. We are testing the range in the pre-test.

Before Adimark conducts the pre-test please confirm that you have received, read and understand these directions. Please ask me questions for clarification before you conduct the pre-test if something is not clear.

Thank you,

Tyler Davis
Principle Investigator, Benefit-Cost In-Depth Study
Global Impact Study
Information School, University of Washington
tbdavis@uw.edu

Appendix B: In-Depth Survey

Survey Instrument

Hello, my name is _____ and I am calling today on behalf of the University of Washington Global Impacts Project. The University of Washington is a Public University in the United States working with Adimark in Chile.

We are conducting research to inform public policy on how to best provide public access to information and communication technology. Obtaining feedback from you is vital to the goal of best providing internet access to the public. We will **only** request your opinion about access to internet this is available to the public.

Your responses are voluntary and will be confidential. Responses will not be identified by individual. Responses will be kept for the duration of the project and you phone number will not be linked to your responses.

It should take about 15 minutes of your time.

If you have any questions or concerns, please contact Tyler Davis, Co-Principal Investigator for the Global Impacts Research Center at tbdavis@u.washington.edu.

We would appreciate your taking the time to complete the following survey.

(Section 1. State overall goal)

These questions are designed to help estimate the value people place on public libraries, telecenters and internet cafés. This research project is interested in the value you place access, and the value that you place on other people's access to these venues, even though you may not use them.

(Section 2. Outline differences)

Differences exist between the three types of venues: Public Libraries are non-commercial organizations usually supported by public funds, where people can borrow books and other materials. They may also provide access to computers and the internet. The average one hour cost of using computers at libraries is (INSERT LOCAL AVERAGE COST ESTIMATE).

Telecenters are non-commercial organizations usually supported by public or donor funds where people can use computers and other technology equipment. The average one hour cost of using computers at telecenters is (INSERT LOCAL AVERAGE COST ESTIMATE).

Finally, internet cafés are private businesses where people can purchase (or buy) access to computers and the internet. The average one-hour cost of using computers at internet cafés is (INSERT LOCAL AVERAGE COST ESTIMATE).

(Section 3. Contextualization)

1) Were you aware that the public has access to these public access venues? (yes/no)
2) Have you ever used these public access venues? (yes/no)
3) Do you know anyone that has ever used these public access venues? (yes/no)
4) Do you think having access to these services is important? (yes/no)

(Section 4. Situation)

Imagine this situation: The public access venues that I just described have financial problems and therefore they will reduce the hours of use available to the public by XX% (XX to randomly rotate between 25, 33, and 50%). For example if a library was able to provide 100 people each one hour of access before, now they would only be able to provide (100-XX) people one hour of access. The next questions are designed to assess how much you would be willing to prevent the reduction in hours of use.

(Pre-test 1)

Do you understand the scenario?

If yes, go to question 1

If no, re-read the scenario, then ask what is confusing?

Can you tell me what is not clear in this scenario?

_____
_____
_____
_____
_____
_____

(Section 5. Budget Reminder and Dissonance Minimization)

2. Bearing in mind your own budget, can you tell me if you agree, disagree or are neutral on each of the following four statements?
    a. I support public access to computers connected to the internet and I would consider making a contribution to keep it available. (agree, disagree, neutral)
    b. I support public access to computers connected to the internet but I would not consider making a contribution to keep it available. (agree, disagree, neutral)
    c. I support public access to computers connected to the internet depending on the situation. (agree, disagree, neutral)
    d. I oppose public access computers connected to the internet. (agree, disagree, neutral)

(Section 6. Provision Point Bias Minimization)

Next I am going to ask four questions about your willingness to pay to continue to provide public access to information and communication technology. There are two important points I want to first share:

> **First**, if not enough people pay for the referendum to keep the venue open then nobody will make any contribution. That means than anyone that made a contribution would get a complete refund.
>
> **Second**, if more than enough money is raised to pay to keep the venue open then people will receive a rebate proportional to their contribution. This means that if we collect 10% more than needed you will get 10% back.

(Pretest 2)

Do you understand the contribution portion of this scenario? (yes/no)

(if no, reread the scenario)

Can you tell me what is not clear in this scenario?

_____
_____
_____

Do you understand the refund portion of this scenario? (yes/no)

(if no, reread the scenario)

Can you tell me what is not clear in this scenario?

_____
_____
_____

(Section 7. Reinforcing scenario) Remember the scenario; due to lack of funds, XX% of usage hours will be reduced in public venues that provide access to information and communication technology. We are considering a **ONE TIME** program that would keep them open…

3. Would you be willing to make a one-time payment of **BID #1** to keep public libraries open, meaning internet cafés and telecenters would reduce their hours by XX?
    a. (If yes) Would you be willing to pay BID#1a to them open?
    b. (If no) Would you be willing to pay BID#1b to keep them open?

4. Would you be willing to make a one-time payment of **BID #2** to keep telecenters open, meaning internet cafés and libraries would reduce their hours by XX?
    a. (If yes) Would you be willing to pay **BID#2a** to them open?
    b. (If no) Would you be willing to pay **BID#2b** to keep them open?

5. Would you be willing to make a one-time payment of **BID #3** to keep internet cafés open, meaning telecenters and libraries would reduce their hours by XX?
    a. (If yes) Would you be willing to pay **BID#3a** to them open?
    b. (If no) Would you be willing to pay **BID#3b** to keep them open?

6. Would you be willing to make a one-time payment of **BID #4** so that ALL THREE of these venue types do not reduce their hours by XX? In this case all three would stay open.
    a. (If yes) Would you be willing to pay **BID#4a** to them open?
    b. (If no) Would you be willing to pay **BID#4b** to keep them open?
    c. (if no) Would you be willing to make a contribution of $1 (or some very small sum)?

(Section 8. Demographics) The last questions are about you, remember that your answers are confidential.

7. What is your gender?
    (1) Male
    (2) Female

8. What year were you born?

9. What is the highest level of education you have completed?
    a) Pre-primary education (no formal schooling)
    b) Primary education/First stage of basic education (grade school or equivalent)

c) Secondary education (high school or equivalent)
d) Post-secondary non-tertiary education (vocational or trade school)
e) Tertiary education (college/university degree) or higher
f) Don't know

10. Do you have the following at home (1=yes)
    a) Computer
    b) Internet connection
    c) Television set
    d) Satellite for television
    e) Radio
    f) Car
    g) Electricity
    h) Landline phone

11. How often do you use the internet in an average…
    a. Daily? (y/n) How many times? _____
    b. (if less than 5 in "a") Weekly? (y/n) How many times? _____
    c. (if less than 2 in "b") Monthly? (y/n) How many times? ____
    d. (if less than 5 in "c") Yearly? (y/n) How many times?

12. Including yourself how many adults live in your home? (individuals older than 18 years old)

13. How many children live in your home? (individuals under 18 years old)

14. What is your current occupational status?
    a. Self employed
    b. Employed part time
    c. Employed full time
    d. Student [Skip next question]
    e. Homemaker
    f. Unemployed looking for a job [Skip next question]
    g. Unemployed not looking for a job [Skip next question]
    h. Retired (over 40 years?) [Skip next question]
    i. Other (specify)

15. What sector do you work in?
    a) Government or public sector
    b) Agriculture
    c) Education
    d) Health services
    e) Construction
    f) Manufacturing
    g) Transportation
    h) Wholesale or retail
    i) Financial services
    j) Business services
    k) Personal services

l) Other trades
m) Other [specify] _____

16. What is your personal monthly income, not the income of your whole household? [refer to net income, after taxes, and include all sources]
    a) Range 1
    b) Range 2
    c) …
    d) Range 10

17. What is your *household* monthly income? [refer to net income, after taxes, and include all sources]
    a) Range 1
    b) Range 2
    c) …
    d) Range 10

Thank you for your responses.

Appendix C: Non-User Survey

These next questions are designed to help estimate the value people place on public libraries, telecenters and internet cafés. The following questions ask you about your opinion on the value of services provided by public access venues. This research project is interested in the value you place on other people's access to these venues, even though you may not use them.

Differences exist between the three types of venues: Public libraries are non-commercial organizations usually supported by public funds, where people can borrow books and other materials. They may also provide access to computers and the internet. The average one hour cost of using computers at libraries is (INSERT LOCAL AVERAGE COST ESTIMATE). Telecenters are non-commercial organizations usually supported by public or donor funds where people can use computers and other technology equipment. The average one hour cost of using computers at telecenters is (INSERT LOCAL AVERAGE COST ESTIMATE). Finally, internet cafés are commercial organizations where people can get access to computers and the internet. The average one-hour cost of using computers at internet cafés is (INSERT LOCAL AVERAGE COST ESTIMATE).

Imagine this scenario: The public access venues that I just described have financial problems and therefore will close. The next questions are designed to assess how much you would be willing to pay to keep the venues open for all people to use.

	4.1 Which of the following four statements most closely resembles your view? [Choose ONE from the following list:]	
	☐ I support public access to computers connected to the internet and I can afford payment.	
	☐ I support public access to computers connected to the internet but I cannot afford payment. [Skip to 4.4]	
	☐ I support public access to computers connected to the internet depending on the situation.	
	☐ I oppose public access computers connected to the internet regardless of the cost. [Skip to 4.4]	
	4.2 Which of the following three statements most closely resembles your view if you had to pay some amount of money for the public to access computers connected to the internet? [Choose ONE from the following list:]	
	☐ I would pay a fee of **any amount** so the public could have access if I were convinced that the government itself did not have enough public funds to pay for the service.	
	☐ I would pay a fee of **any amount** so the public could have access if it were funded out of **existing** taxes.	
	☐ I would pay for the public to have access if the suggested price seemed appropriate.	
	☐ Does not apply to me, or I don't pay taxes	
	4.3 How much would you be willing to pay per year so the public could have access to computers with internet connections in each of these three venues?	
	a. Just public libraries – meaning Internet cafés and telecenters would close	
	b. Just internet cafés – meaning libraries and telecenters would close	
	c. Just telecenters – meaning libraries and internet cafés would close	
	4.4 When considering **ONLY** the **overall value of public access to computing with internet**, how much would you be willing to pay per year so that **ALL THREE of these venue types do not close**? In this case all three would stay open.	

Appendix D: User Survey (Travel Cost Questions)

SECTION 3: ACCESS

Public Access in General

I will ask you some questions about using computers and the internet at public access venues like internet cafés, public libraries, and telecenters. First I will ask you about public access venues in general.

	QUESTION	WRITE IN ANSWER
	3.1 In addition to this venue, how many different public access venues have you gone to in the past 12 months to use computers?	
	☐ This is my first time using a public access venue [Skip to 3.19]	
	☐ 0 (This is the only venue frequented) [Skip to 3.22]	
	☐ 1 or 2	
	☐ 3-5	
	☐ More than 5	
	☐ Don't know	
	3.2 What is the *main* reason you use computers at public access venues? Choose from the options I will read to you. Is it [choose only one]	
	☐ No other option for computer access	
	☐ No other option for internet access	
	☐ To work or be with friends or other people	
	☐ To get help from other users	
	☐ To get help from venue staff	
	☐ Better equipment than home or work	
	☐ Other [specify ➡]	

	QUESTION	RESPONSE				
	3.3 On a scale of 1 to 4, with 1 being "not important at all" and 4 being "very important", how important are the following aspects in choosing *which public access venue you go* to use computers?	**NOT IMPORTANT AT ALL 1**	**2**	**3**	**VERY IMPORTANT 4**	**DON'T KNOW**
	a. The venue is the only public access venue in the area	☐	☐	☐	☐	☐
	b. Convenient location. For example, close to home, school or workplace	☐	☐	☐	☐	☐
	c. Cost of service is affordable	☐	☐	☐	☐	☐
	d. Hours of operation are convenient	☐	☐	☐	☐	☐
	e. The venue does not restrict access to programs and websites that I want to use	☐	☐	☐	☐	☐
	f. Venue is quiet	☐	☐	☐	☐	☐
	g. I don't need to wait in line to use computers	☐	☐	☐	☐	☐
	h. The computers are in good working condition	☐	☐	☐	☐	☐
	i. The internet connection is fast	☐	☐	☐	☐	☐
	j. My friends go there	☐	☐	☐	☐	☐
	k. Venue staff are knowledgeable and helpful	☐	☐	☐	☐	☐
	l. The layout allows privacy	☐	☐	☐	☐	☐
	m. Provides content in my local language/mother tongue	☐	☐	☐	☐	☐
	n. Provides assistance to people with low literacy	☐	☐	☐	☐	☐
	o. Provides physical and/or computer access for people with disabilities.	☐	☐	☐	☐	☐
	p. The environment is safe and/or supportive of people of my gender	☐	☐	☐	☐	☐

	QUESTION	WRITE IN ANSWER
	3.4 If public access computer venues were no longer available to you, do you think your usage of computers and the internet would go up, go down, or stay the same?	
	☐ Go up	
	☐ Go down	
	☐ Stay the same (would find other option)	
	3.5 How often do you use computers at public access venues? Is it	
	☐ Daily or almost daily	
	☐ At least once a week	
	☐ At least once a month	
	☐ A few times a year	
	3.6 What type of public access venue do you usually visit to use computers? Is it an internet café, telecenter, public library, or other type of venue?	
	☐ Internet café	
	☐ Telecenter	
	☐ Public library	
	☐ Other [specify ➡]	
	3.7 How far from that venue do you live?	
	☐ <1km	
	☐ 1-2km	
	☐ 3-5km	
	☐ >5km	
	☐ Don't know	
	3.8 How often do you visit *that* venue?	
	☐ Daily or almost daily	
	☐ At least once a week	
	☐ At least once a month	
	☐ A few times a year	
	3.9 What time of day do you generally visit that venue? [choose ONE]	
	☐ Morning	
	☐ Afternoon	
	☐ Evening	
	☐ Night	
	☐ Late night/early morning	
	3.10 Do you generally visit that venue on weekdays, weekends, or with no regular pattern?	
	☐ Weekdays only	
	☐ Weekends only	
	☐ Both weekdays and weekends	
	☐ No regular pattern	

	QUESTION	WRITE IN ANSWER
	3.11 Do you generally travel to that venue from home, work, or another location?	
	☐ Home [Skip to 3.13]	
	☐ Work	
	☐ School and/or university	
	☐ Other [specify ➡]	
	3.12 How far from the venue is the above location?	
	☐ <1km	
	☐ 1-2km	
	☐ 3-5km	
	☐ >5km	
	☐ Don't know	
	3.13 How do you typically travel to that venue? [choose ONE]	
	☐ Walk	
	☐ Ride a bicycle	
	☐ Drive (car, motorbike, scooter)	
	☐ Public transportation (bus, train, subway, taxi)	
	☐ Catch a ride with a friend/family member/colleague	
	☐ Other [specify ➡]	
	3.14 How long does it take you to travel to that venue? [specify ➡]	_____ hr. _____ min.
	☐ Don't know	
	3.15 How much money does it cost for transportation to that venue? [specify ➡]	
	☐ Nothing	
	☐ Don't know	
	3.16 Still considering the venue you usually go to, how many times did you visit that venue in the last month to use computers? [specify ➡]	

	3.17 On average how much *time* did you spend during each visit to that venue *in the last month?* [specify ➡]	_____ hr. _____ min.
	☐ No regular pattern [specify time range ➡]	___ hr. ___ min. to ___ hr. ___ min.
	☐ Don't know	
	☐ Not applicable (for people who have not visited this venue in the last month)	
	3.18 Approximately how much *money* did you spend *in the last month* using computers and other technology services at that venue? [specify ➡]	
	☐ Not applicable (for people that have not visited this venue in the last month)	
	• [Skip to 3.26]	

These next set of questions are about the venue we are in now.

	QUESTION	WRITE IN ANSWER
	3.19 What is the *main* reason you chose to use computers at a public access venue today? Choose ONE from the options I will read to you. Is it [choose only ONE]	
	☐ No other option for computer access	
	☐ No other option for internet access	
	☐ To work or be with friends or other people	
	☐ To get help from other users	
	☐ To get help from venue staff	
	☐ Better equipment than home or work	
	☐ Other [specify ➡]	

	QUESTION	RESPONSE				
	3.20 On a scale of 1 to 4, with 1 being "not important at all" and 4 being "very important", how important are the following in choosing which public access venue to use today?	NOT IMPORTANT AT ALL 1	2	3	VERY IMPORTANT 4	DON'T KNOW
	a. The venue is the only public access venue in the area	☐	☐	☐	☐	☐
	b. Convenient location. For example, close to home, school or workplace	☐	☐	☐	☐	☐
	c. Cost of service is affordable	☐	☐	☐	☐	☐
	d. Hours of operation are convenient	☐	☐	☐	☐	☐
	e. The venue does not restrict access to programs and websites that I want to use	☐	☐	☐	☐	☐
	f. Venue is quiet	☐	☐	☐	☐	☐
	g. I don't need to wait in line to use computers	☐	☐	☐	☐	☐
	h. The computers are in good working condition	☐	☐	☐	☐	☐
	i. The internet connection is fast	☐	☐	☐	☐	☐
	j. My friends go there	☐	☐	☐	☐	☐
	k. Venue staff are knowledgeable and helpful	☐	☐	☐	☐	☐

	QUESTION			WRITE IN ANSWER		
	l. The layout allows privacy	☐	☐	☐	☐	☐
	m. Provides content in my local language/mother tongue	☐	☐	☐	☐	☐
	n. Provides assistance to people with low literacy	☐	☐	☐	☐	☐
	o. Provides physical and/or computer access for people with disabilities.	☐	☐	☐	☐	☐
	p. The environment is safe and/or supportive of people of my gender	☐	☐	☐	☐	☐

	QUESTION	WRITE IN ANSWER
	3.21 If public access computer venues were no longer available to you, do you think your usage of computers and the internet would go up, go down, or stay the same?	
	☐ Go up	
	☐ Go down	
	☐ Stay the same (would find other option)	
	• [Skip to 3.27]	

	QUESTION	WRITE IN ANSWER
	3.22 What is the *main* reason you use computers at public access venues? Choose from the options I will read to you. Is it [choose only ONE]	
	☐ No other option for computer access	
	☐ No other option for internet access	
	☐ To work or be with friends or other people	
	☐ To get help from other users	
	☐ To get help from venue staff	
	☐ Better equipment than home or work	
	☐ Other [specify ➡]	

	QUESTION	RESPONSE				
	3.23 On a scale of 1 to 4, with 1 being "not important at all" and 4 being "very important", how important are the following aspects in choosing *which public access venue you go* to use computers?	**NOT IMPORTANT AT ALL 1**	**2**	**3**	**VERY IMPORTANT 4**	**DON'T KNOW**
	a. The venue is the only public access venue in the area	☐	☐	☐	☐	☐
	b. Convenient location. For example, close to home, school or workplace	☐	☐	☐	☐	☐
	c. Cost of service is affordable	☐	☐	☐	☐	☐
	d. Hours of operation are convenient	☐	☐	☐	☐	☐
	e. The venue does not restrict access to programs and websites that I want to use	☐	☐	☐	☐	☐
	f. Venue is quiet	☐	☐	☐	☐	☐
	g. I don't need to wait in line to use computers	☐	☐	☐	☐	☐
	h. The computers are in good working condition	☐	☐	☐	☐	☐
	i. The internet connection is fast	☐	☐	☐	☐	☐
	j. My friends go there	☐	☐	☐	☐	☐
	k. Venue staff are knowledgeable and helpful	☐	☐	☐	☐	☐
	l. The layout allows privacy	☐	☐	☐	☐	☐
	m. Provides content in my local language/mother tongue	☐	☐	☐	☐	☐
	n. Provides assistance to people with low literacy	☐	☐	☐	☐	☐
	o. Provides physical and/or computer access for people with disabilities	☐	☐	☐	☐	☐
	p. The environment is safe and/or supportive of people of my gender	☐	☐	☐	☐	☐

	QUESTION	WRITE IN ANSWER
	3.24 If public access computer venues were no longer available to you, do you think your usage of computers and the internet would go up, go down, or stay the same?	
	☐ Go up	
	☐ Go down	
	☐ Stay the same (would find other option)	
	3.25 How often do you use computers at public venues? Is it	
	☐ Daily or almost daily	
	☐ At least once a week	
	☐ At least once a month	
	☐ A few times a year	
	• [Skip to 3.27]	
	3.26 Is the venue we are in now the one you usually come to?	
	☐ Yes [Skip to 3.33]	
	☐ No	
	3.27 How far from this venue do you live?	
	☐ < 1km	
	☐ 1-2km	
	☐ 3-5km	
	☐ > 5km	
	☐ Don't know	

	QUESTION	WRITE IN ANSWER
	3.28 Did you travel to this venue from home, work, or another location?	
	☐ Home [Skip to question 3.30]	
	☐ Work	
	☐ School and/or university	
	☐ Other [specify ➡]	
	3.29 How far from this venue is the above location?	
	☐ < 1km	
	☐ 1-2km	
	☐ 3-5km	
	☐ > 5km	
	☐ Don't know	
	3.30 How did you travel to this venue?	
	☐ Walk	
	☐ Ride a bicycle	
	☐ Drive (car, motorbike, scooter)	
	☐ Public transportation (bus, train, subway)	
	☐ Catch a ride with a friend/family member/colleague	
	☐ Other [specify ➡]	
	3.31 How long did it take you to travel to this public access venue? [specify ➡]	_____ hr. _____ min.
	☐ Don't know	
	3.32 How much money did it cost for transportation to this venue? [specify cost ➡]	
	☐ Nothing	
	☐ Don't know	
	3.33 Not including today, how many times have you used computers at this venue in the last month? [specify ➡]	
	☐ Not applicable	
	3.34 On average how much time did you spend in each visit to this venue in th last month? [specify ➡]	_____ hr. _____ min.
	☐ No regular pattern [specify time range➡]	___ hr. ___ min. to ___ hr. ___ min.
	☐ Don't know	

	☐ Not applicable	
	3.35 Approximately how much money did you spend the last month using computer and other technology services at this venue? [specify ➡]	
	☐ Don't know	
	☐ Not applicable	
	3.36 Did you come here looking for specific information?	
	☐ Yes	
	☐ No [Skip to 4.1]	
	3.37 What type of information were you seeking? [check all that apply]	
	☐ Employment and business opportunities	
	☐ Health information	
	☐ Education	
	☐ Government services	
	☐ Culture and language	
	☐ Local news	
	☐ International news	
	☐ Entertainment	
	☐ Other [specify ➡]	

SECTION 4: FINANCING AND COSTS

R	QUESTION	WRITE IN ANSWER
(R4_1)	4.1 Is this venue currently affiliated with a larger firm, organization, or network? (Q4_1)	
	1 Yes	
	2 No	
	a. Which one? [Specify ➡]	(Q4_1a)
(R4_2)	4.2 What are this venue's top TWO sources of funding for public access computing operations? Is it: [Check TWO]	
	1 Government support (Q4_2_1)	
	1 NGO support (Q4_2_2)	
	1 Grants (Q4_2_3)	
	1 Community contribution (Q4_2_4)	
	1 Usage/service fees (Q4_2_5)	
	1 Other [Specify ➡] (Q4_2_6)	(Q4_2x)
	1 Don't know/not sure (Q4_2_7)	
(R4_3)	4.3 What is the center's total revenue (or operating income) from public access computing operations in a typical month?	(Q4_3)
(R4_4)	4.4 Which <u>three</u> venue services provide the most revenue? [list services below and specify **average monthly income** in the column to the right ➡]	Average Monthly Income
	1) (Q4_4_1)	(Q4_4_1x)
	2) (Q4_4_2)	(Q4_4_2x)
	3) (Q4_4_3)	(Q4_4_3x)
	1 This venue has no fee based services (Q4_4)	

(R4_5)	4.5 How much of a *typical month's* expenses for public access computing operations are for each of the following? [check the types of expenses below and write the actual value in the local currency. If the respondent cannot give a value, he/she can give a percent of the total month's expenses. ➡]	Value (in local currency)	Percent	DON'T KNOW
	1 Internet connection (Q4_5_1)	(Q4_5_1xv)	(Q4_5_1xp) (Q4_5_1a)➡	1
	1 Software/licenses (yearly/12 if necessary) (Q4_5_2)	(Q4_5_2xv)	(Q4_5_2xp) (Q4_5_2a)➡	1
	1 Buying and repairing computers/hardware (Q4_5_3)	(Q4_5_3xv)	(Q4_5_3xp) (Q4_5_3a)➡	1
	1 Staff salary (Q4_5_4)	(Q4_5_4xv)	(Q4_5_4xp) (Q4_5_4a)➡	1
	1 Training for staff (Q4_5_5)	(Q4_5_5xv)	(Q4_5_5xp) (Q4_5_5a)➡	1
	1 Rent (Q4_5_6)	(Q4_5_6xv)	(Q4_5_6xp) (Q4_5_6a)➡	1
	1 Variable expenses (i.e. electricity, water) (Q4_5_7)	(Q4_5_7xv)	(Q4_5_7xp) (Q4_5_7a)➡	1
	1 Other (Q4_5_8) [Specify: ___(Q4_5_8xx) _____]	(Q4_5_8xv)	(Q4_5_8xp) (Q4_5_8a)➡	1

(R4_6)	4.6 What are the center's total expenses for public access computing operations in a typical month? [Specify ➡]	(Q4_6)
(R4_7)	4.7 Taking into account all expenses and revenues, is the center: (Q4_7)	
	1 Losing money	
	2 Breaking even	
	3 Making money	
	4 Don't know	
	5 Not applicable [for venues that do not collect usage fees of any kind]	