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The use of public computing facilities by library patrons: demography, motivations, and barriers☆

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ABSTRACT

Public libraries play an important part in the development of a community. Today, they are seen as more than store houses of books; they are also responsible for the dissemination of online, and offline information. Public access computers are becoming increasingly popular as more and more people understand the need for internet access. Using a series of surveys conducted in 12 libraries across the state of Michigan, the current study is a step towards understanding why the computing facilities are widely used, and what are the motivations behind their use. In addition, barriers and other factors that hinder usage are also discussed. The findings from this study will help policy makers and library administrators evaluate the current allocation of scarce resources, help them promote greater use of the library's resources, and guide their future course of action. The study is conducted as part of a federally funded public computing center grant.

1. Introduction

As the internet becomes increasingly essential in American society, public computing facilities in libraries bridge a critical gap between those who have internet access and those who lack it. As of October 2010, 40% of Americans reported having no broadband connection, and close to 30% of the households had no internet access (National Telecommunications & Information Administration, 2011). Seven percent have dial-up but not broadband connections (Smith, 2010). The lack of access to a broadband connection can limit access and effective usage of many economic and social resources, such as online learning, e-government applications, health information, employment opportunities online, and basic communication functions such as email and web browsing (Federal Communications Commission, 2011).

This void in broadband and internet facilities is often fulfilled by public computing facilities in libraries that provide computers and free broadband internet access, regardless of the individual's ability to pay. Far from being made obsolete by online information sources, libraries are becoming more critical in the information age. A study by the American Library Association (ALA, 2011) found that 40% of library computer users used the facility for career and employment needs. Close to 32 million people (42%) used the library resources for their education and training needs. A study by the Gates Foundation reported that 77 million Americans depend on the library's resources for their internet use and the ones that are below the poverty line depended on its resources even more (Becker et al., 2010).

Community centers facilities in general, and libraries in particular, have been struggling to keep pace with the increasing need for public computing facilities. The recent economic crises have only increased the patron demand for public computers in libraries that are serving as "America's first responders to the economic crisis" (Rettig, 2009, n.p.). Library budgets have at best remained flat in the aftermath of the Great Recession of 2007–2009, with three-fifths of library systems reporting flat or declining operating budgets in 2011 (Hoffman, Bertot, Davis, & Clark, 2011), and 15% of the libraries reducing their open hours with urban libraries especially hard-hit by the cutbacks (Hoffman et al., 2011). At the same time, demand for public access computers increased year-over-year in 70% of libraries and nearly two-thirds of library outlets are the only source of free internet access in their communities, with over four-fifths of all libraries providing broadband internet access to the public.

The need to improve public access in the U.S. is further underscored by two issues: the nation's mediocre standings in international broadband rankings (International Telecommunication Union, 2010; Organisation for Economic Co-operation & Development, 2009) and the disparities in the internet access that have persisted between urban and rural, majority and minorities, high income and low income, young and old, and highly educated and less educated citizens (Advanced Communications Law & Policy Institute, 2009; LaRose et al., 2011; NTIA, 2011).

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To address these infrastructure needs, the American Recovery & Reinvestment Act (ARRA) (2009) allocated $7.2 billion to extend broadband internet access in underserved and unserved areas (Pub.L. No. 111-5, Sec. 6001, 2009). The U.S. Department of Agriculture (USDA) awarded $3 billion of this total through a program administered by the Rural Utilities Service (RUS) called the Broadband Investment Program (BIP). The National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce awarded the balance of the funds through its Broadband Telecommunication Opportunities Program (BTOP). The BTOP funds a wide range of projects including infrastructure construction, community broadband applications through community computing centers, and sustainable adoption projects intended to impact the use of broadband technology for the benefit of health care, education, children, employment, and public safety (LaRose et al., 2011).

Over 250 BTOP awards were made across all 50 states to further community computing centers, basic infrastructure construction, and community interventions to promote sustainable internet adoption. One of the main purposes of the BTOP is to extend broadband access to the segments of the population who do not currently enjoy full access to broadband (e.g., low income, minorities, senior citizens, small businesses), either by increasing the availability of broadband to the home or through the provision of public computing facilities by community anchors such as schools and libraries. The present study focuses on one of these community anchors – libraries – that were funded as part of the BTOP initiative to add public access computers.

Despite the federal investments, library administrators are unsure if the ARRA, BTOP and other initiatives such as the e-rate program (Funds for Learning, 2012) and changes in the Universal Service fund allocations (FCC, 2011) can keep pace with the growing demand for public computing facilities. Prior to the ARRA, a longitudinal analysis of public libraries survey data suggested that libraries were struggling to cater to an escalating demand for public computing facilities (Becker et al., 2010). More recently, findings from the Public Library Funding and Technology Access project noted that libraries are facing the dual challenges of shrinking state and local-level funding, and the burgeoning demand for service (Bertot & Jaeger, 2011).

Although the large-scale studies discussed above are providing an understanding of the range and amount of public computing services being offered to library patrons, little is known about what motivates patrons to use library computers beyond the commonly known demographic differences. Understanding the psychological drivers of public computing use complements interesting facts about usage along with inferences from the demographic data. In light of the pressing need to use the limited resources more efficiently, understanding the computing needs from the patrons' perspective can also help policy makers and library directors plan the provision of services and facilities more efficiently. From the national policy perspective, it is important to understand the relationship between the provision of internet services and the demand for public access so that appropriate and efficient strategies for sustaining broadband adoption may be devised.

The current study fills a gap in our understanding of the role of public computing facilities by examining them from the perspective of the library patrons. The paper has two foci. First, the study presents the demographics and usage patterns of library patrons. Second, the study analyzes the motivations to use public computing facilities, and the barriers to their utilization. The research is guided in part by the framework of the Theory of Planned Behavior (TPB) to predict future utilization of public computing facilities. Policy recommendations are presented accordingly.

1.1. Libraries and the digital divide

Libraries serve an important role in bridging the nation's digital divide between the haves and the have-nots of internet facilities. Librarians and library administrators have a considerable responsibility and are increasingly called upon to fill the role of facilitators of computer use in the library whether or not they have received formal training to disseminate IT information. Previous research has examined the different aspects of internet use by library staff such as the attitudes of public library staff to the use of internet (Spacey, Goulding, & Murray, 2004), the impact of the internet on adoption of website resources (Kim, 2010), and the market for internet and library services (D'Elia, Jorgensen, Woelfel, & Rodger, 2002).

There have been relatively few studies about internet usage patterns in public libraries from the perspective of the patrons and these have focused primarily on demographic differences between users and non-users of public computing facilities. A Gates Foundation study by Gordon, Moore, and Gordon (2003) that studied public access computers and libraries in poor neighborhoods directed attention towards the importance of demographic variables such as income, education and ethnicity in determining internet access and use. In a study that examined broadband use in rural communities, interviews with library patrons indicated that in some cases library access was being used in place of home access, including instances in which home computers had been abandoned in favor of library computers (LaRose, Steinfield, Pompliano, Gustad, & Du, 2007). The study also found that patrons used library computers as a supplement to home computers for applications that their slower (or less secure) home connections did not support.

With the growing number of people using public computing facilities and the potential of these facilities to narrow the digital divide, knowledge of internet usage patterns by the patrons can inform library administrators on how best to provide public access and allocate scarce resources accordingly. One research agenda that the current study has is to construct a fuller profile of library patrons who are using the public computing facilities. Beyond the most frequently examined demographic information such as gender, age, income and education, the study also examines geographic information such as the residency status of the library patron as well as usage patterns such as internet access points, reliance on library computers and the applications that are accessed on the library computers. This expanded user profile will help administrators in their allocation of scarce resources to benefit those who are most reliant on public computing facilities. By distinguishing library patrons in terms of their needs, resources can be channeled to the appropriate communities, in which the libraries are located, and not visitors or those who merely use the facilities as a convenience. Thus, we pose the following research question:

> RQ_1: What groups of library patrons are most reliant on public computing facilities?

Libraries have been found to be particularly important for people who are unable to gain access to the internet in their homes or at other locations. A recent study found that 44% of people in households living below the federal poverty line ($22,000 a year for a family of four) use public library computers and internet access (Becker et al., 2010). The same study also found that among young adults (14–24 years of age) living below the federal poverty line, 61% use public library computers and internet for educational purposes. Other studies have found that lower income patrons were more likely to use library computers for job searches (Brustein, 2009; Gronowska, 2009; Saulny & Cullotta, 2009; Yates, 2009). As such, this study poses the following research question:

> RQ_2: How does income affect the patrons' dependence on public computing facilities?

1.2. Barriers that affect usage

Besides the commonly examined demographic variables such as income, age, gender, race, and education, other attributes of library patrons

can also help library administrators understand the needs of the clients that they are catering to. The residential status and library membership of the patrons, their alternative internet access points as well as the online applications they access (Bertot, Langa, Grimes, Sigler, & Simmons, 2010) are needed to provide a more complete picture of the library internet user. Library patrons in many cases must also have the knowledge and requisite skills to use the public computing facilities. In certain instances, the patrons may feel that they are required to troubleshoot issues by themselves and face other barriers that inhibit them from accessing the facilities. While the demographic information of the patrons is important to study usage, one must also take into account the factors that restrict usage. Indeed, the American Library Association (ALA) has been tracking these barriers to use such as transportation and literacy for their patrons (ALA, 2008). Although barriers have been frequently discussed in studies on internet access in libraries, these barriers are often positioned as challenges faced by the librarians such as the lack of technical training or personnel (Bertot, 2009; McClure, Bertot, & Jaeger, 2011). The current study revisits the framing of barriers from the perspective of the library patrons as per the 2008 ALA study. Both kinds of barriers are important in understanding the role that libraries play in providing internet access, and this study focused on the ones faced by the patrons to complement that rich findings that are already known about the challenges that librarians face.

Barriers faced by the patrons that inhibit access might include concerns about privacy during use, network security as well as infrastructural limitations. Public computing facilities may have limited appointment times and insufficient workstations to meet the growing demands of the users. Understanding the barriers that impede access can help library administrations allocate the limited resources more effectively to balance the needs of patrons as well as fulfill objectives of the public computing facilities. Hence, the third research question for the study is:

RQ_3: What are the important barriers that restrict internet access and use in public libraries among the patrons of the libraries?

1.3. Psychological factors that promote library computer use

While studying the demographics of the patrons as well as the barriers that inhibit use of the libraries' resources is a good starting point, one also needs to understand that there are other psychological mechanisms in play that affect the use of the internet. A better understanding of the patrons' reasons for using the public access computers can direct attention to alternative ways to extend access to vulnerable groups in society that can facilitate better targeted outreach. Only knowing that less well-to-do, less educated, and older Americans tend not to be users of the public access computers does not offer many actionable solutions to overcoming the digital divide (van Dijk, 2005). Overcoming the demographic disparities requires interventions that do more than increase the availability of public internet terminals, although that is a necessary first step. Prior research suggests that public outreach and education activities in addition to improved infrastructure access are needed to extent broadband adoption (LaRose, Strover, Gregg, & Straubhaar, 2011). By understanding the motivations people have for accessing public computers, library administrators and policymakers can better communicate the perceived value of public access computing and target outreach programs to specific user motivations. For instance, novice broadband adopters need gain confidence in their internet skills, what is more formally known as self-efficacy (see below) before they attempt to use the resources to their full efficiency (LaRose, Gregg, Strover, Straubhaar, & Carpenter, 2007). Confidence in one's digital competency may also encourage continued use as well and thus, understanding user motivations can shed light on the kinds of interventions that can also help bridge the digital divide. Hence the fourth research question is:

RQ_4: What are the key psychological factors that motivate patrons to use the broadband and the internet facilities in the libraries?

Recognizing the need for theory-based research in explaining the abovementioned issues, and to provide practical solutions to library administrators, the current study examines internet use in public libraries through behavioral measures from the framework of the Theory of Planned Behavior (TPB). The TPB is a widely accepted model for explaining volitional human behavior (Ajzen, 2002). TPB posits that intentions to perform a particular behavior, such as using public access computers, can be predicted from attitudes toward the behavior, subjective norms, and perceived behavioral control. The behavioral intentions, together with perceptions of behavioral control, account for considerable variance in actual behavior. In the current study, the theory of planned behavior is used to study the motivations that drive people to access internet in the public libraries, and explore the future patterns of internet use through behavioral measures. Importantly, the TPB variables should explain additional variance in library usage over and above that contributed by demographic differences.

Key predictors of behavioral intention include attitudes, subjective norms, and perceived behavioral control (PBC). Attitude, which is defined as "the degree to which a person has a favorable or an unfavorable evaluation of a behavior in question" (Ajzen, 1991, p. 188), predicts a person's behavioral intentions. Subjective norms refer to the perceptions of what friends, family, work colleagues and friends in the neighborhood think of the particular behavior; in this case, the use of public computers in the library. Although subjective norms were often found to be weak predictors of behavior in traditional attitude studies (Conner & Armitage, 1998), library internet access may be an exception. In a study that examined the use of university library web-resources, subjective norms were found to be one of the most important factors that predicted the use of the resources (Kim, 2010).

Perceived behavioral control (PBC) refers to "people's perception of the ease or difficulty of performing the behavior of interest" (Ajzen, 1991, p. 183). PBC reflects past experiences, anticipated impediments, and obstacles. For the current study, we looked at perceived behavioral control as a sum of perceived barriers that the patrons encounter in the libraries. PBC is typically understood in relationship to overcoming external barriers to implementing a behavior.

On the other hand, self-efficacy is defined in terms of personal and internal barriers. Self-efficacy refers to "people's beliefs about their capabilities to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1991, p. 257). A previous meta-analysis compared the explanatory power between self-efficacy and perceived behavioral control, and found that self-efficacy accounted for more variance in behavioral intention than perceived behavioral control (Armitage & Conner, 2001). In addition, self-efficacy has been examined in studies of internet use (Eastin & LaRose, 2000; LaRose, Gregg et al., 2007) and was found to be positively correlated with internet use. Although there have been few studies that have examined internet use in a specific setting, such as libraries, it is plausible that there might be a significant relationship between self-efficacy and the intention to use the internet in public libraries. In a similar vein, habit strength has also been found to be a significant predictor of future media consumption behavior (LaRose, 2010). Here, in accordance with previous TPB research (Conner & Armitage, 1998), habit strength was assessed in terms of the frequency of past behavior.

To recap, the current study aims to put together an expanded user profile of the library internet user in two ways. First, it analyzes the demographics and usage patterns of library patrons. Second, it analyzes the patrons' intentions to use the public computing facilities in terms of their motivations by applying the theory of planned behavior. Policy recommendations are then made in accordance to the expanded user profile.

2. Research methods

2.1. Data collection

From a pool of 169 libraries[1] in Michigan (31 were class size[2] six libraries, 23 were class size five, 41 were class size four, 25 were class size three, 25 were class size two, and 25 were class size one libraries) that were funded through the BTOP public computing center program, 11 libraries were randomly selected and one library was selected for convenience due to its proximity to the researchers' home university. The selected libraries comprised of 1 class one library, 2 class two libraries, 3 class three libraries, 3 class four libraries, 1 class five library and 2 class six libraries. The data was collected in six months between December 2010 and June 2011. The survey was administered to 177 patrons in the selected libraries. Four surveys were incomplete yielding a final sample size of 173.

2.2. Operational measures

The dependent variable, broadband intentions, was based on a six-item scale that was operationalized as the likelihood to use public computing facilities. Items included questions that probed if the patron intended to regularly use the library computers in the future and the likelihood of using the library computers for checking emails in the future. This scale was adapted from Ajzen (2002). Appendix A lists the full set of measures, individual items from the questionnaire and the reliability of the measures.

Attitude towards computer use in libraries was operationalized as the user perception and judgment of the particular behavior. This variable was measured on a 7-point semantic differential scale comprising bipolar items (Ajzen, 2002) such as "for me to use the public computer in the library is important/unimportant" and "valuable/worthless". Self-efficacy was operationalized as the patrons' beliefs of their capabilities to perform the behavior. The scale used in this study was adapted from the scales used to measure general internet use self-efficacy (LaRose & Eastin, 2004). Items included "I have no difficulty in using the library computers" and "I never ask help from the librarians while using the computer." Perceived behavioral control was operationalized by summing perceptions of barriers including "limited appointment times" and "some of the websites I want to visit are filtered."

Subjective norms were operationalized as the patrons' perception of what their significant others would want them to do. It was measured on a four-item Likert-type scale that ranged from 1 (strongly disagree) to 5 (strongly agree). The scale was adapted from Rhodes and Courneya (2003). Perceived behavioral control (PBC) was a cumulative scale that was operationalized by adding the perceived barriers of use such as limited appointment time in the library, high transportation costs to reach the library, filtering of websites in the library, lack of privacy in the library, and the inability to access the library when needed.

To determine habit strength in terms of past behavioral frequency, patrons were asked to indicate their answers to two questions: "Including today, how many times did you use the public computers in the library in the past month?" and "How many minutes do you spend on the library computers during the average visit?" Current use was calculated as the logarithmic transformation of the total hours of internet use in the past month plus one (since the log of zero is undefined). The questionnaire included other single-items measures such as demographic information (gender, age, family income, employment status and education), alternative locations for internet access and whether the library computers are the primary means of internet access. The results were then analyzed using SPSS (2011) version 19.0.

3. Results

3.1. User profile

Close to half of the 173 library patrons surveyed were male, 45% were female and eight did not indicate their gender. The mean age range was between 35 and 44 and 80% of the patrons were White Americans. About 40% of the patrons surveyed were 34 and below, 35% were between 45 and 65 and 7% were above 65 years old. Patrons had a median of 13 years of education, ($M = 13.53$, $SD = 3.19$). More than 50% of the respondents had a family income of $25,000 or less and half of these respondents (26% of all respondents) had less than $10,000. One in four patrons was unemployed and 28% had full-time employment.

Of the 173 patrons who completed the questionnaire, 85% were local residents; nine percent were from another neighborhood in the same town, and the final 10% were from outside the town. This helped us to understand that the libraries' resources were predominantly used by the members of the local community as opposed to supporting visitors; thus placing greater importance of local community development via the use of the library. Most of respondents (82%) had a membership card. Nearly all of the library users surveyed (92%) access the internet in the library and more than half of them (53%) rely on the library computers as their primary means of accessing the internet. Of these patrons who rely on the library computers as their primary means of accessing the internet, the gender, age, and education distribution is comparable to those who do not. However, 72% of the group who rely on library computers primarily have a family income of $25,000 or less, compared to 50% of all the respondents. In terms of the barriers faced by this group, 47% cited limited appointment times to access the computer as a barrier, 42% said that the library was closed when they need it, 22% cited lack of privacy and 23% said that some websites that they want to access are filtered.

Three in four patrons also access the internet in other locations (see Table 1). About half of them have access at home, one in five at work, 16% have access in another public building and 14% at school. One in four patrons visit the library mainly to use the computers and more than half (57%) visit the library to use both the computers and resources.

3.2. Applications accessed

Library patrons accessed a mix of applications when using the library computer. While some were recreational, others were work-related. The top four applications accessed were email, social networking, job searches and news. That job searches and news were high on the list of applications that patrons accessed reinforces the importance of public computing facilities in providing online access for utilitarian tasks. Patrons who use the library computers as their primary source of internet access were twice as likely to use the computers for job searches and accessing public services (see Table 2). Except for taking online classes and searching library resources, patrons who use the library computers as their primary source of internet access were

Table 1
Alternative access locations and connection speed.

	Access location ($N = 163$)	Broadband connection ($N = 138$)
Home	49.69%	47.83%
Work	20.25%	20.29%
Another public building	15.95%	18.12%
School	14.11%	13.77%

[1] Currently, the BTOP is funding the improvement of computing facilities in public libraries across the country. The current study focuses on public libraries in Michigan that have opted in for one of the upgrading programs.

[2] Michigan libraries are classified by class sizes based on the population they served and other requirements. Class six libraries serve a population of 50,000 or more and class one libraries serve a population of 3999 or less. For more detailed classification criteria, refer to http://www.michigan.gov/documents/mde/lm_2010_CEManualFINAL_308216_7.pdf.

Table 2
Applications that users accessed on library computers.

	Library computers are primary source of internet access ($N=92$)	Library computers are *not* primary source of internet access ($N=81$)
Email	79.30%	64.20%
Social networking	38.00%	24.70%
Searching library resources	15.20%	22.20%
Entertainment	29.30%	16.00%
News	34.80%	22.20%
Job search	39.10%	19.80%
Online class	3.30%	7.40%
Access public services	12.00%	6.20%
Online shopping	9.80%	4.90%

Table 3
Comparison of respondents with family income below $25,000 and those with $25,000 and above.

	Family income	Mean	*SD*	*F*	Sig.
How likely are you to use the library computers for job search?	Below 25,000	4.97	2.467	13.99	.000
	25,000 and above	3.52	2.53		
	Total	4.21	2.60		
Current use of public computing facilities	Below 25,000	2.54	.850	17.56	.000
	25,000 and above	1.95	.98		
	Total	2.23	.960		
Intentions to use public computing facilities	Below 25,000	4.61	1.27	19.90	.000
	25,000 and above	3.68	1.44		
	Total	4.13	1.43		

Table 4
Barriers that inhibit use of library computers by family income.

	$25,000 and below ($N=83$)	Above $25,000 ($N=90$)
Limited appointment times	44.30%	40.90%
Transportation costs	13.90%	3.40%
Filtered websites	28.20%	13.60%
Library is closed when I need it	35.90%	36.40%
Lack of privacy	25.60%	22.70%

more likely to use the computers for all the other applications in the questionnaire.

RQ_2 probed the relationship between income and dependence on the public computing facilities. A comparison of the respondents according to their income levels showed that those who are living near the federal poverty line ($22,000), defined here as $25,000 or less in annual income, were significantly more reliant on the public computing facilities than those with incomes greater than $25,000 (see Table 3). Library patrons who are living near the federal poverty line were more likely to use the public access computers to look for employment, $F(1, 163)=13.99$, $p<.001$. They also used public computer facilities more, $F(1,171)=17.56$, $p<.001$ and had higher intentions to use the facilities $F(1,171)=19.90$, $p<.001$. We also compared other specific uses such as checking email and social networking and the two groups were not statistically different in these aspects.

3.3. Barriers to use

While we are primarily interested in understanding the motivations behind usage, we also wanted to find out the barriers that restricted patrons from using the facilities in the libraries. This would help the administrators serve the needs of their clients better and understand the full extent of the demand for public computing facilities. For policy makers and library administrators, understanding the barriers that library users face in accessing public computers can help optimize resource allocation. With regard to RQ_3, library users were most disappointed by limited appointment times and library opening hours. Other concerns include the lack of privacy and the presences of web filters. While administrators can only address some of these concerns, understanding these barriers will help to map the allocation of scarce library resources in the future. The list presented in Table 4 ranks the list of barriers that the patrons face with breakouts in family income.

Thus far, the results provided demographic descriptions of the patrons, their motivations, and the barriers they face. To put together a fuller user profile, Pearson product–moment correlations were calculated for the variables. Table 5 shows the matrix of the Pearson product–moment correlations.

The correlation matrix of the demographic and TPB variables of the patrons and their use of public computing facilities shows several useful relationships. With regard to age, older patrons were less self-efficacious about using the library computers and had lower intentions of using the computers in the future. With regard to family income, patrons who reported lower income used more applications, were more influenced by subjective norms (their perception of what their significant others would want them to do), encountered more barriers during their use, had more favorable attitudes of library

Table 5
Correlation matrix of demographic, motivations and use of public computing facilities.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Mean	*SD*
1. Gender	1														1.47	0.49
2. Age	−.033	1													3.22	1.54
3. Education	−.117	.316**	1												13.53	3.10
4. Family income	.049	.278**	.367**	1											3.59	2.17
5. Residency status	−.080	.160*	.116	.096	1										1.20	0.53
6. Library membership	.112	.001	.122	.053	−.383**	1									0.82	0.39
7. Public access reliance	−.049	−.114	−.149*	−.392**	−.212**	.120	1								0.53	0.50
8. Number of applications	−.178*	−.175*	−.005	−.228**	−.111	.044	.241**	1							2.27	1.52
9. Self-efficacy	.126	−.239**	−.070	−.015	−.058	.045	−.011	.036	1						3.75	0.87
10. Subjective norms	−.128	−.058	−.193*	−.191*	−.032	.028	.264**	.222**	−.061	1					3.12	1.06
11. Attitudes	.102	−.064	−.099	−.175*	−.167*	.184*	.283**	.134	.131	.216**	1				5.85	1.23
12. Barriers	−.103	−.100	.002	−.179*	.057	−.108	.109	.163*	−.306**	.042	−.106	1			0.26	0.22
13. Habit strength	−.212**	−.080	−.094	−.310**	−.143	.047	.417**	.511**	−.080	.387**	.264**	.186*	1		2.23	0.96
14. Behavioral intentions	−.005	−.260**	−.212**	−.350**	−.104	.080	.399**	.524**	.059	.381**	.340**	.069	.620**	1	4.26	1.53

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

computer use, and had higher intentions of future use. There was a negative relationship between library membership and residential status. This was a function of how the variables were coded. A higher value on library membership meant that the patrons were also members. A higher value on residential status meant that the patrons were visitors or from out of town. The negative relationship indicates the intuitive scenario where the residents were also library members and that the visitors from out of town were not members of the library.

The use of public computing facilities is predicted by several user attributes. Patrons with lower income, those with favorable attitudes and those who were more influenced by subjective norms also used the computers more. In addition, younger patrons and those who have lower education also intended to use the public computing facilities more often in the future. Contrary to previous studies, the relationship between self-efficacy and habit strength was not statistically significant. While previous studies have found that greater proficiency in the use of internet applications would also predict more frequent and more intense use, the data did not support these relationships. Analysis of the single items also did not reveal any significant relationship. It may be that the limited appointment times constrained the development of stronger habitual use on the public computing facilities.

A hierarchical regression was then conducted with behavioral intention as the dependent variable. The results of the regressions are presented in Table 6. Fifty-two percent of the variability in behavioral intentions was predicted by the independent variables in model 2. Fifteen percent of the variance was accounted for by the four demographic variables. Public access reliance, the behavioral variables and habit strength accounted for an additional 40% of the variance. The strongest predictors of future use are gender, age, public access reliance, self-efficacy, attitudes, and habit strength.

4. Discussion

The present research attempted to put together a fuller profile of library patrons who use the public access computers. This section discusses and suggests how the findings can help policy makers and library administrators optimize their investments based on the patrons' demographic profile and motivations to use the public access computers. First, the findings about the demography and geography of the library patrons will be discussed. This will be followed by a discussion of the psychological profile of the patrons. As each finding is discussed, the relevant policy recommendations are also made.

For certain demographic groups in the society, public libraries play a vital role by serving as their means of accessing the internet. Library patrons who are living near or below the poverty line are especially reliant on the public access computers. In fact, more than half of the respondents in this study were using the library computers as their primary means of accessing the internet. These findings about the usage patterns of low income populations are in line with existing library survey data (see for example, Bertot, McClure, & Jaeger, 2008). The present research extends these findings to individual library patrons, as opposed to the previous research in which libraries were the unit of analysis, helping us to understand the needs of low income patrons who are present even in libraries with low overall levels of poverty in their community. The implication of these corroborated findings is that keeping the public computing facilities accessible and up-to-date is mission critical to bridging the digital divide in America. By making internet access available to residents, public computing facilities are allowing individuals to access online resources and applications that they might otherwise be excluded from because of their economic condition. With the current uncertainty in the economy, it is important that libraries continue to provide good quality public access facilities to cater to the informational needs of groups in society who may be living below or near the poverty line and are actively trying to improve their condition by seeking employment.

The findings also showed that patrons in the survey who relied on library computers as their primary source of internet access were more likely to use them for utilitarian tasks such as job searches, news, entertainment, social networking and email compared to those who have alternative sources. At the policy level, that job searches that are being performed extensively on the public access computers point to an opportunity for collaboration between library administrators and state employment agencies. In the current economic climate, both types of agencies might be able to share the costs of providing their respective services through ad hoc projects that are collocated. Since the public access computers are already being used for job searches, publicly funded employment agencies could work with library administrators to hold workshops for jobseekers in library facilities. Given that the job-seekers will be learning how to use the online employment searches on computers that they may regularly access for other purposes, the acquired familiarity with common online applications and facilities might promote frequent, habitual use of the facilities that can benefit patrons in other areas of their lives as well. Other than job-seeking, workshops and seminars on filing taxes online and other e-government services can also be conducted.

Studying usage patterns by demographic groups may lend insight into how the public access computers are being used but is limited in the sense that the barriers restricting or preventing use do not show up in usage data. An understanding of the factors that restrict access will help library administrators manage the public access computers so that the facilities can be used to their fullest potential and to make the case for additional resources to fulfill unmet needs. Many of the patrons surveyed stated that there were unable to access information from public facilities because they could not afford the transport costs to the libraries and this concern was far more prevalent among those at or below the poverty line than above it. To overcome this barrier, local libraries might partner with local transportation systems. For example, student discounts for bus passes might be extended to those taking online courses at nonlocal institutions through their local library. Ride-sharing among lower-income patrons might also be arranged through library-based online applications or through local church and community service groups.

Patrons also pointed to the limited appointment times and the unavailability of computer terminals for use. Echoing the infrastructure limitations highlighted by Jaeger, Bertot, McClure, and Langa (2006) and Bertot, Jaeger, Wahl, and Sigler (2011), library patrons have indicated that they need to have longer hours of operation or to have previous hours of operations restored. However, the large proportion of nonmembers using public terminals who are not library members suggests that substantial numbers of the public might be served by limited separation of public computing from other services. Public terminals

Table 6
Regression of demographics and motivations on behavioral intentions.

Model		Standardized coefficients	t	Sig.
1	(Constant)		9.372	.000
	Gender	−.003	−.047	.963
	Age	−.163	−2.145	.033
	Education	−.056	−.706	.481
	Family income	−.284	−3.642	.000
2	(Constant)		1.042	.299
	Gender	.117	2.074	.040
	Age	−.136	−2.264	.025
	Education	−.063	−1.021	.309
	Family income	−.059	−.925	.356
	Residency status	.084	1.412	.160
	Library membership	.039	.655	.513
	Public access reliance	.266	4.187	.000
	Number of applications used	.006	.105	.917
	Self-efficacy	.115	1.961	.052
	Subjective norms	−.058	−.988	.325
	Attitudes	.114	1.911	.058
	Barriers	.090	1.420	.158
	Habit strength	.384	5.417	.000

$F(13, 159) = 15.25$, $p<0.001$; adjusted $R^2 = .52$; $\Delta R^2 = .40$.

might be placed in spaces that can be accessed during hours that the full array of library services are not available, such as in rooms where separate, secure access can be maintained for extended hours on school nights. Administrators might allow longer appointments to be made to select patrons; for example, to complete the requirements of the growing number of online college course offerings or to complete job searches. The prioritization process can be done in partnership with schools and local employment development agencies so that those who are certified can use the computers for a longer period of time.

However, limited appointment times and hours of operation affect all patrons equally regardless of their economic standing. Many more low-income patrons than those above the poverty line also indicated that filtered websites were a hindrance. While we are not recommending that the filters be removed so that patrons can access adult materials, there may be a genuine need for health and sex information that could be addressed through case-by-case overrides of filter results.

Library membership was less important than the extent to which the patrons depend on the library computers. Non-members were using the computers and were just as reliant on the computers as the members. Yet at the same time, an increasing number of libraries ration computing access to only library cardholders. Although this policy is rational given the technological needs to control access and the policy need to track access, library administrators should understand that they may be restricting an important segment of their potential community base. This finding suggest that libraries are serving a wider audience than what membership figures indicate and administrators should take this into consideration when they are putting together the number of patrons served when they are requesting for resources.

On the whole, the findings on the demographic profile of computer users in libraries fit into current understanding of the existing library use studies. The results indicate that poverty is restricting access to computing resources at home and libraries are fulfilling a critical need of those who lack access to the internet. The description of the barriers to use draws administrators' attention to how the library resources can be optimized and made more accessible by implementing schemes that can overcome these obstacles. The next part of the discussion highlights the motivations that drive the use of public access computers.

Four psychological variables influence library patrons' decisions to use public computers — self-efficacy, attitudes, habit strength, and perceived social norms. Statistically, the inclusion of the three variables from the theory of planned behavior explained significantly more variance in the intentions to use the public access computers than the demographic variables alone and so can add to our understanding of how to encourage the use of public computing centers. Among the psychological variables, habit strength was the strongest predictor in the model. What this means is that current use of the public access computers encourages future use by way of a virtuous cycle. For library administrators, this finding suggests that a proactive approach to help library patrons develop a habit of using the facilities can promote future use. For instance, library administrators can create opportunities for patrons to test-drive the public access computers and be introduced to the online applications. Once the habit of using the library terminals gains traction, the virtuous cycle of use may follow, provided that the barriers to access do not intrude. However, before habits can be established patrons must see that the internet has something of value for them and for people who are important to them and gain confidence in their abilities to obtain desired outcomes; in other words, self-efficacy, supportive attitudes, and social support must be developed.

Self-efficacy affects the intention to use public computers in the future as well as habitual persistence in their use. This means that the more confident the patrons felt about their ability to use the public access computers, the more likely they were to use the public access computers. These findings raise concerns about digital divides in the skill levels of internet users that persist even after basic access has been provided (van Deursen & van Dijk, 2009).

Herein is where the insights from the demographic profile can be paired with the psychological profile to generate positive outcomes. From the demographic analysis, younger patrons were more self-efficacious than older patrons about their ability to use the public access computers. From the psychological profile, we know that patrons who are more self-efficacious tend to use the public access computers more. One possible strategy for promoting greater use by older library users would be organizing younger patrons, such as volunteer high school students, to sit with older patrons while they are navigating the applications. By bringing the two age groups together, library administrators and policy makers can help narrow the digital divide between the young and old by pairing those who are more self-efficacious with those who are less self-efficacious. In doing so, the expanded public access computers will help accomplish the goals of the BTOP by bridging the age divide.

More generally, self-efficacy can be enhanced through four proven strategies (Bandura, 1991): observational learning, enactive mastery, persuasion, and anxiety reduction. As the term implies, observational learning takes place when patrons observe others successfully carrying out online tasks. In a library setting with individual users hunched over their computers there is a limited opportunity for meaningful observations to take place. Organizing a directory of YouTube videos demonstrating popular applications is a convenient way to let patrons virtually "look over the shoulder" of skilled users demonstrating how, for example, to write a macro in Microsoft Excel. Enactive mastery follows as users practice on their own tasks and go back and forth between their efforts and the demonstration videos. In a public computing center, the librarian's role is to persuade patrons that they can accomplish online tasks on their own with a little prompting, but that goes without saying. However, the time pressure applied by fixed appointment times and the frustration of mastering new applications can be anxiety-inducing and disrupt self-efficacy and task performance. Again, flexible scheduling could help by allowing novice users to reserve longer appointments.

Third, positive attitudes predict future use of the public access computers. Here, general attitudes towards using public computers were assessed but within TPB it is well established that these in turn rest upon beliefs about the expected outcomes of internet usage, such as completing an assignment for a course, getting a job, or obtaining health information. To inculcate more positive attitudes towards the computing facilities, librarians can consider putting up in-house posters, placing items in community newsletters, or posting log-in messages that link computer applications available in the library to desired life outcomes such as these. Further survey research of patrons could uncover the outcomes that facilitate continuing use more than others, but the observations of library staff or (anonymized) logs of user activity can provide the necessary insights as well.

Finally, the present results indicate that public computer use might be encouraged by social norms, in that beliefs that their families, co-workers, neighbors, and other significant others are related to both intentions to use library computers in the future and to habitual continuing use. Social norms might act in a variety of different ways that should be explored through further research. They may act as general beliefs in social support, such as parents encouraging young adults to acquire computer skills and to complete assignments for college courses. Perceived social norms could also indicate reliance on a family "computer expert" who uses library computers to check for email messages and perform other online tasks for family members. Finally, perceived social norms may be indicators of tangible support received from family and neighbors, such as providing transportation to the library or temporary child (or elder) to facilitate library visits. Community and family support networks might be further engaged through library outreach activities that promote child care and ride sharing in exchange for completing essential online tasks for others. For example, patrons who do not know how to use

the internet for job searches or government services might be allowed to make appointments that could be kept jointly with more knowledgeable family members or neighbors working with them side-by-side who could then "earn" more time for themselves.

5. Limitations

There are several limitations of this study that should be taken into account in the interpretation of the results. First, the generalizability of the current findings is limited to the research context. The survey data was obtained from library patrons in public libraries in a single state participating in a sustainable broadband adoption project funded by the BTOP. The sampling frame was all Michigan libraries that were recipients of the grant. The sampled libraries comprised libraries from all the six different class sizes, thereby providing a good representation of the different library sizes in the state of Michigan. However, generalization outside Michigan might be limited by the current economic condition of the state. Michigan was one of the states that were hard-hit by the economic crises and thus the economic conditions reported in the study are likely to be more dire than some other states.

Second, the participants who were invited to complete the survey on site were volunteers. Those who chose to participate in the survey may be different from other patrons who chose not to participate. It may be that those who participated had more favorable views about public access computers. Also, non-users were not included in the study and hence, the digital divide between users and non-users was not addressed in the study. Also, the generalizability of the profiles of the library patrons in Michigan may be limited to other patrons in culturally proximate Midwestern states. Patrons in other regions of the U.S. may have community norms and cultures that would affect their intentions to use the public access computers differently.

In addition, cross-sectional survey data was used to test causal relationships but cannot establish the direction of those relationships definitively nor rule out third-variable explanations. Time-series and longitudinal studies are preferred for studying causal relationships. Also, in this study, behavioral intentions served as the dependent variable and these are not always valid indicators of actual future behavior. Meta-analyses in TPB have found that intentions were better predictors of self-reported behavior compared to observed behavior (Armitage & Conner, 2001; Hessing, Elvers, & Weigel, 1988). The current study makes no contribution to this broader debate since actual behavior was not measured.

6. Conclusion

Our study contributes to an understanding of the evolving role that public libraries play in local communities. Public access computers in libraries are frequently used by patrons who rely on them most to search for jobs and to access government services online. This underscores the continued relevance of libraries in the digital age. By providing public access computers, public libraries act as a conduit in strengthening the community by meeting the information needs of their residents such as connecting under-privileged residents to online applications, learning opportunities and potential employment. Our findings indicate that public computing facilities are indeed helping to meet the needs of marginalized citizens and the BTOP-funded improvements of these facilities are likely to help narrow the digital divides among demographic groups in this respect. An examination of psychological barriers to the usage of library computers addresses secondary digital divides related to effective use of public computers once basic access is provided. From the findings, creating opportunities to cultivate a habit of using the public access computers, improving attitudes and developing a stronger sense of self-efficacy will encourage library patrons to put the computers to better use in their lives. Notably, flexibility in scheduling depending on need rather than short, fixed time appointments that assure wide access but may frustrate mastery of important tasks should be considered.

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Appendix A

List of measures.

Attitude: For me to use the public computer in the library is…	*Cronbach's alpha*
Important/unimportant	.78
Worthless/valuable	
Enjoyable/unenjoyable	
Harmful/beneficial	
Useful/useless	
Self efficacy	.71
I feel confident in handling all the possible problems with the computer I use in the library.	
I have no difficulty in using the library computers.	
I never ask help from the librarians while using the computer.	
I am able to accomplish the task on the public computer in the time available.	
Subjective norms	.96
My family members think I should use the public computer in the library.	
My work friends think I should use the public computer in the library.	
Most people important to me think that I should use the public computer in the library.	
Friends from my neighborhood think that I should use the public computer in the library.	
Intention	.76
I intend to use the library computers again within the next week.	
I will regularly use the library computers in the future.	
I plan to use the computers in my library more in the future than I do now.	
How likely are you to use the library computers for checking emails?	
How likely are you to use the library computers for social networking?	
How likely are you to use the library computers for entertainment?	
Single-item measures	
Gender	1 = male, 2 = female
Age	1 = 18–24, 6 = 65 and above
Residency status	1 = resident, 2 = non-resident, 3 = visitor
Library membership	1 = yes, 0 = no
Public access reliance (Are the library computers your primary source of internet access?)	1 = yes, 0 = no
Habit strength = log10 ((no of times per month * 7 average number of minutes per visit) + 1))	

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