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Broadband Technology Opportunities Program  
Evaluation Study

Order Number D10PD18645



## **Case Study Report**

### **Round 2**

## **Michigan State University Evidence Based Computer Centers II**

### **Public Computer Center**

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# Executive Summary

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*“Many of the libraries have been relying on computers previously funded through Gates Foundation grants in the early 2000s. My guess is, under the budget cuts, the number of computers being replaced would have shrunk and shrunk and shrunk, and so what we would have seen is a lot of aging technology at these locations. So we would have probably seen more aging infrastructure, and classes would not have been able to keep on top of the latest technologies.” – Michigan State University Grant Administrator*

Michigan State University (MSU), founded in 1855, is a land-grant public research university in East Lansing, Michigan. MSU's Department of Telecommunication, Information Studies, and Media conducts research and teaches courses related to broadband technology, including research on broadband technology use by telehealth and healthcare providers, and courses on the potential social implications of broadband usage and innovation.

On August 1, 2010, the National Telecommunications and Information Administration (NTIA) awarded MSU a Broadband Technology Opportunities Program (BTOP) Public Computer Center (PCC) grant for \$6,056,819 to implement the Evidence Based Computer Center II project. The project established or improved PCCs in colleges, public libraries, public housing developments, tribal community centers, and other community support organizations across the state. The grantee proposed to accomplish the following, with the results shown:

- Purchase hardware, software, and furniture for computer workstations. As of December 31, 2012, MSU had installed 3,202 new computer workstations.<sup>1</sup>
- Purchase equipment required to upgrade broadband connections and establish or improve Wi-Fi networks. Broadband connections were improved and wireless networks established in 205 PCCs by the end of 2012.<sup>2</sup>
- Hire interns to help with the deployment and installation of the computers and training of PCC staff. The internship program had 673 participants from MSU and 3 area community colleges.<sup>3</sup>
- Purchase subscriptions to LearningExpress, an online resource that provides training materials for education and workforce development topics. MSU offered this training option in addition to the 86,430 hours of classroom training.<sup>4</sup>

MSU focuses the Evidence Based Computer Centers II project on urban centers most affected by the economic decline, targeting communities with the greatest need for broadband services, and one tribal area. The targeted populations are generally low-income, unemployed, disabled, racial minorities, elderly, and youth. Members of these targeted populations typically have lower levels of broadband adoption. The poverty rate in the service area, 16.8 percent, is more than 2 percentage points higher than both the state and national rates.<sup>5</sup> The census tracts in which the PCCs funded by the grant are located, which are spread throughout the state, have a smaller proportion of minorities than either the State of Michigan or the nation.<sup>6</sup>

This case study is one of fifteen performed by ASR Analytics, LLC (ASR), on a sample of eight PCC and seven Sustainable Broadband Adoption (SBA) grants. It is part of a larger mixed-methods evaluation of the social and economic impacts of the BTOP program.

The purpose of this case study is to:<sup>7</sup>

- Identify how the grantee maximized the impact of the BTOP investment.
- Identify successful techniques, tools, materials, and strategies used to implement the project.

- Identify any best practices and gather evidence from third parties, such as consumers and anchor institutions, as to the impact of the project in the community.

The case study is primarily qualitative. ASR collected the information presented here during two field visits to evaluate the social and economic impacts of the MSU grant. The evaluation study team originally met with representatives of MSU and grant partners from three PCC locations over a two-day period in September 2011. ASR conducted a follow-up site visit with the grantee and its partners from April 22-24, 2013. During the second site visit, ASR returned to the PCCs included in the first site visit: Hackley Public Library in Muskegon, East Michigan Environmental Action Council (EMEAC) in Detroit, and Mt. Elliott Makerspace in Detroit. The evaluation study team also met with representatives from Capital Area District Libraries (CADL) at the South Lansing Branch in Lansing.

In total, the evaluation study team performed five case study site visit interviews and focus groups during the second visit. ASR transcribed the discussions and used this information, and other information and reports provided by the grantee, to supplement Quarterly Performance Progress Reports (PPR), Annual Performance Progress Reports (APR), and other publicly available information. Where possible, ASR performed statistical analysis based on these materials and data provided by MSU and grant partners.

This report further investigates the initial impacts uncovered during the first round of visits and identifies additional impacts that occurred in the time between the site visits. The results presented in this report reflect the evaluation study team's observations at the time of the second site visit. This report includes both qualitative and quantitative components. It will serve as a basis for *Interim Report 2*, which will analyze data from fifteen PCC and SBA case studies.

The most significant impacts of the grant stem from new or improved PCC capacity. Before the grant, a shortage of workstations was a common problem at high-traffic PCCs. The installation of additional workstations coincided with reductions in the frequency and length of users' waiting periods. Users now have prompt access to PCC resources and often enjoy longer computer sessions than were possible before the grant. Upgraded Internet speeds, operating systems, and software have also enhanced user experiences. The most common uses of new workstations include applying for jobs, participating in technology trainings, and maintaining social connections.

The evaluation team noted the following major impacts of the MSU BTOP grant:

- PCC staff members have observed improvement in their patrons' digital literacy skills. Whether because of training delivered by the PCC, greater access stemming from increased PCC capacity, or exposure to new technologies, recurrent users have become more proficient in computer and Internet use. Staff members gauge these strides in digital literacy by patrons' requests for assistance. Overall, users' questions have shifted from very basic computer help to intermediate- and advanced-level usage questions or requests for specific software or hardware.
- The provision of BTOP equipment has increased PCC capacity, mitigating wait times. As a result, users' waiting periods have diminished in length and frequency. ASR's analysis of grantee data shows that the BTOP grant may have reduced Michigan users' total waiting time for computers at library locations by more than 160,000 hours per year.<sup>8</sup>
- PCCs have used BTOP-provided equipment to deliver computer-based training on a variety of topics, including basic computer use, e-mail, search engine use, Microsoft Office, social media, job searching and résumé writing, and mobile devices. Some courses targeted specific populations such as seniors or job seekers. Training included classroom-style, peer learning, and one-on-one instruction. As of December 2012, MSU had delivered 86,430 hours of digital literacy training.<sup>9</sup> The CADL PCC staff provided Book-A-Librarian individual learning sessions to 366 individuals as of April 2013.<sup>10</sup>
- Students from MSU, Jackson Community College (JCC), Lansing Community College (LCC), and Mott Community College (MCC) served as interns who helped coordinators with the setup

and installation of PCC workstations. The program had 673 participants.<sup>11</sup> While their education and career outcomes were not tracked, interns received valuable IT training and hands-on experience through the program.

- PCC users who complete digital literacy training, whether in a classroom setting or one-on-one, use foundational skills as a springboard for adopting new technologies. Interviewees gave accounts of patrons purchasing e-readers or other mobile devices after mastering basic computer skills.
- MSU did not collect job placement data. However, PCC staff members stated that many of their job-seeking patrons secured employment after taking advantage of PCC resources. Job seekers used PCC workstations to search for and apply to job openings, develop résumés, access Michigan Works! services, and participate in employment-based training. A statistical analysis of data from CADL shows the intensity of use of the PCC is highly correlated with the prevailing unemployment rate.<sup>12</sup>

Interviewees expressed that, without BTOP, PCCs would have continued to offer a lower level of service and training. PCC capacities were inadequate and waiting for computer access was commonplace. Insufficient bandwidth and outdated software yielded a less-than-optimal user experience. As discussed in the report, the focus of the MSU grant on resolving these problems was fundamental in achieving the benefits described.

# Section 1. Introduction

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Michigan State University (MSU), founded in 1855, is a land-grant public research university in East Lansing, Michigan. MSU's Department of Telecommunication, Information Studies, and Media conducts research and teaches courses related to broadband technology, including research on broadband technology use by telehealth and healthcare providers and courses on the potential social implications of broadband usage and innovation. On August 1, 2010, the National Telecommunications and Information Administration (NTIA) awarded MSU a Broadband Technology Opportunities Program (BTOP) Public Computer Center (PCC) grant for \$6,056,819 to implement the Evidence Based Computer Center II project. The project established or improved 205 PCCs in colleges, public libraries, public housing developments, tribal community centers, and other community support organizations across the State of Michigan, distributing 3,202 computer workstations by the end of 2012.<sup>13</sup> Other project provisions include furniture and additional equipment required to upgrade broadband connections; interns to help deploy and install computers and train PCC staff; and subscriptions to LearningExpress, an online resource that provides training materials for education and workforce development topics.

MSU focuses the project on urban centers most affected by the economic decline, targeting communities with the greatest need for broadband services, and one tribal area. As a result, the targeted populations are generally low-income, unemployed, disabled, racial minorities, elderly, and youth. Members of these targeted populations typically have lower levels of broadband adoption.

MSU considers each PCC host organization to be a grant partner. These organizations may also have their own partners with which they work to deliver training and conduct outreach. Lansing Community College (LCC), Mott Community College (MCC), and Jackson Community College (JCC) provide interns for a program involved in implementation of the grant. Michigan Works!, a government employment and career development agency, partners with some PCCs to deliver training and support services. Other partners include Community Outreach Services Corporation (COSC), the Michigan Department of Information Technology, the State of Michigan Planning Consortium for Broadband, and the Library of Michigan.

## 1.1 What the Interviewees Told Us

Figure 1 presents words commonly used by interviewees during discussions that took place between ASR Analytics, LLC (ASR) and focus groups. These interviewees included program management and representatives from four grantee PCCs: Capital Area District Libraries (CADL) in the Lansing area, Hackley Public Library in Muskegon, East Michigan Environmental Action Council (EMEAC) in Detroit, and Mt. Elliott Makerspace in Detroit. The word cloud displays the 100 words used most frequently by the interviewees. The word cloud provides a succinct visual summary of the conversations that occurred. Statements made by ASR personnel during the interviews and focus groups were excluded from the analysis, as were common words, such as prepositions, articles, and conjunctions, which were identified using a standard "stop list."

As shown in the word cloud, the respondents perceived the grant as being highly focused on "computers" and the "people" that use them. The majority of the PCCs are located in "libraries" and "community" centers, as reflected in the figure. Other significant words in the cloud refer to PCC access and services, including "connection," "locations," "programs," "questions," "classes," and "training." Interviewees also discussed the inputs required to support PCC operations, such as "technology," "space," and "time."





## Section 2. Impacts

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Impacts of the MSU grant span across all focus areas discussed in this section. Interviewees emphasized that the main impacts derive from new or improved PCCs. Popular PCCs experienced significant crowding before BTOP. The new workstations have diminished crowding, leading to a reduction in the frequency and length of users' waiting periods. As a result, users have faster and greater access to PCC resources. Improved broadband connections, Wi-Fi networks, and updated operating systems have also enhanced user experiences.

Precise measurement of social and economic impacts of the MSU grant is challenging because most PCCs did not track outcomes. Libraries, in particular, have strict privacy policies that protect user information, including their identity and online activity. Of the 205 PCCs that received grant funding, 162 are located within libraries.<sup>14</sup> Because of the infeasibility of outcome tracking, ASR has relied heavily on anecdotal evidence from PCC staff to assess the impact of the BTOP grant. PCC staff reported several success stories, including the following:

- A patron of the CADL Williamson Branch found a job after many months of using the library computers to search and apply for jobs during the grant period. CADL librarians indicated that these types of impacts happen regularly and that patrons will often notify them orally or in writing, expressing gratitude for the PCC resources.
- A librarian at the Pickford Community Library introduced an acquaintance who had never obtained a general equivalency degree (GED) to the LearningExpress Library offered through BTOP. The individual successfully used this tool, along with adult education courses, to acquire a GED, and is now pursuing a degree in geriatric nursing.
- The Mt. Elliott Makerspace is the birthplace of numerous small businesses. Businesses started at the Makerspace include a silk-screening business, a t-shirt production business, a catering service, and a cookie company. Local stores such as Whole Foods, Avalon International Breads, and Harbortown Market carry products of a tea company that originated at Mt. Elliott. Some enterprises continue to use Makerspace workshops and resources for production activities.
- An at-risk youth patron of Mt. Elliott Makerspace used BTOP-provided computers and audio production tools to record, produce, and edit his own music, which helped launch his music career. His achievements include an entry in the Billboard Top 100. He has performed at major music events such as the Billboard Music Awards, and since entering the entertainment industry, has secured some modeling jobs.

The BTOP grant was instrumental in producing these impacts. Interviewees emphasized that, without the grant, PCCs would have been forced to offer a lower level of service and training because of a lack of workstations, slow Internet connections, and out-of-date software.

### 2.1 Focus Areas

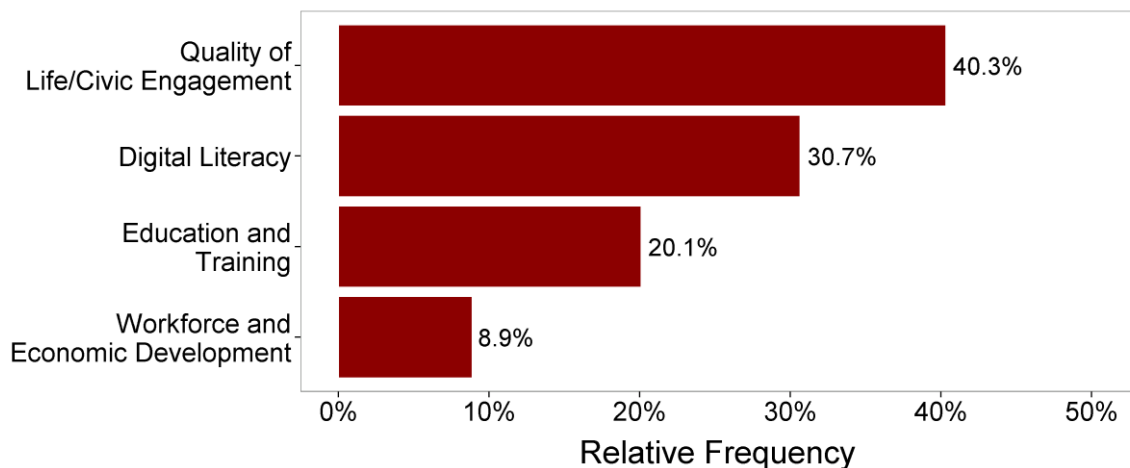
This section describes the impacts of the MSU project in terms of five focus areas. In order to analyze where impacts should expect to be found for this project, ASR tabulated the training hours for MSU reported in the 2012 Annual Performance Progress Reports (APR) using the focus area categories described in *Interim Report 1*.<sup>15</sup> As shown in Figure 2, the grantee reported training hours in the 2012 APR only in the area of Digital Literacy.<sup>16</sup>

**Figure 2. Grantee Training Hours Categorized by Focus Area**



ASR also analyzed the statements grantees made during the interviews and focus groups and categorized them based on focus area, as shown in Figure 3. Since PCCs do not track the content of users' online activity, they rely on users' self-disclosure during casual conversation to gauge what the most common uses of PCC resources may be.

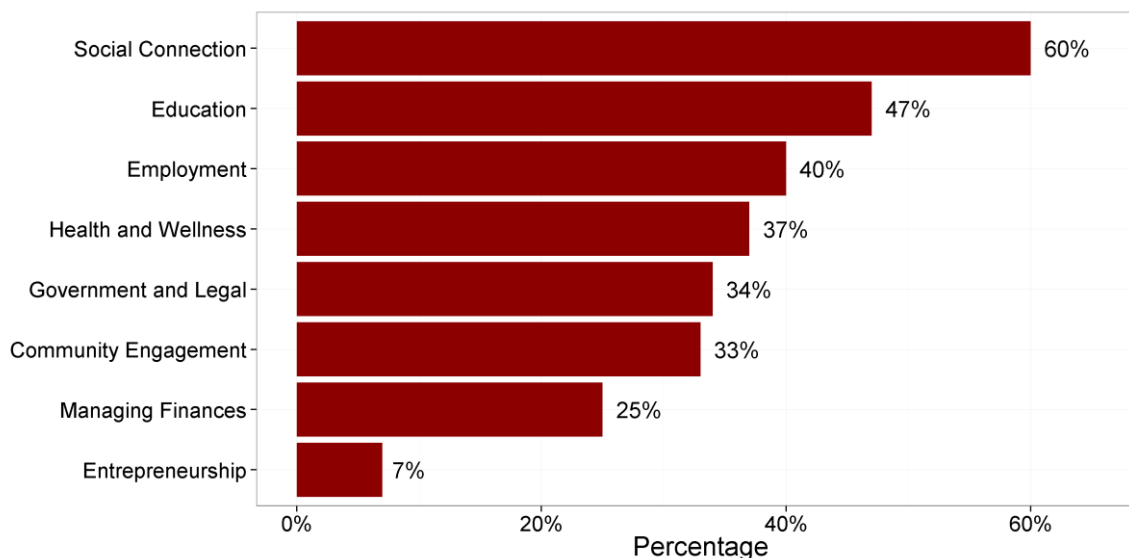
**Figure 3. Focus Area Statements Made by Interviewees**



Quality of Life/Civic Engagement was the most frequently discussed focus area during site visit interviews and focus groups. Of the PCCs visited by ASR, two were libraries and two were community organizations. This breakdown is not representative of the PCCs included in the MSU grant, where libraries account for more than 79 percent of PCCs (162 locations) and community organizations make up 18 percent (37 locations).<sup>17</sup> For this reason, the proportion of discussions related to Quality of Life/Civic Engagement may overestimate the degree to which PCC users engaged in Quality of Life/Civic Engagement activities. Digital Literacy and Education and Training follow, trailed by Workforce and Economic Development, which accounted for a relatively small portion of the discussions.

Research on Internet use in libraries in the United States echoes the finding that Quality of Life/Civic Engagement and Digital Literacy activities tend to dominate library Internet use. Becker et al. (2010) explored library patrons' Internet use in eight of the most common subject areas, as shown in Figure 4.<sup>18</sup> Quality of Life/Civic Engagement includes the government and legal and community engagement subject areas, while Digital Literacy encompasses social connection and managing finances.

**Figure 4. Rank of Library Internet Use by Subject Area from Becker et al. (2010)**



Employment and Entrepreneurship activities are included in the Workforce and Economic Development focus area. While the research conducted by Becker shows that 37 percent of users report using library computers to access health and wellness information, site visit interviewees did not report any accounts of PCC use within the Healthcare focus area. The grant funded the establishment of one PCC at a healthcare facility, suggesting that PCC activity relating to Healthcare topics likely occurs. However, the evaluation study team did not visit this location.

## 2.2 Digital Literacy

*“How do you prove that the grant is having a direct impact? Perhaps because not as many basic questions are being asked of our Technology Assistant on a daily basis. That would be the proof right there. The expectations and skills of the users are steadily climbing.”*  
 – Librarian, Hackley Public Library

This focus area is fundamental to all the others. Grantee PCCs administered training hours only in the area of Digital Literacy, but the categorization of discussions in Figure 3 suggests that impacts and activities occurred in other focus areas as well. Digital Literacy defines a set of skills and abilities that enable an individual to interact with the digital aspects of culture, and to maintain a digital identity. In the National Broadband Plan, the Federal Communications Commission (FCC) defines digital literacy as “the skills needed to use information and communications technology to find, evaluate, create, and communicate information.”<sup>19</sup> This focus area includes personal activities such as online banking and shopping, paying bills, and maintaining social connections with friends and family.

The main impact in the area of Digital Literacy is an increase in the overall skill level of PCC users. Although PCCs did not collect data on skills before or after grant activities took place, shifts in the complexity of questions posed to PCC staff indicate improvements in Digital Literacy. In the early grant period, patrons required assistance to complete basic computer tasks, such as turning on the computer or using a word processor. Patrons have developed a richer skill set, resulting in questions on more advanced or specialized computer topics. Individuals who complete basic Digital Literacy training may use those skills as a starting point for adopting other technologies.

The following activities supported this impact:

- Public libraries across the state have used new or increased PCC capacity to deliver 86,430 hours of digital literacy training as of December 2012.<sup>20</sup> Course topics include basic computer use, e-mail, search engine use, Microsoft Office, social media, couponing, tablets, e-readers, and smartphones. Some sites offer classes for specific target populations such as senior citizens or children.
- CADL branches have formed a loose partnership with the Information Technology Empowerment Center (ITEC) in Lansing. ITEC delivers technology literacy programs for youth and adult populations in the Capital Area.
- CADL branches have implemented a Book-A-Librarian program through which patrons can reserve a thirty-minute one-on-one training appointment on the technology-related topic of their choice. Some individuals receive training on a digital device such as a smartphone, tablet, or e-reader. Many request help establishing an email account, particularly during tax season.
- The grant provided a license for LearningExpress software for Michigan Public Libraries. Accessible through the Michigan eLibrary (MeL) website, the LearningExpress Library offers a self-guided Computer and Internet Basics course and numerous tutorials for popular software. Topics include Windows and Mac operating systems, Microsoft Word, Access, Excel, and Adobe Photoshop. Any user with a valid Michigan driver's license can access LearningExpress from any device with an Internet connection.
- Some subgrantees received multiplatform equipment to broaden the range of digital literacy skills among their patrons. These PCCs provide a combination of laptops, desktops, Macs, PCs, open-source software, and high-end technical software. EMEAC and Mt. Elliott Makerspace are examples of this.
- Patrons frequently use library computers to complete everyday tasks that were previously conducted offline, such as banking, shopping, and couponing. They also access social media to maintain connections with friends and family. This includes email, messaging, and uploading and downloading pictures.

## 2.3 Education and Training

*"Because the school districts don't have school librarians anymore, the public library is filling in. We have 120 kids from the school across the street come over every other week so they can get books and do homework during school hours." – Librarian, South Lansing Branch, Capital Area District Libraries*

This focus area includes activities that lead to a certificate or diploma that would typically be awarded by an educational institution, or that indicates the recipient has received training that is recognized as valuable for career advancement. Examples of certificates or diplomas include: community college degrees, four-year college degrees, advanced degrees, GEDs, certifications in advanced software technologies such as network engineering, and other licenses or certifications that reflect knowledge of a particular subject at a level that would typically be taught at an educational institution. Becker estimates that 42 percent of library Internet users access educational material.<sup>21</sup>

PCC and education-related privacy policies make it difficult to measure impacts related to Education and Training. Research suggests the following impacts have likely occurred, based on interviewee-reported activities:

- According to Becker, over 64 percent of adults who apply to college or certificate programs on a library computer are accepted.<sup>22</sup> PCC staff reported that users have applied to postsecondary programs on PCC computers.

- Becker also estimates that more than 51 percent of those who applied for financial aid on a library computer received funding.<sup>23</sup> Interviewees said that many of those using library computers to apply for higher education opportunities often use them to complete Free Applications for Federal Student Aid (FAFSA).

The following Education and Training activities have also commonly occurred at PCCs:

- Current students use the PCC workstations to conduct research, complete assignments, or access their school's learning management system. Many online students do not have access to a college library so the public library is the best available alternative. For college-level research, librarians recommend the MeL database. MeL offers access to academic articles and research-level materials suitable for completing college-level work.
- School funding cuts in the Lansing area have affected school libraries and computer labs. Schools with inadequate resources will often send students to the nearest public library to make use of PCC resources. Here, they have access to research tools and are trained in MeL database use.
- CADL branches offer literacy programs for fifth- and ninth-grade students that align with their respective curricula. The fifth-grade students learn about research methods and tools to complete their first research paper. The ninth-grade program focuses on the freshman English course.
- The head librarian at the South Lansing Branch Library has seen individuals accessing the library's Wi-Fi service to complete schoolwork outside of operating hours. One example of this occurred in the early morning, when two students were using the service to complete their homework assignments on their own devices outside of the library before school.

## 2.4 Workforce and Economic Development

*"A woman came in, and she was just in tears. She had been in for months and months practicing on the computer and using the computer to apply for jobs ... and she said 'I got a job. I got a job!'" – Librarian, South Lansing Branch, Capital Area District Libraries*

This focus area includes activities intended to increase overall employment of the target population, or to assist employed members of that population in finding jobs that offer increased salaries, better benefits, or a more attractive career path, including self-employment. Workforce and Economic Development activities can be performed for one's own benefit, or they may be done on behalf of another person to assist with his or her employment situation. In order for project activities to be included in this category, it must be the intention of the grantee to assist members of the workforce in improving their employment outcomes, and project resources must be devoted to this purpose.

Although MSU did not directly measure impacts related to Workforce and Economic Development, research suggests that impacts in this area have likely occurred, including:

- The grantee trained 673 MSU and community college student interns to help with the configuration, delivery, and installation of new equipment.<sup>24</sup> While interns gained valuable experience through the program, the evaluation study team could not assess the impact of the program on their future education and career paths because Family Educational Rights and Privacy Act (FERPA) restrictions limit opportunities for outcome tracking. However, research conducted by the National Association of Colleges and Employers indicates that an internship significantly increases the likelihood of receiving a full-time job offer.<sup>25</sup> Interns received IT training and hands-on practice as they worked alongside coordinators to install BTOP workstations and support equipment.
- Becker estimates that of those who search for job opportunities on library computers, 33 percent interview for a job and 16 percent are hired.<sup>26</sup> Library patrons who are job seekers use

PCC workstations to complete job searches and apply to openings. Library staff assists novice users in navigating to popular employment sites and completing online job applications. Those who are proficient users are typically aware of web-based employment resources and complete applications and other materials without assistance.

The evaluation study team visited the Mt. Elliott Makerspace in Detroit, a community workshop where patrons can explore creative and entrepreneurial activities involving digital or physical projects. Mt. Elliott received BTOP funding to expand its PCC, purchasing four iMac computers and a digital projector. The iMacs are equipped with several media production tools, including GarageBand, Pro Tools, Final Cut, and Inkscape. Existing resources include a woodworking area, a bicycle repair area, multiple computer numerical control (CNC) machine tools, equipment for printing digital images on various materials, and kits for computers, electrical systems, and robotics. The following Workforce and Economic Development impacts have occurred because of Makerspace activity:

- A number of entrepreneurs established their business out of the Makerspace. Some continue to operate with the help of Makerspace resources. Businesses include a silk-screening business, a t-shirt production business, a catering service, a cookie company, and a tea company. Local businesses, including Whole Foods, Avalon International Breads, and Harbortown Market, now carry products from the tea company established at Mt. Elliott.
- An aspiring musician who was an at-risk youth used the BTOP computers and audio production tools to record and edit music. The finished products helped launch his career as a successful entertainer, with an entry in the Billboard Top 100. He has since performed at large-scale events such as the Billboard Music Awards and taken up professional modeling.

In addition, the following Workforce and Economic Development activities occurred during the grant period:

- LearningExpress Library offers access to job-training materials for workplace skills improvement and occupation practice tests. Preparatory materials are available for Armed Services Vocational Aptitude Battery (ASVAB), Commercial Driver's License (CDL), and Praxis, among others.
- Patrons actively enrolled in Michigan Works!, a government employment agency, and use PCC workstations to access their online Michigan Works! accounts. Some PCCs collaborate with their local Michigan Works! service center to deliver workforce development training.
- Several libraries offer entrepreneurship and career readiness workshops using their PCCs. Topics include résumé writing, making the most of a LinkedIn membership, and operating an eBay business. Those who participate in software training are encouraged to highlight their proficiency in those programs on their résumé.

## 2.5 Quality of Life/Civic Engagement

*"Before, people were saying 'I need to touch this paper. I need to get the USA Today and read it.' Now everyone is saying 'USAToday.com. I'll read it online.' So it's a critical awareness, and it's opening up people to the possibilities that you can get information that can help improve your quality of life." – Program Coordinator, East Michigan Environmental Action Council*

The Quality of Life/Civic Engagement category includes activities that create stronger and more integrated communities, and those that promote interaction between citizens and their governments. Common uses of library PCCs within this focus area include researching laws and regulations, downloading government forms, researching government programs or services, seeking help from a government official or agency, following current events, researching candidates or issues, and managing a club or nonprofit organization.

Becker reports that 34 percent of library Internet users engage in activities related to government and legal subjects and 33 percent in community engagement activities.<sup>27</sup> Figure 3 shows that interviewees heavily discussed the Quality of Life/Civic Engagement focus area, but PCCs were not required to track associated impacts. The following activities occurred:

- Interviewees expressed that popular uses of PCC resources include filing taxes online, downloading government forms, and applying to government programs.
- LearningExpress Library offers exam preparation materials for U.S. citizenship and a guide for obtaining a permanent residence card (green card). Content is available in English and Spanish.

Community center PCCs, such as the center at EMEAC, conducted many grant activities related to Quality of Life/Civic Engagement. These PCCs engage in activities specific to the core mission of the host organization. The grant partially funded EMEAC's Re:Media environmental justice media program. The goal of the program is to promote the production and use of multimedia as a means for driving change around environmental and social justice issues.

EMEAC uses the equipment provided by the grant to train residents and allow them to create media artifacts around issues that affect their communities. EMEAC takes mobile equipment into neighborhoods to facilitate workshops, making residents critically aware of the digital divide in their area. EMEAC serves isolated neighborhoods where Internet use is scarce and makes a concerted effort to include those individuals in the electronic community. EMEAC has also developed outreach and training opportunities such as the Environmental Justice Media Fellows program. The impact of these activities is unknown, as EMEAC, like the other PCCs, was not required to track impacts associated with their activities. Other practices include the following:

- The EMEAC YouTube channel includes sixty-one videos.<sup>28</sup> While EMEAC leadership produced some of the content, community members and workshop participants produced many of the videos. Video content ranges from information on water quality, prospective land sales, food security, and other issues of interest to community members. EMEAC media creators used grant-funded hardware and software to produce many of the videos. As of May 2013, the channel had thirty-three subscribers.<sup>29</sup> Programs for all ages center on environmental justice-focused media creation. EMEAC also screens media artifacts in the community to educate residents about environmental justice issues and to serve as a means of outreach.
- EMEAC engages in heavy use of social media to promote its programs. It creates Facebook posts, blog entries, and Twitter hashtags around issues and stories. The goal is to synthesize media reports into easily readable narratives, and then disseminate that information through social media websites to reach individuals who might not follow traditional media channels. EMEAC encourages the use of social media by local residents to raise awareness in their communities and to achieve greater self-efficacy at the national or global level.

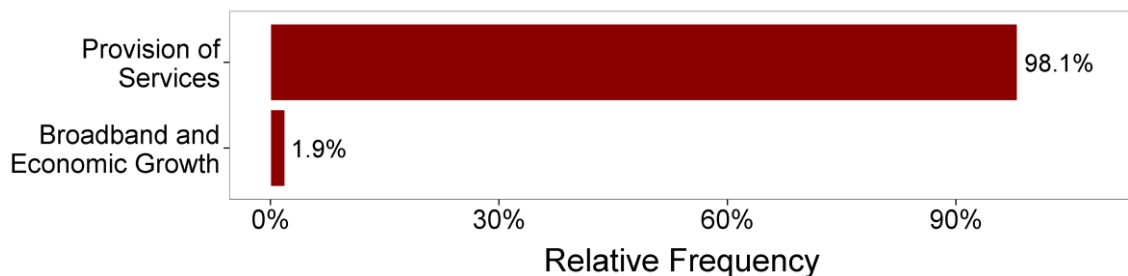
## Section 3. Recovery Act Goals

This section describes the activities and outcomes associated with Recovery Act goals. Of the five Recovery Act goals for the BTOP program as a whole, two relate most directly to PCC programs:

1. Provide broadband education, awareness, training, access, equipment, and support to
  - a. schools, libraries, medical and healthcare providers, community colleges and other institutions of higher learning, and other community support organizations
  - b. organizations and agencies that provide outreach, access, equipment, and support services to facilitate greater use of broadband services by vulnerable populations (e.g., low-income, unemployed, seniors)
  - c. job-creating strategic facilities located in state- or federally designated economic development zones
2. Stimulate the demand for broadband, economic growth, and job creation

Figure 5 presents the relative frequency of topics related to Recovery Act goals as discussed during interviews and focus groups. Since the grant primarily funded new equipment and connectivity improvements, the majority of statements made by interviewees relating to Recovery Act goals focused on Provision of Services.

**Figure 5. Frequency of Topics Related to Recovery Act Goals**



### 3.1 Provision of Services

*"You don't want anybody to come in here and be frustrated because they can't get a computer. You want them to come in here and have a good experience, and [the grant] has allowed us to do that." – Librarian, South Lansing Branch, Capital Area District Libraries*

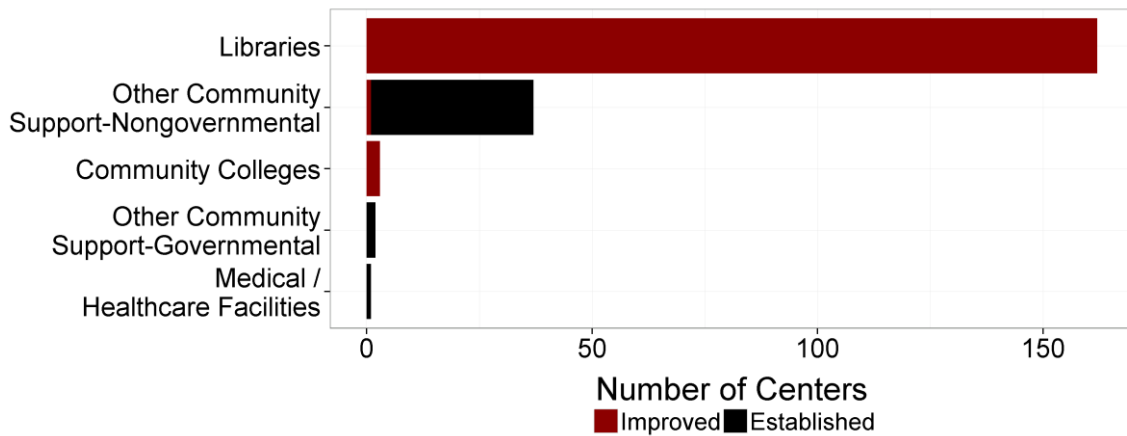
The focus of the grant was on the provision of broadband equipment and connections at 205 PCCs, including libraries, churches, and other community anchor institutions, as of December 31, 2012.<sup>30</sup> Many of these locations had been making do with limited or no computer resources before the BTOP grant. Without the BTOP grant, users would have continued to experience frequent waiting periods, slow connection speeds, out-of-date software, and older operating systems.

The grant funded the purchase of desktops, laptops, network support equipment, upgraded Internet connections, and furniture for new and existing PCCs. The equipment and furniture purchased varied among sites and depended on existing PCC resources. Figure 6 presents the number of PCCs improved and established through the BTOP grant. The grant established 39 new PCCs and



funded improvements at 166 PCCs. Improvements include the addition of new workstations to an existing center, installation of new support technology, and upgrades to connection speeds. The majority of PCCs affected by the grant were located in libraries. All 162 library PCCs received improvements. Nongovernmental community organizations were the next largest group to receive grant funding, with thirty-six new PCCs established and one improved. The grant also established one medical/healthcare facility PCC and two public housing PCCs, and funded PCC improvements at three community colleges.<sup>31</sup>

**Figure 6. PCCs Improved and Established**

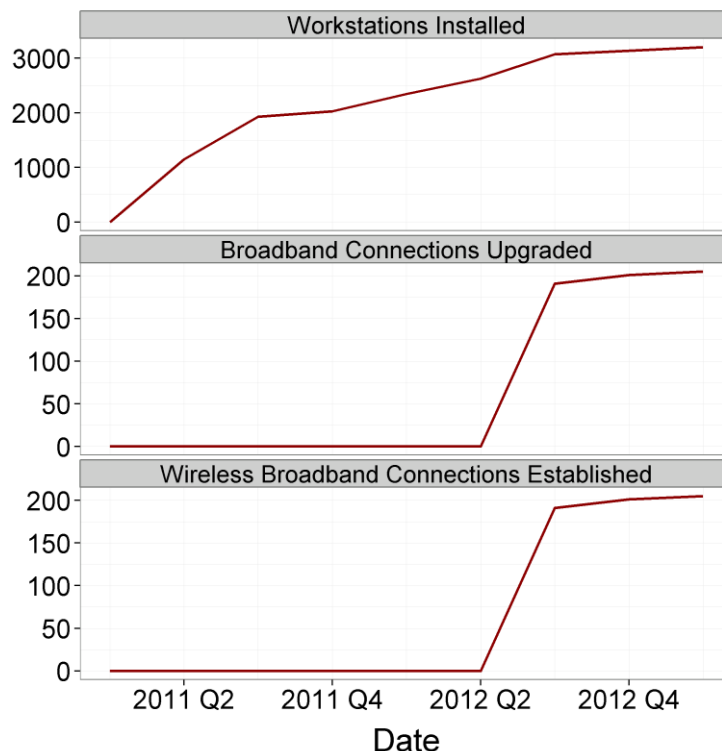


The following examples illustrate several ways in which MSU allocated funding to provide PCC services:

- Newly established PCCs typically had little to no existing infrastructure to build on and required more resources. These sites required the installation of all major PCC features, from the workstations themselves to furniture.
- MSU commonly installed workstations identical to or similar to existing equipment at previously established PCCs. In addition, existing equipment often received comprehensive software and connectivity improvements to standardize stations and accommodate increased capacity.
- Some PCCs chose to establish or improve public Wi-Fi networks. Wi-Fi access is available outside of the building, during or outside of library hours. Interviewees provided several accounts of individuals, and even neighboring businesses, accessing public Wi-Fi networks from outside the walls of the PCCs, during and outside of standard operating hours.
- Other subgrantees ordered laptops for multipurpose use. Laptops can be set up in a temporary lab setting, taken into communities to function as a mobile lab, or simply checked out to library patrons when not in use.
- Grant funding established special workstations for users with physical, visual, hearing, and other impairments at some PCCs. PCC staff noted infrequent use of disabled-accessible workstations.

Installation of workstations increased steadily throughout most of the project, as shown in Figure 7, tapering off in late 2012.<sup>32</sup> MSU calculated the most efficient number of computers for each location using a Colorado State Library formula that takes existing infrastructure, user demand, and physical constraints into account. The results functioned as a loose guideline for allocating funds to subgrantees. As of December 31, 2012, MSU had installed 3,202 new computer workstations.<sup>33</sup>

**Figure 7. Cumulative Hardware and Connectivity Progress**



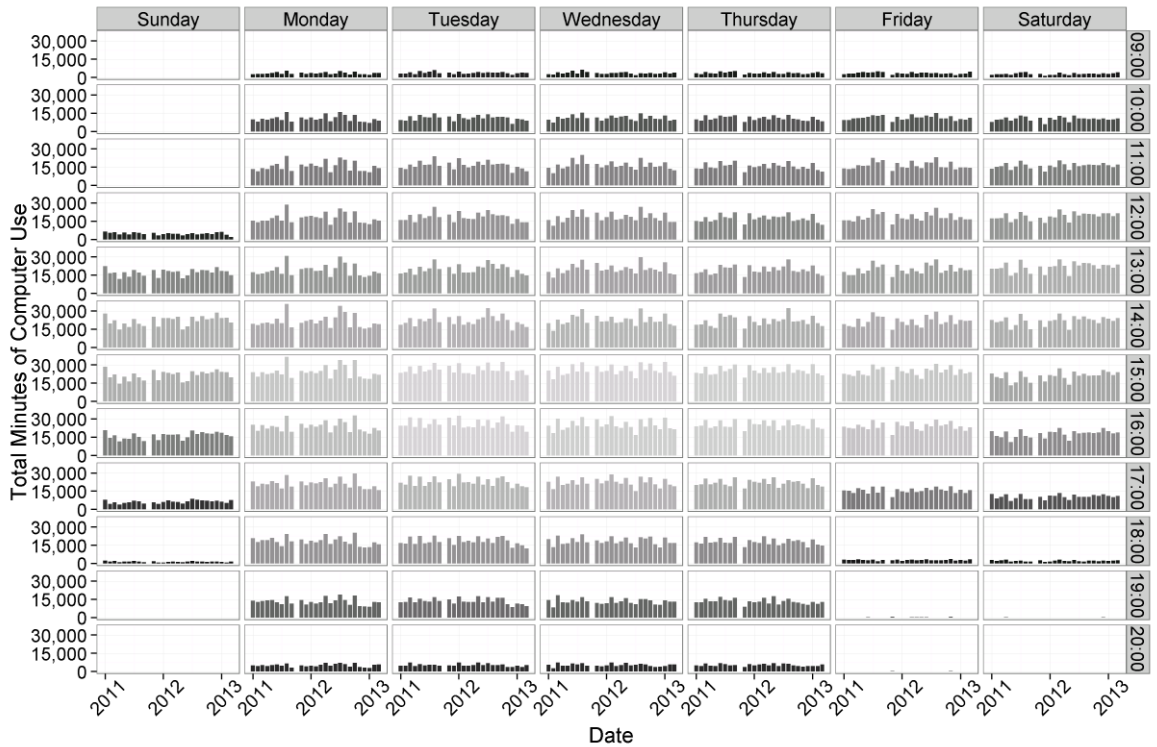
By the third quarter of 2012, MSU had upgraded broadband connections and established wireless connections at 201 PCCs. The remaining four PCCs received upgraded broadband connections and wireless connectivity in the following quarter.<sup>34</sup> The values depicted in the graph reflect when broadband improvements and new networks were complete, although work took place over multiple quarters. MSU made an effort to complete all connectivity upgrades by the latter part of 2012. This accounts for the spikes in upgraded broadband connections and established wireless networks between the second and third quarters of 2012.

### **3.1.1 Evidence from CADL PCCs**

Grantee PCCs are not required to gather utilization data. However, those that do offer some quantitative evidence for the analysis of grant impacts. This subsection presents data from the CADL system as an example of the effect of BTOP PCC usage.

Figure 8 displays the total minutes of use for each day and hour of availability at all CADL PCC locations. The color gradient represents the degree of usage, with lighter shades indicating higher levels of use. The pattern in shading shows that CADL public computers are busiest in the late afternoon during the middle of the week. Usage levels are relatively low just after opening and just before closing. Data were captured using Cybrarian, a public computer management system that compiled hourly data for all CADL public computers. This software helps library staff manage PCC utilization and captures usage statistics, including wait times, number and length of sessions, and PCC capacity and utilization. A single user might have multiple sessions in a single day. There is no way to assign sessions to a particular individual, as sessions are initiated with a valid library card and extensions are granted through visitor cards.

**Figure 8. Minutes of Use by Hour and Day at CADL PCCs**



While the grant increased capacity to varying degrees in all locations, Figure 9 shows that the total number of sessions in CADL PCCs exhibits a downward trend from mid-2009 through early 2013.<sup>35</sup> PCC staff members remarked that they experienced noticeable increases in usage during months when the recession was most severe. As the recession eased, they noticed PCC usage fall. This suggests that, during the recession, users in the Michigan area may have used the PCC to access online employment resources. Data for October 2011 are unavailable.

**Figure 9. Number of Sessions per Month at CADL PCCs**

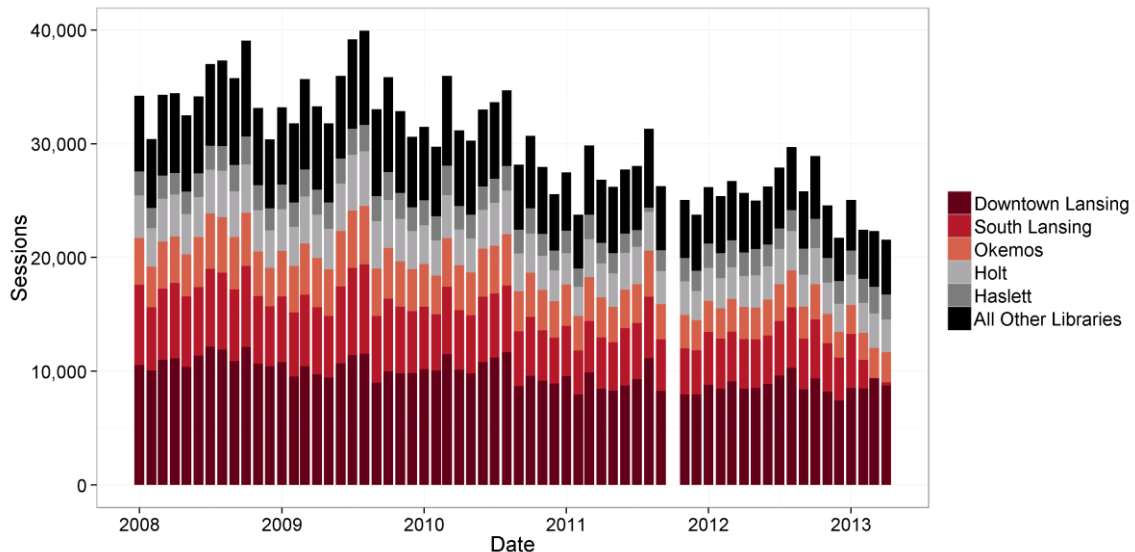
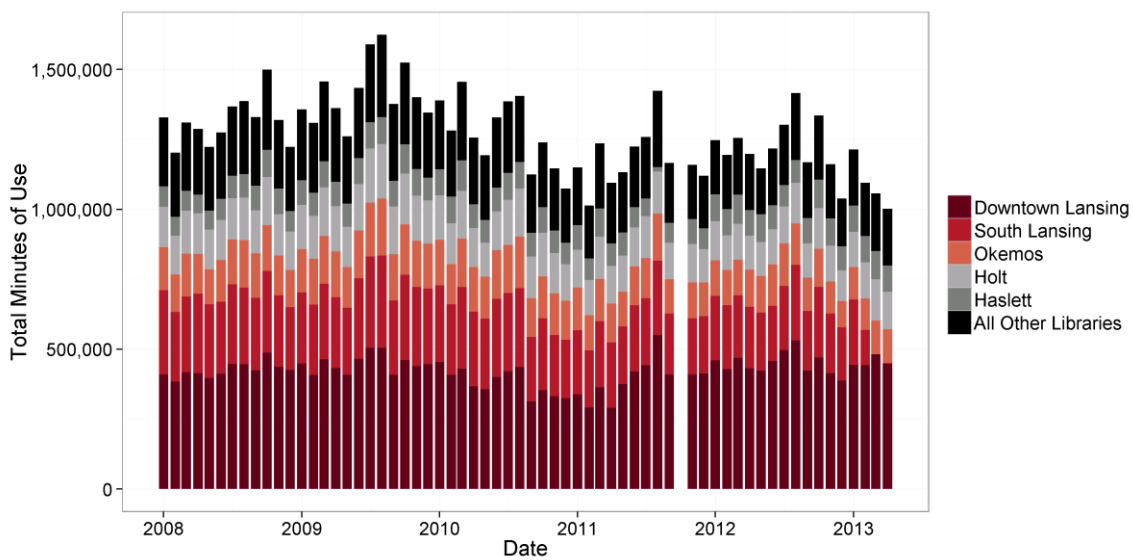


Figure 10 presents the total minutes of use for CADL computers each month.<sup>36</sup> Minutes of use follow a trend similar to that of number of sessions. Libraries typically cap individual sessions at thirty or sixty minutes. If there are no other patrons waiting for a session, users may be granted a session extension, up to a total of 180 minutes per day. If, after 180 minutes of use, the user requests additional time, he or she may be allotted additional time on a visitor card if there are no other patrons waiting.<sup>37</sup> It appears there is a slowly declining level of use at CADL PCCs. While some of this decline might be because of an easing of economic conditions, another explanation could be the growing popularity of mobile devices. All CADL locations offer public Wi-Fi service, commonly accessed by patrons via devices such as laptops, smartphones, and tablets. The Cybrarian system does not capture Wi-Fi usage statistics. The figures presented here do not reflect Wi-Fi usage. As mobile devices have grown in popularity, it is likely that more users are substituting Wi-Fi access for wired access, reducing the number of PCC sessions over time. This is supported by anecdotal evidence provided by library staff.

**Figure 10. Total Minutes of Use per Month at CADL PCCs**



Reduced wait times are the most prominent impacts on PCC utilization. Figure 11 and Figure 12 show that, in general, instances of waiting and average wait times decreased after grant implementation.<sup>38</sup> Section 7 provides more in-depth analysis of these effects on wait times.

**Figure 11. Number of Sessions with a Wait per Month at CADL PCCs**

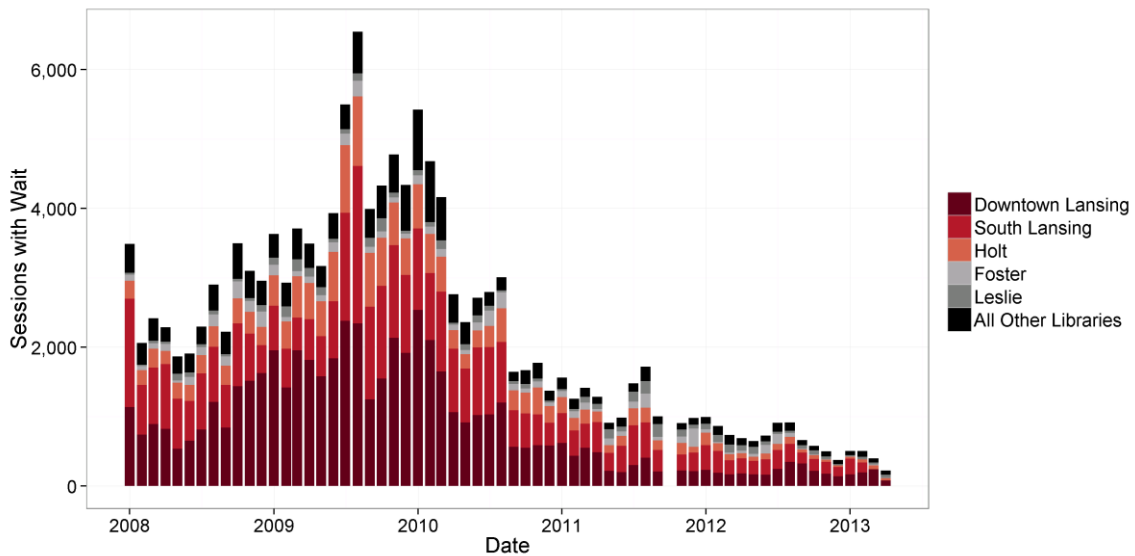
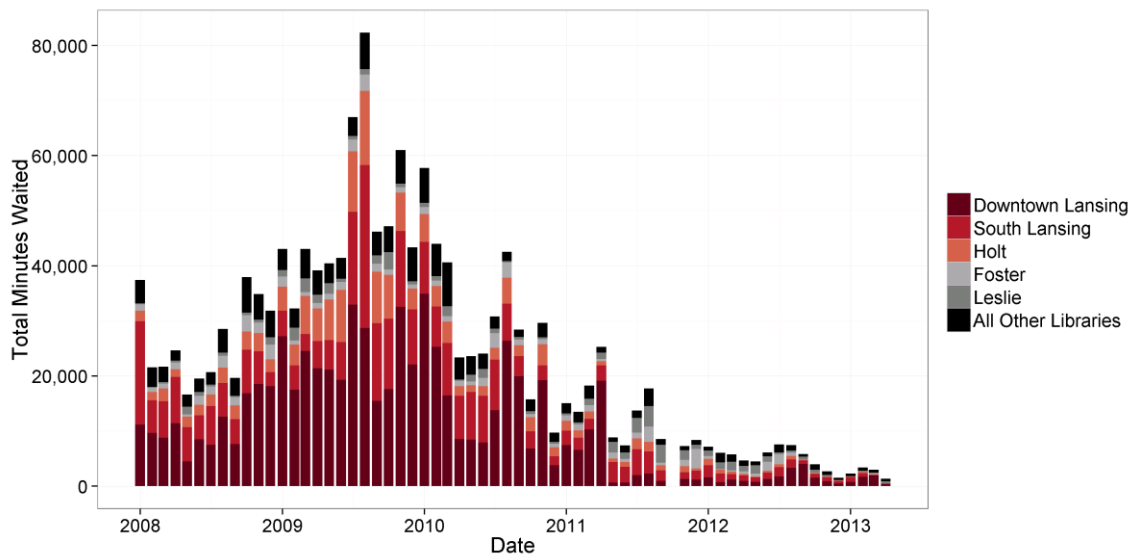


Figure 11 shows a rapid decrease in the number of sessions for which CADL patrons were required to wait before they could access a workstation. Figure 12, which presents aggregated wait times, exhibits a similar trend. The decreasing number of sessions as seen in Figure 9 could account for some of the reduction in the number and length of waiting periods. However, the frequency and length of waiting periods declined at a much sharper rate than the number sessions or minutes of use, indicating that increased capacity contributed to improved access.

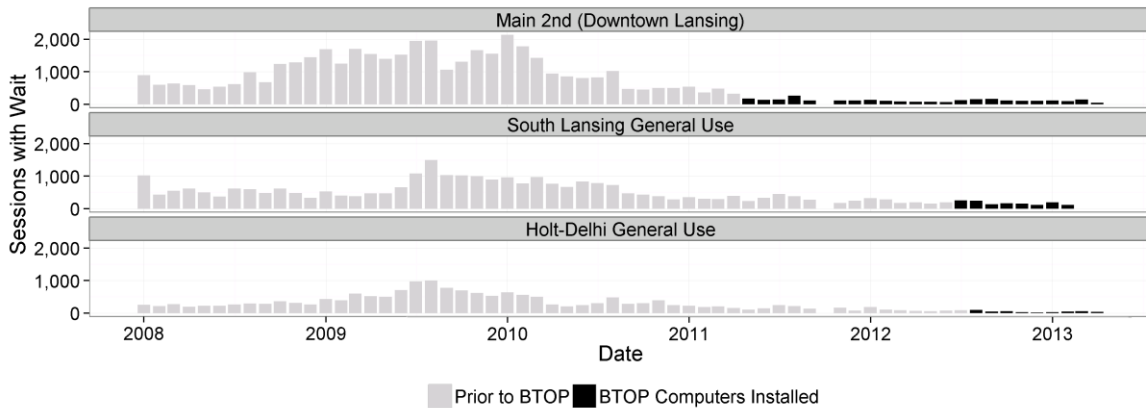
**Figure 12. Total Minutes Waited per Month at CADL PCCs**



MSU delivered grant equipment at different times in each library, and it is useful to visualize the data broken down by location. Figure 13 displays the number of sessions preceded by a waiting period for three high-traffic PCCs in the CADL system. Grey columns represent months before installation of grant-funded workstations, and black columns represent the months in which the grant-funded computers were in operation. The downward trend in frequency of waiting periods began before the installation of BTOP

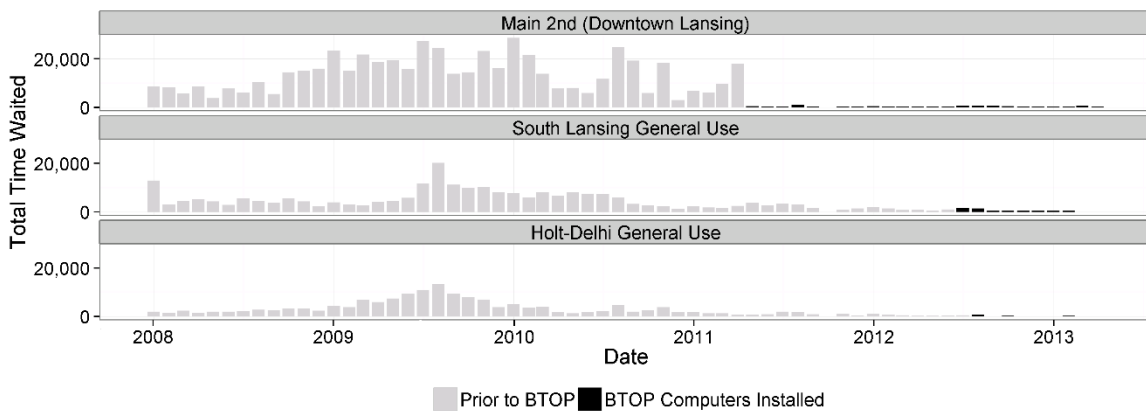
equipment. This indicates that the falling number of sessions shown in Figure 9 could have contributed to the reduction in the number of waits. However, the rate of decline at Downtown Lansing, the main CADL location, becomes more pronounced following the installation of BTOP computers.

**Figure 13. Number of Sessions with a Wait per Month at CADL PCCs**



Similarly, Figure 14 shows users' combined waiting time each month for the same three PCCs. As in Figure 13, total minutes waited each month began to shrink at South Lansing and Holt-Delhi before installation of grant-funded equipment, possibly because of a decline in use. Conversely, at Downtown Lansing, CADL's most-used PCC, aggregate monthly wait times fluctuated before installation of new workstations and fell significantly after they were in operation. Location-based data, at least for the Downtown Lansing site, lend further support to the claim that new and improved equipment mitigated waiting periods.

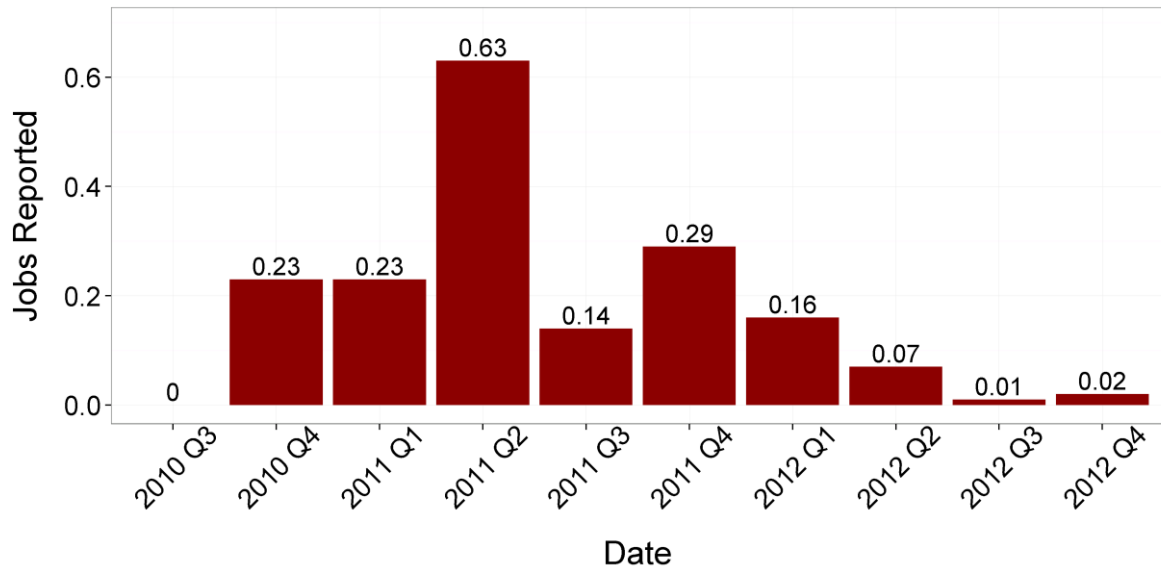
**Figure 14. Total Minutes Waited per Month at CADL PCCs**



### 3.2 Broadband and Economic Growth

As required by the Recovery Act, MSU reported the number of jobs created as a direct result of the project on a quarterly basis. Direct job creation was minimal, remaining below one full-time-equivalent position for the duration of the project and nearing zero by the last quarter of 2012 as seen in Figure 15.<sup>39</sup> The majority of grant dollars funded the provision of equipment and connectivity, rather than staff.

**Figure 15. Direct Jobs Created by MSU**



It is important to note that the figure above displays only direct jobs created, and does not include indirect or induced job creation, such as those deriving from entrepreneurial activities at Mt. Elliott Makerspace. The grant created an internship program in which 673 students from MSU and area community colleges worked with program coordinators to set up and install equipment provided through BTOP.<sup>40</sup> FERPA restricted ASR's ability to track individual students, so the effect of the internship program on jobs is unknown.

## Section 4. Grant Implementation

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This section describes particular aspects of the implementation of the MSU grant in order to understand the composition of activities and outcomes observed. The purpose of this categorization is twofold. First, settling on a consistent set of categories for each of the grants in the study sample facilitates cross-case comparison and analysis. Second, presentation of the activities and outcomes for this case by category simplifies understanding of the focus of the grantees' work. This analysis draws on qualitative observations made during our site visit.

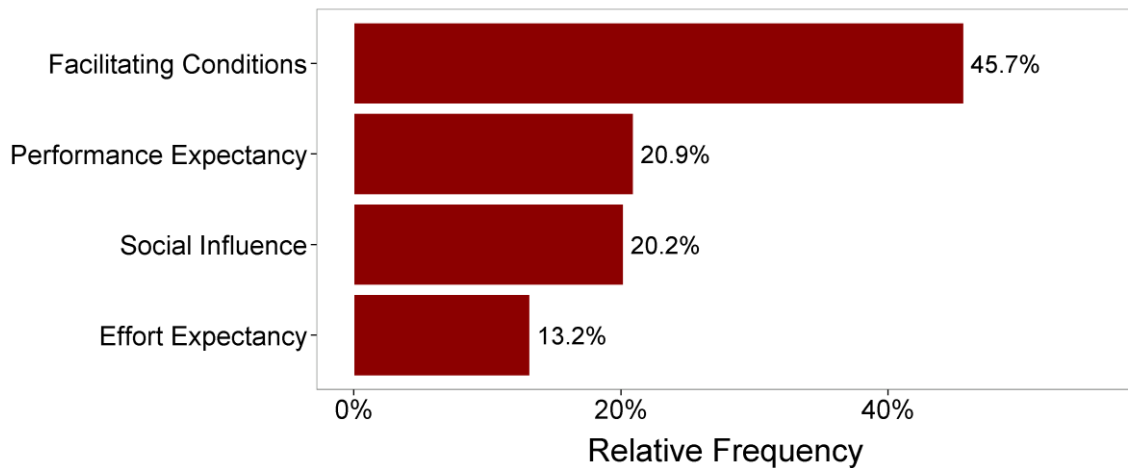
ASR is using a theory-based evaluation approach to examine the social and economic impacts of the BTOP program. This permits deeper understanding of grant features in terms of theory, which helps to explain how the grant activities produce impacts. For the PCC and SBA grants, ASR uses theories of technology adoption to examine factors that shape the demand-side of broadband services. The key theory ASR employs is the unified theory of the acceptance and use of technology (UTAUT), a technology adoption model proposed by Venkatesh et al. (2003).<sup>41</sup> The model is among the top three most frequently cited articles published in the information systems field and the preeminent article explaining the adoption of information systems. The UTAUT model traces its history from theoretical constructs found in literature that have a bearing on a user's intention of technology adoption and use. The UTAUT model is derived from the leading theories of technology adoption, including the theory of reasoned action, technology acceptance model, motivational model, theory of planned behavior, a combined theory of planned behavior/technology acceptance model, model of personal computer use, diffusion of innovations theory, and social cognitive theory.

UTAUT explains technology acceptance by looking at a user's intention to use an information system and the user's long-term use of that technology. The UTAUT model combines concepts found in earlier models of technology use to posit a unified theory of information technology adoption and use. UTAUT includes four dimensions determining user intention and technology use: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Each of these dimensions is further classified into constructs constituting the dimension. The subsections below define and discuss each of these dimensions. Venkatesh empirically tested the model and reported that it was successful in explaining more variation in user adoption of technology than other adoption models tested.

Figure 16 presents the relative frequency of topics related to grant implementation as discussed during interviews and focus groups, corresponding to the four UTAUT categories listed above. Facilitating Conditions is the most commonly mentioned topic. Interviewees also frequently mentioned Performance Expectancy and Social Influence topics.



**Figure 16. Distribution of Grant Implementation Topics by UTAUT Dimension**



## 4.1 Facilitating Conditions

*"Our customer base is still a lot of foot traffic, a lot of people that don't have home computers. So BTOP allowed us to get workstations that can handle today's speeds and also bring us up to Windows 7. We were on XP." – Technology Specialist, Hackley Public Library*

This category captures the degree to which the technical infrastructure available to the user supports potential broadband adoption, and the degree to which there are organizational supports to adoption. As a PCC grantee, MSU focused on Facilitating Conditions. This includes access to broadband technology, the extent to which users can choose to use broadband, the compatibility of broadband with their lifestyles and activities, and the cost of using broadband. It also includes the resources needed to support the PCC's services to provide access to the Internet and computers. It includes such things as the broadband connection, computers, workspaces, and clean and safe computer labs.

### 4.1.1 Access

Because the grant funded hardware, software, and furniture for new and upgraded PCCs, the grantee selected subgrantees that already had the staff and infrastructure in place to support PCC operations. Some sites undertook their own renovations to provide adequate space or technical infrastructure in order to qualify for grant funding. The following list explains how MSU addressed the issue of broadband access:

- The majority of PCCs received PC desktop workstations, but some received PC laptops or Mac desktops or laptops. Additional hardware included printing equipment and support technology for wired and wireless Internet connections. Updated Windows and Mac operating systems, LearningExpress online tutorial software, and word processing and media creation tools were among provided software. Connection speeds were also improved at existing sites. MSU found that standardizing equipment as much as possible across PCCs was an efficient strategy. Standardization allowed for bulk purchasing, lowering the purchase price per workstation. Reduction in per-unit costs allowed the grantee to provide more workstations than was initially anticipated.
- MSU used a Colorado State Library formula that accounts for existing infrastructure and physical constraints to estimate the appropriate number of workstations for each PCC. The

resulting figure served as a starting point instead of a hard rule for equipment provision. PCC staff members believed that the number of workstations provided through the grant was adequate for their centers' needs.

- Some PCCs used grant funds to set up a disability-accessible workstation. PCCs installed special furniture and hardware to accommodate users with physical disabilities, as well as software to accommodate those with hearing, visual, and other impairments.
- Some PCCs received new or improved Wi-Fi connectivity. Overall, Wi-Fi usage at PCCs has grown during the grant period as the selection and affordability of mobile devices has increased. The use of mobile devices at PCCs through wireless service frees PCC workstations that might have otherwise been occupied, mitigating overcrowding and waiting periods. Wireless access also serves a broader patronage than wired service because it is accessible outside of standard operating hours and in some cases outside of the PCC building.
- Home access among PCC patrons varies. Some have home computers that function poorly or have an unreliable Internet connection, while others do not have home access at all. Interviewees have observed patrons use the PCC as a substitute for home access because of the high costs of computer maintenance and Internet subscription. This practice was more common during the most severe months of economic recession.
- Most libraries offer open lab access during all hours of operation, including weekends. Some have limited resources or a unique PCC setup, such as a classroom-style lab, and regulate access more strictly. Other PCC host organizations provide varying degrees of access, often in more formal settings, because of staffing and time constraints.
- Some grantee PCCs have held informal events as an alternative to formal training sessions. These sessions typically promote a certain use or practice rather than provide focused instruction. Therefore, attendees are usually computer-proficient. For example, EMEAC facilitates Eat and Tweet, and Twitter Tea events in which participants enjoy a meal or a cup of tea together in a casual setting while engaging in social media use around a specific issue. Hackley Public Library holds Tech Wednesdays, an informal, hands-on workshop series that explores a different device or digital tool each week.

#### 4.1.2 Cost and Available Contract Terms

The MSU grant did not include activities that reduced the cost or increased the availability of broadband connections for new or existing subscribers.

## 4.2 Performance Expectancy

*"We're seeing a customer base that moved from 'I've never used a computer before, show me how to turn it on,' to 'Do you have this program? Do you have that program?' So they're coming in with the expectations of services that we provide now." – Technology Specialist, Hackley Public Library*

Performance Expectancy measures the degree to which a potential adopter believes that using the public computing center to gain access to broadband is beneficial for an activity in a particular focus area. Aspects of Performance Expectancy include the perceived usefulness of the new technology, outcomes expectations, and the perceived relative advantage of the technology versus previously used technologies. The following list describes Performance Expectancy as it relates to the MSU grant:

- Expectations of service have risen as communities have collectively become more digitally literate. Shifts in the types of questions fielded by PCC staff signal a baseline of services and equipment patrons have come to expect. As the grant period has progressed, PCC staff

members have received fewer basic computer questions and more specific requests for certain programs or hardware.

- Younger users tend to use PCCs primarily for social networking and entertainment. Some PCCs offer youth training programs designed to convey to participants that the Internet could serve as more than a source of entertainment. EMEAC summer camps, for example, teach students how to become media makers instead of consumers, while CADL literacy programs show students how to use online research tools.
- Library patrons who gain basic digital literacy skills often discover more ways to integrate broadband use into their everyday activities. For example, CADL librarians reported accounts of patrons establishing an e-mail account at a Book-A-Librarian appointment, and later purchasing an e-reader to take advantage of the library system's catalog of digital downloads rather than checking out a physical copy of a book.

### 4.3 Social Influence

*"In our survey, one of the interesting results was there was a small group that just wanted computing to be social. They want to be able to poke the person sitting next to them and say, 'Oh, look at this.'" – Grant Administrator*

This category measures the degree to which potential adopters perceive that others will view them favorably or interact with them in a positive way if they adopt broadband technology. This includes friends and family members who might already be using broadband technology. It also includes measures of whether the use of broadband is considered a social norm for the social group to which the potential adopter belongs. Components of Social Influence include subjective norms, social factors, and the image associated with broadband use. The following list describes Social Influence as it relates to the MSU grant:

- Because many patrons use PCC resources to maintain contact with family and friends and engage in social media, Social Influence is an important driver of PCC activity. PCC staff members consistently reported that e-mail, social networking sites, and other means of electronic communication were among the most popular uses of PCC workstations.
- Social Influence is a particularly significant dimension regarding PCCs anchored at community organizations. Social by nature, these organizations strive to get members online since their goal is to use computers as a means to raise awareness, increase members' self-efficacy, and ultimately generate change.
- Multigenerational programming alleviates the digital divide between younger generations and senior citizens, who often feel isolated regarding Internet use. EMEAC holds intergenerational social media workshops where younger users work directly with seniors in a casual, one-on-one setting.

### 4.4 Effort Expectancy

*"What the patrons tell me is that they're finding the computers so easy to use here. They don't have to maintain their own computer. You know how hard it is to maintain a PC. They don't have to buy print cartridges. They can do all of that here." – Librarian, South Lansing Branch, Capital Area District Libraries*

This category measures the expectations of the potential adopter regarding the difficulty of using broadband to achieve benefits in one or more of the focus areas described above. It includes preconceived ideas about the difficulty of using broadband technology and computers in general, and anxiety or concerns about the risks of broadband use. For PCCs, it indicates how the service

model made using broadband to access information and services on the Internet easier. The following are examples of how MSU addressed Effort Expectancy:

- Grantee PCCs have support staff and training programs in place to help users understand how to use the computers. Support staff arrangements vary across sites. While some PCCs have created staff positions devoted to PCC support, others have existing staff to address users' concerns when needed. Training ranges from formal, classroom-style instruction, to one-on-one tutoring sessions, to informal hands-on sessions.
- Interviewees believe that one reason users find PCC computers easy to use is that the PCC assumes the burden of maintenance. Many users have home computers that are malfunctioning because of viruses or lack of maintenance. At the PCC, patrons can enjoy access to a computer without having to maintain software and hardware, renew virus protection, replace printer ink cartridges, or purchase a monthly Internet subscription.

## Section 5. Techniques, Tools, and Strategies

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This section describes successful techniques, tools, and strategies identified by the grantee. MSU noted many successful techniques, tools, and strategies that it developed over the course of the grant.

### 5.1 Techniques, Tools, and Strategies

- MSU standardized equipment as much as possible across PCC sites and procured equipment at a reduced price through bulk purchasing. This allowed the grantee to supply more equipment than was initially proposed.
- Grant administrators conveyed the importance of minimum technology standards for PCC workstations to subgrantees that were not well versed in technology purchases. They emphasized a balance among affordability, functionality, and the long-term usefulness of the equipment.
- Library systems receiving BTOP resources allocated equipment among branches based on current PCC utilization as well as physical space. The Colorado State Library formula used by MSU has been an effective means of estimating the appropriate number of workstations at each PCC. Interviewees believed they had received an adequate number of units for their respective centers.
- The creation of a new staff position that functions as the primary source of PCC support allows staff to focus their full attention on their existing responsibilities. Hackley Public Library established a Tech Assistant position after its reference librarian received more requests for computer assistance than could be addressed while attending to her official duties.
- At the beginning of the year, Hackley Public Library holds a series of e-reader training courses, because e-readers are a common holiday gift among their patrons. Participants learn how to navigate their devices and how to access the library's selection of digital downloads.
- Intergenerational trainings, like those at EMEAC, are effective for a number of reasons. The informal, peer learning-style setting leverages the knowledge of the individual younger volunteers, meaning a skilled workshop leader is not required. The workshops target senior citizens, who tend to show low levels of broadband adoption. Volunteers provide focused, one-on-one training for senior trainees that allows training to proceed at the speed most appropriate for the trainee.
- Course offerings reflect the skills and demand of the service population. Workshop facilitators at Hackley, for example, monitor course attendance to adapt to patrons' demand for training. If attendance in basic computer classes should decline, staff would reallocate training resources to allow for more specialized instruction on a particular application or device.
- Shared public computer management software, such as Cybrarian, helps PCCs manage the utilization of their resources and identify usage trends. Management uses this information to maximize the efficiency of PCC resources.
- The Mt. Elliott Makerspace has implemented an earned computer program. The Makerspace solicits computer donations from individuals and businesses to use at the workshops. Workshop participants generally have basic digital literacy skills and receive instruction regarding computer anatomy and reinstallation of computer operating systems. Once they successfully reinstall an operating system, they receive an earned desktop computer.

## 5.2 Challenges

- The location of PCCs within libraries may imply to the public that the library staff can assist them in navigating the growing number of online government services. While they are willing to serve in this role when possible, the library staff interviewed by the evaluation study team indicated that absorbing this responsibility in addition to their official duties can be challenging.
- Cuts to library funding have resulted in branch closings, making it difficult for MSU to allocate resources in some areas.
- Existing contracts with Internet service providers have made it difficult for some PCCs to upgrade connection speeds. While their current providers may not offer service that is adequate for their needs, these PCCs are contractually required to continue their current service arrangement for a specified time before they can select a new provider. Because exiting such a contract is a costly venture, these sites must make do with slower speeds than desired.
- Keeping up with patrons' performance expectations can be a challenge for PCCs. As digital literacy becomes more widespread, users desire a greater variety of software and hardware from their PCCs.
- Because the BTOP grant is not a recurring source of funding, the sustainability of the equipment is uncertain. Individual PCCs will have to secure funding for the continued maintenance and replacement of equipment provided through the grant.
- Some sites that requested grant funding did not have the existing space, technical infrastructure, or staff required to support a PCC.
- EMEAC suffered a robbery in December 2012 in which all BTOP-provided laptops were stolen. Staff filed an insurance claim shortly after, and the stolen equipment was replaced. This indicates the importance of maintaining proper insurance as part of overall PCC management.

## Section 6. Conclusions

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The MSU grant addressed the issue of broadband access by providing public computers with broadband connectivity, Wi-Fi networks, and user support. The grant funded improvements at 166 existing locations and established 39 new PCCs. Libraries account for nearly 80 percent of grantee PCCs. Remaining centers include community organizations, public housing authorities, community colleges, and a medical facility. These sites were chosen as an overlay to library service where the capacity of area libraries was determined to be insufficient to address access needs of the local community, even with grant funding. The service model used by the grant focused on expanding PCC capacity and enhancing user experiences through increased Internet speeds, current software, and on-site support staff. At some sites, Wi-Fi connectivity and printing services are available. Patrons find the computers easy to use because they are well maintained and they face shorter waiting periods after the installation of additional workstations.

On-site staff members support users by fielding questions and handling basic computer maintenance duties. They deliver formal instruction through training programs. Grantee PCCs delivered all training hours in the area of Digital Literacy. Most PCCs deliver some form of training, whether in a classroom, peer-learning, or one-on-one setting. Classroom and peer-learning topics range from broad (introductory computer skills, Internet basics) to focused (LinkedIn, couponing). One-on-one instruction typically centers on topics of the trainees' choosing. Common subjects are e-mail and e-reader use. Patrons desiring a more casual learning experience can access online self-guided tutorials through MeL's BTOP-funded LearningExpress Library.

Users' digital literacy skills have improved over the grant period, based on anecdotal evidence, casual self-disclosure of PCC activities, and the types of questions posed to support staff. Frequent patrons now require less assistance with basic computer use and have progressed to intermediate- and advanced-level computer use, approaching staff with requests for specialized hardware and software. Features of the MSU project that contributed to developments in digital literacy include greater access because of increased PCC capacity, the delivery of training and support, and exposure to new technologies.

The frequency and length of patrons' wait times to use PCC workstations have diminished with the installation of BTOP computers. Fewer waiting periods implies greater broadband access, as envisioned by the Recovery Act. Users can quickly and easily log on to a computer and often enjoy a longer session than before capacity was expanded. While the evaluation study team could not measure individual outcomes of the project's intern program, student interns received indispensable training and hands-on vocational experience. Activities at individual PCCs have also focused on employment and enterprise, delivering career skills training, providing employment search support, and facilitating entrepreneurial activities.

The lessons learned in furnishing multiple PCCs through a centralized entity can be applied to projects with a similar structure. Choosing sites with existing technical infrastructure and staff to support PCC operations and standardizing hardware across sites are successful strategies for minimizing expenditures and maximizing efficiency. Mandating minimum technology standards necessitates a balance between functionality and cost while addressing long-term usefulness of equipment.

## Section 7. Quantitative Analysis

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The qualitative evidence presented in this report is supported by quantitative analysis of data on the CADL system provided to the evaluation study team by the grantee. In order to assess the extent to which there was statistical support for the conclusion that the MSU grant reduced the amount of users' waiting time, the evaluation study team developed a statistical model of wait times at PCCs that relates changes in minutes waited to the prevailing unemployment rate and the number of user sessions per month. The goal of this model is to understand the effect of the installation of additional computers on access to broadband at the PCC.

The mathematical statement of the model is as follows:

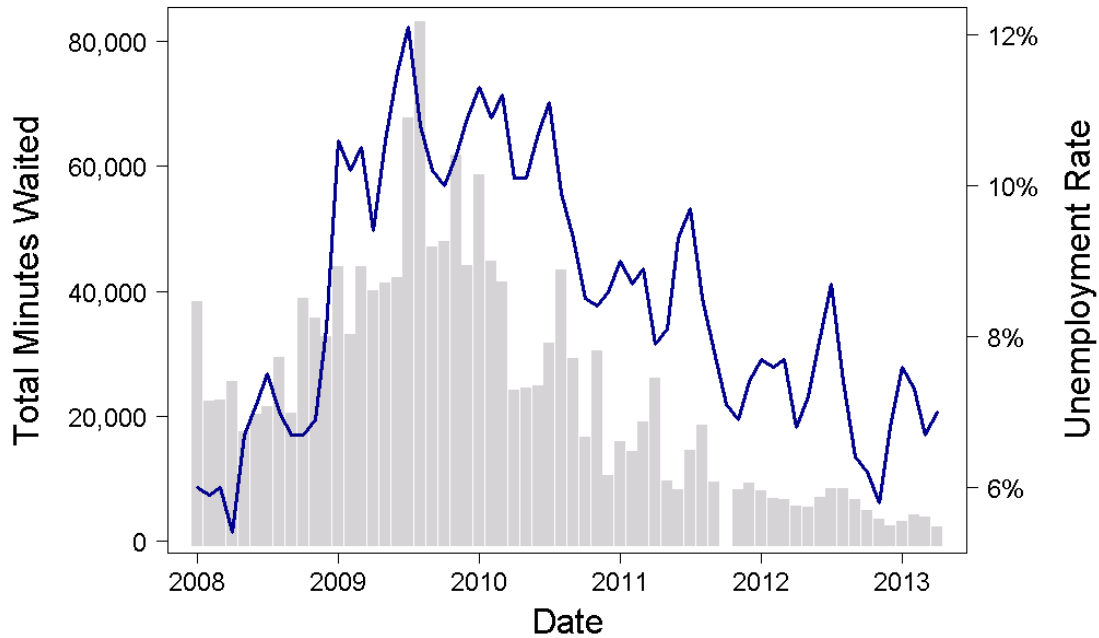
$$\begin{aligned}\Delta\% \text{ MINUTES WAITED}_{i,t} \\ &= \alpha + \beta_1 \cdot \Delta\% \text{ NUMBER OF COMPUTERS}_{i,t} + \beta_2 \cdot \Delta\% \text{ NUMBER OF SESSIONS}_{i,t} \\ &+ \beta_3 \cdot \Delta \text{ UNEMPLOYMENT RATE}_t + \varepsilon_{i,t}\end{aligned}$$

The dependent variable in this equation,  $\Delta\% \text{ MINUTES WAITED}_{i,t}$ , is the twelve-month percentage change in total minutes of waiting time for observed in month  $t$  at PCC  $i$ . MSU provided data for this variable for PCCs in CADL libraries for the months from January 2008 to April 2013. The equation models CADL patrons' aggregate wait time as a function of three explanatory variables and a constant term:

- $\Delta\% \text{ NUMBER OF COMPUTERS}_{i,t}$  represents the twelve-month percentage change in the number of computers in a CADL PCC. That is, a single observation represents the percentage change in the number of available computers in at PCC  $i$  from month  $t - 12$  to month  $t$ . All substantial changes in the number of computers in a PCC lab were the result of new, grant-funded workstations. The CADL system received twenty-six computers. PCC reconfiguration, downtime, and other factors led to other small variations in the number of computers in other months or labs. The installation of additional computers increases capacity, and would be expected to reduce wait times.
- $\Delta\% \text{ NUMBER OF SESSIONS}_{i,t}$  is the twelve-month percentage change in the number of sessions in CADL PCC  $i$  from month  $t - 12$  to month  $t$ . All else constant, an increase in the number of sessions indicates the PCC is experiencing higher demand, resulting in greater wait times.
- $\Delta \text{ UNEMPLOYMENT RATE}_t$  is the twelve-month absolute change in the unemployment rate of the Lansing metropolitan area.<sup>42</sup> As shown in Figure 17, the peak values of total time waited in CADL PCCs roughly coincide with the peak values of the Lansing-area unemployment rate during and following the recession of 2007 to 2009. Unemployed individuals may increase the frequency of their PCC sessions in response to additional time available for PCC use, in order to search for a job, or as a substitute for a costly home Internet subscription. As a result, excessive unemployment in the area could increase wait times.
- The constant term,  $\alpha$ , captures the effect of other factors on the year-over-year percentage change in total minutes of waiting time. For example, this could capture a linear trend in the total number of hours the library itself is open for use.



**Figure 17. Total Minutes Waited Versus Lansing Unemployment Rate**



Ordinary least squares in R was used to estimate the coefficients of the model described above. Table 1 displays the regression results.

**Table 1. Total Minutes Waited (Twelve-Month Percentage Difference)  
Regression Estimates for All CADL PCCs**

Explanatory Variable	Estimate	S.E.	t statistic	p-value
$\alpha$	-0.155	0.038	-4.069	< 0.001
$\Delta\% \text{ NUMBER OF COMPUTERS}_{i,t}$	-4.104	0.415	-9.888	< 0.001
$\Delta\% \text{ NUMBER OF SESSIONS}_{i,t}$	1.169	0.112	10.458	< 0.001
$\Delta \text{ UNEMPLOYMENT RATE}_t$	9.810	1.636	5.998	< 0.001
$N$	1507	$R^2$		0.149
$F$ -statistic	87.655	$p$		< 0.001

The statistically significant  $F$ -statistic of the regression provides evidence that, taken together, the unemployment rate, number of PCC computers, and number of PCC sessions have a significant effect on patrons' aggregate waiting time. According to the  $R^2$  statistic, variation among the explanatory variables specified in the model accounts for 14.9 percent of the variation in the year-over-year percentage change in total minutes of wait time.

All estimated coefficients are statistically significant beyond the 1 percent level. According to the estimated coefficients presented in Table 1:

- a 10 percentage point increase in the number of computers is associated with a 41 percentage point decrease in the total minutes of wait time
- a 10 percentage point increase in the number of sessions is associated with an 11.7 percentage point increase in the total minutes of wait time

- a 1 point increase in the Lansing unemployment rate is associated with a 9.8 percent point increase in the total minutes of wait time.

Since the grant funded new workstations in CADL PCCs, these regression results can estimate the effect of the grant on wait times. Predictions are calculated for two scenarios: the observed case, in which grant-funded workstation installations occurred, and the unobserved case, the hypothetical situation in which grant-funded workstation installations did not occur. The differences in predicted wait times between these scenarios represent the estimated impacts of the grant at affected PCCs. According to the regression results in Table 1, BTOP-funded workstations decreased total waiting time by an estimated 1,676 hours per year at CADL libraries, or roughly 64 hours per computer per year. To estimate the impact on wait times at all library PCCs, the average annual benefit can be extended to all new library workstations, assuming the effects of these computers throughout Michigan libraries will be similar, on average, to the effect observed at CADL. Seventy-nine percent of grantee PCCs were libraries, which corresponds to 2,597 workstations, if the 3,286 workstations purchased by the BTOP funding as of March 31, 2013 were allocated proportionally.<sup>43</sup> Overall, this number of workstations may be projected to reduce aggregate wait times at Michigan libraries by 166,208 hours per year.

## Section 8. Next Steps for the BTOP Evaluation Study

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ASR will deliver *Interim Report 2* to NTIA in early 2014. This report will include a summary of the second round of case study visits to the fifteen PCC and SBA grants, allowing for an analysis of the impacts of the grants over time. *Interim Report 2* will also summarize the findings from case study visits to twelve Comprehensive Community Infrastructure (CCI) grants. These visits will take place in the fall of 2013 and result in a set of twelve case study reports delivered to NTIA over several months.

For the PCC and SBA projects, *Interim Report 2* will provide an update to and refinement of the analysis presented in *Interim Report 1*. For the CCI projects, *Interim Report 2* will summarize the activities underway by twelve CCI grantees and the impacts these projects intend to have on broadband availability and adoption for community anchor institutions, communities, and individuals.

MSU is currently developing strategies to address sustainability. ASR will check in with MSU in the second quarter of 2014 to learn more about the sustainability of the project.

Finally, in September 2014, ASR will deliver a *Final Report* that quantitatively and qualitatively measures the economic and social impact of BTOP grants (including CCI, PCC, and SBA). The centerpiece of the *Final Report* will be an assessment of how and to what extent BTOP grant awards have achieved economic and social benefits in areas served by the grantees. To the extent that such information is available, results from studies performed by the grantees will round out the conclusions presented.

# Notes

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<sup>1</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11” (Washington, D.C.: Distributed by National Telecommunications and Information Administration, 2013).

<sup>2</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>3</sup> American Library Association, “U.S. Public Libraries and the Broadband Technology Opportunities Program”, May 2013, <http://www.scribd.com/doc/138899219/U-S-Public-Libraries-and-the-Broadband-Technology-Opportunities-Program-May-2013>.

<sup>4</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>5</sup> United States Census Bureau, “ACS 2005-2009 Summary.”

<sup>6</sup> United States Census Bureau, “ACS 2005-2009 Summary,” *American Community Survey*, December 13, 2011, <http://www2.census.gov/acs/>.

<sup>7</sup> National Telecommunications and Information Administration, “Statement of Work for Broadband Technology Opportunities Program (BTOP) Evaluation Study”, July 26, 2010.

<sup>8</sup> See Section 7.

<sup>9</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>10</sup> Teresia Hagelberger, “FW: Performance Statistics: CADL Book-a-Librarian,” email message to author, May 21, 2013.

<sup>11</sup> American Library Association, “U.S. Public Libraries and the Broadband Technology Opportunities Program.”

<sup>12</sup> See Section 7.

<sup>13</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>14</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>15</sup> ASR Analytics, *Progress towards BTOP Goals: Interim Report on PCC and SBA Case Studies, Broadband Technology Opportunities Program Evaluation Study (Order Number D10PD18645)* (Potomac, MD, 2012).

<sup>16</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>17</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>18</sup> Samantha Becker et al., *Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries* (Washington, DC: Institute of Museum and Library Services, March 2010).

From Becker et al. (2010): “This study’s findings were based on nearly 50,000 completed surveys, including 3,176 from a national telephone survey and 44,881 web survey responses from patrons

of over 400 public libraries across the country. Another 319 interviews were conducted with users, non-users, staff, administrators, funding agencies, and other community agencies in four case study sites around the country (Baltimore, Maryland; Fayetteville, Arkansas; Marshalltown, Iowa; and Oakland, California) to provide greater depth to the findings.”

<sup>19</sup> Federal Communications Commission, *Connecting America: The National Broadband Plan*, 2010, <http://www.broadband.gov/plan/>.

<sup>20</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>21</sup> Becker et al., *Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries*.

<sup>22</sup> Becker et al., *Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries*.

<sup>23</sup> Becker et al., *Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries*.

<sup>24</sup> American Library Association, “U.S. Public Libraries and the Broadband Technology Opportunities Program.”

<sup>25</sup> National Association of Colleges and Employers, “Class of 2013: Paid Interns Outpace Unpaid Peers in Job Offers, Salaries”, 2013.

National Association of Colleges and Employers, “Class of 2012: 60 Percent of Paid Interns Got Job Offers”, 2012.

<sup>26</sup> Becker et al., *Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries*.

<sup>27</sup> Becker et al., *Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries*.

<sup>28</sup> EMEAC Green Screen, “EMEAC Green Screen - YouTube”, 2012.

<sup>29</sup> EMEAC Green Screen, “EMEAC Green Screen - YouTube.”

<sup>30</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>31</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>32</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>33</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>34</sup> National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-03-11.”

<sup>35</sup> Teresia Hagelberger, “FW: Performance Statistics,” email message to author, May 17, 2013.

<sup>36</sup> Hagelberger, “FW: Performance Statistics.”

<sup>37</sup> Capital Area District Libraries, “Computer FAQs”, June 5, 2013, <http://ww2.cadl.org/computer-faqs/>.

<sup>38</sup> Hagelberger, “FW: Performance Statistics.”

<sup>39</sup> The Recovery Accountability and Transparency Board, “Recovery API,” *Recovery.gov* (Washington, DC, March 20, 2013), <http://www.recovery.gov/FAQ/Developer/Pages/RecoveryAPI.aspx>.

<sup>40</sup> American Library Association, “U.S. Public Libraries and the Broadband Technology Opportunities Program.”

<sup>41</sup> Viswanath Venkatesh et al., “User Acceptance of Information Technology: Toward a Unified View,” *MIS Quarterly* 27, no. 3 (September 2003): 425–478.

<sup>42</sup> Bureau of Labor Statistics, “Lansing-East Lansing, MI Metropolitan Statistical Area,” *Local Area Unemployment Statistics* (Washington, DC, June 17, 2013), <http://data.bls.gov/timeseries/LAUMT26296203>.

<sup>43</sup> National Telecommunications and Information Administration, *Michigan State University: Evidence Based Computer Centers II First Quarter Performance Progress Report, 2013*, 2013, [http://www2.ntia.doc.gov/files/grantees/26-42-b10545\\_michigan\\_state\\_university\\_ppr2013\\_q1.pdf](http://www2.ntia.doc.gov/files/grantees/26-42-b10545_michigan_state_university_ppr2013_q1.pdf).

# Glossary

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Acronym	Definition
APR	Annual Performance Progress Report
ASR	ASR Analytics, LLC
ASVAB	Armed Services Vocational Aptitude Battery
BTOP	Broadband Technology Opportunities Program
CADL	Capital Area District Libraries
CCI	Comprehensive Community Infrastructure
CDL	Commercial driver's license
CNC	Computer numerical control
COSC	Community Outreach Services Corporation
EMEAC	East Michigan Environmental Action Council
FAFSA	Free Application for Federal Student Aid
FCC	Federal Communications Commission
FERPA	Family Educational Rights and Privacy Act
GED	General equivalency degree
ITEC	Information Technology Empowerment Center
JCC	Jackson Community College
LCC	Lansing Community College
MCC	Mott Community College
MeL	Michigan eLibrary
MSU	Michigan State University
NTIA	National Telecommunications and Information Administration
PCC	Public Computer Center
PPR	Quarterly Performance Progress Report
SBA	Sustainable Broadband Adoption
UTAUT	Universal Theory of Acceptance and Use of Technology

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