Using Data Visualization and Dashboards to Support the Decision Making of Public Library Branch Managers

by

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I certify that I have read this dissertation and that in my opinion it meets the academic and professional standards required by Wilmington University as a dissertation for the degree of Doctor of Education in Higher Education Leadership and Innovation.

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Dedication

For my grandparents, Lillie and George Briggs, who encouraged me to pursue my dreams; my mother, Patricia Briggs McGowan, who made achieving dreams possible; and my son, Cameron Washington, Jr., who has made so many dreams come true.
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Abstract

Branch managers need data to support decision making, demonstrate community impact and be fiscally responsible. The Cleveland Public Library (CPL) system does not provide branch circulation and program attendance data to branch managers who are responsible for purchasing the materials that are borrowed by community members and developing and scheduling programs. The purpose of this study was to learn through feedback the data needs of branch managers. This study used a survey to determine the most useful data dashboard variables for purchasing materials and program planning for CPL branch managers and a plan for meeting branch managers’ data needs. CPL branch managers selected collection statistics and popularity rankings as the most useful data dashboard variables for purchasing collection materials. The number of program attendees and number of programs were selected as the most helpful data dashboard variables for program planning. Qualitative survey responses pointed out that basic library data such as circulation and demographics information is not available to CPL branch managers for decision making. In addition, branch managers indicated a lack of organizational direction regarding program planning and the role of branch managers in the process. The Cleveland Public Library leaders should include branch managers’ perspectives in the development of the organization’s vision, strategic goals, data governance processes, and services. Data from a community assessment and a data governance plan will help CPL build data and departmental initiatives that assist branch managers with innovating and sustaining library collections, programs and services that empower and uplift communities.
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Chapter I

Introduction

In the Association of College and Research Libraries (ACRLs) *The Value of Academic Libraries: A Comprehensive Research Review and Report*, Megan Oakleaf provided strategies to help librarians show the impact of library services through data (2010, p. 8). Oakleaf explained that public libraries have demonstrated their value through economic and social impact studies (Oakleaf, 2010, p. 72). For example, *The Return on Investment of Ohio’s Public Libraries and A Comparison with Other States* gives Ohio’s public libraries a return on investment (ROI) on an “average of $3.89 in value to Ohio residents for every $1 that is spent” (Howard Fleeter & Associates, 2016, p. 11). This ROI is based, in large part, on the circulation of physical materials (books, DVDs, CDs) and electronic materials, technology services, library program attendance and public library operating expenditures (Howard Fleeter & Associates, 2016, p. 10). The Ohio Library Council (OLC) commissioned *The Return on Investment of Ohio’s Public Libraries and A Comparison with Other States* report to support its ongoing advocacy to maintain state funding for Ohio’s public libraries through the Public Library Fund (Ohio Library Council, 2018, p. 1).

Librarians and library administrators are responsible for reporting the statistics used in a library organization’s reports that demonstrate library value and funding needs. The OLC report mentioned above used statistics reported to the Institute of Museum and Library Services (IMLS) by librarians and library administrators. IMLS works with state libraries to produce annual reports (Howard Fleeter & Associates, 2016, p. 1). But librarians rarely have access to the data used to compile these reports for daily decision making.

In the Cleveland Public Library (CPL) system, branch managers are responsible for “plan[ning] and implement[ing] programming” and “demonstrat[ing] fiscal accountability for
branch resources and the ability to achieve outcomes within allocated resources” (Cleveland Public Library, 2019, p. 2). However, the tools to meet these job duties are not provided. Circulation and attendance statistics are reported to CPL’s board of trustees each month and published in the Minutes of the Regular Board Meeting two months later. But the specific types of physical materials that circulate the most at each branch, which is the most useful information for purchasing, are not provided. In addition, CPL branch managers are assigned a monthly amount to spend on purchasing materials and an annual amount for spending on programs. Yet, branch managers are not given a monthly report about how much they have spent, if they are on target to use allocated funds, and if spending is impactful on branch circulation and program attendance.

The Cleveland Public Library (CPL) system first provided services on February 17, 1869 (Cramer, 1972, p. 19). In 1890, CPL was one of the first libraries to allow open access to their book collections, which increased use of materials (Cramer, 1972, p. 52; Martin, 1998, p. 25). CPL’s first neighborhood branch opened in 1892 (Cramer, 1972, p. 76). With the assistance of a grant from Andrew Carnegie in 1903, 15 library branches in addition to the four already established were built (Cramer, 1972, p. 78). Branch libraries are essential in gaining funding support through levies because “branch libraries frequently [win] deepest community loyalties because they [are] focused on neighborhood needs” (Wiegand, 2015, p. 96). As of 2016, CPL has 27 branch libraries and the fourteenth largest collection in the nation (American Library Association, 2019).

The Cleveland Public Library (CPL) system was innovative in the late 1800s and early 1900s due to the ideas of librarians, such as Effie L. Power who pioneered library services for children (Cramer, 1972) and Effie Lee Morris who began her library career at a CPL branch and
focused on children’s services in low income African American communities (Zalusky, 2010). Power and Morris based their innovative library services on their daily work with CPL patrons. There has been a “voluminous increase in library-related data, not only in transactional information from online library systems and electronic resources usage but also from efforts to gain more direct user input through surveys, focus groups, and other methods” (Hiller & Self, 2004, p. 129). Also, tools to effectively use data for decision-making have also increased. CPL has not been innovative in developing data governance processes to facilitate use of technology and data to develop and improve public library customer services.

In higher education, data use is encouraged to measure general information, such as retention, graduation rates, and cost per student, as well as academic program development, financial management, and institutional management and succession (Martin & Samels, 2009, pp. 85-91). In order to improve completion rates, some colleges and universities are using predictive data to identify students who may need support services to help them reach their educational goals. For example, the University at Texas at Austin (UT at Austin) uses a predictive analysis tool to measure “14 variables, from an incoming student’s family income to his SAT score to his class rank to his parents’ educational background” to determine the probability of a student graduating in four years (Tough, 2014, para. 28). Students who have a 40% or less probability of graduating on time are assigned to a student success program that provides these students with “small classes, peer mentoring, extra tutoring help, engaged faculty advisors and community-building exercises” (Tough, 2014, para. 26). The freshman class of 2013 at UT at Austin, the first cohort to participate in the student success programing described above, had a 90.5% persistence rate after two years of college (UT at Austin, 2015, para. 4).
Georgia State University’s predictive analytics system tracks more than 800 student success risk factors daily and increased the number of students who graduate in six years by 22% between 2003 and 2017 (McMurtrie, 2018, para. 3). Public libraries should use data to learn more about patron usage patterns to improve and innovate services to community members as some higher education institutions have used data to increase student success.

Higher education institutions and libraries use different systems to track and collect data. In addition, many higher education institutions have institutional research (IR) departments that oversee “data governance, stewardship, and compliance” (Gagliardi, 2018, p. 11). Some colleges and universities have a data governance system in place to effectively use data, which often includes employing dashboards and data visualization that “engages users, identifies salient issues, fosters a culture of inquiry, and encourages targeted action to improve student success” (Cardoza & Gold, 2018, p. 137). Public libraries need to develop a similar data governance division that works collaboratively with library leaders and the information technology (IT) department to develop a data-driven organizational culture.

Data visualization allows users to tell a story about data that has been collected, analyzed, evaluated, formatted, and presented in a manner that emphasizes “relationships, patterns, similarities, and differences” (Sosulski, 2019, p. viii; Phetteplace, 2016, p. 1). It is primarily used to engage and inform audiences and make information accessible. This is especially important for libraries because traditionally library data is presented with library jargon that prevents audiences from understanding what libraries do and the value of libraries through the data (Kremer & Hoyt, 2018, p. 222). To illustrate, when Fairfield University’s DiMenna-Nyselius Library’s Assessment Team created a data dashboard to demonstrate the library’s value, “instead of showing how many books are in [the library’s] collection…, [The Assessment
Team] choose data that shows how many books were read” (Kremer & Hoyt, 2018, p. 222).

Using data visualization can help users view data from a different perspective, recognize patterns and communicate more impactful information.

The Traverse Area District Library (TADL) displays a data dashboard for patrons and staff with traditional statistics (circulation, questions answered, computer sessions, and the number of materials added to the collections) in Figure 1 and non-traditional statistics (the most popular books, movies, and music) in Figure 2 on its website (TADL, 2020). A unique feature of TADL’s dashboard is that the traditional information is provided for the library system and each branch. Statistics for TADL’s Peninsula branch are shown in Figure 3. A data dashboard for each Cleveland Public Library (CPL) branch that includes TADL’s non-traditional statistics would help CPL branch managers learn which materials are most popular at their branches and align their physical material purchases with the topics that are most popular in their communities.

![Figure 1. A screenshot of TADL’s traditional data dashboard statistics](image)
**Figure 2.** A screenshot of TADL’s non-traditional data dashboard statistics.
Brooklyn Public Library (BPL) uses multiple data dashboards and displays 22 dashboards on Tableau Public. Tableau Public is a free way to display data dashboards created with Tableau software (Sosulski, 2019, p. 30). BPL has a Most Common Program by Branch data dashboard that shows program attendance for branch programs that are provided regularly. Program attendance for BPL’s Clarendon branch is provided for January – June 2019 in Figure 4. A branch program attendance data dashboard, similar to BPL’s, would help Cleveland Public Library branch managers learn what program topics draw the most attendance in their communities. In addition, branch managers could learn the best dates to schedule programs and forecast annual funding needs for programming.
Figure 4. A screenshot of program attendance at a Brooklyn Public Library branch.

Statement of the Problem

The Cleveland Public Library (CPL) system does not provide branch circulation and program attendance data to branch managers who are responsible for purchasing the materials that are borrowed by community members and developing and scheduling programs. Branch managers need data to support decision-making, demonstrate community impact, and be fiscally responsible.

CPL leaders do not include branch managers’ perspectives in the development of the organization’s vision, strategic goals, data governance processes, and services. Feedback from branch managers, a community assessment and governance plans for data, materials purchasing,
and program planning are needed to help library leaders and branch managers learn and receive data supported evidence of community members’ needs. Creating data visualization dashboards that provide the data most useful to branch managers for purchasing and planning would facilitate meeting customer service needs, increasing library branch use, and gaining more voter support for local funding.

Need for the Study

Cleveland Public Library (CPL) leadership does not provide access to data for decision-making, understand the data needs of branch managers, or have a data governance strategy that allows for a data informed organizational culture. This study provided the most useful data variables for purchasing materials and program planning for CPL branch managers and a plan for meeting branch managers’ data needs.

Purpose of the Study

The purpose of this study was to learn through feedback, the data needs of branch managers for deciding, and which materials to purchase and programs to provide to meet community needs. In addition, this study provided a data governance plan for developing and implementing branch data visualization dashboards similar to Traverse Area District Library’s physical materials dashboard and Brooklyn Public Library’s program attendance dashboard to make data easily understandable and accessible for branch managers.

Research Questions

In order to determine the basic information branch managers need for purchasing and programming, this study answered the following questions:

1. What data do branch managers need to help with purchasing library materials?
2. What data do branch managers need to help with program planning?
3. What is the best way to provide access to the data dashboard for branch managers?

4. What data should be included in a data dashboard to facilitate decision-making about library material purchasing and program planning?
Chapter II

Literature Review

Inclusion Criteria

This literature review will provide a brief overview of the historical use of data for decision-making in libraries, define what data visualization and dashboards are, explain how libraries have used data visualization and dashboards for decision-making, and the benefits and obstacles of data visualization use in libraries. In addition, readers will learn which software is most used by libraries for data visualization.

Research for this literature review was primarily done through Wilmington University’s Library, OhioLINK Library, and Cleveland Public Library’s catalogs and databases. The primary keywords used were data visualization, data dashboards, data visualization in libraries, demonstrating library value, data and decision making in libraries, data governance, and data visualization in public libraries. References in the most relevant articles were used to find more related articles and helpful search terms.

Research about data visualization in libraries focuses on case studies that describe the process and tools used to develop data visualization projects. Examples of data visualizations are often included. The case studies in this literature review are mostly about academic library data visualization projects that concentrate on collection development and library services.

Historical Use of Data for Decision-Making in Libraries

Steve Hiller and James Self explain that “[w]hile many libraries recognize the value of using data for planning and decision-making, they are unsure how to collect, analyze, and apply the data effectively” (2004, p. 130). James Gerould was an academic librarian credited with being the first to collect and understand the importance of library statistics (Hiller & Self, 2004;
Kyrillidou & Cook, 2008). From 1907 through 1962, Gerould collected and published university library statistics. Beginning in 1962, the Association of Research Libraries took over the annual collection and publishing of Gerould’s statistics (Hiller & Self, 2004, p. 130; Kyrillidou & Cook, 2008, p. 892). Gerould’s statistics were useful for “comparisons with other libraries [that] may have added fuel to budget requests for increased funding” (Hiller & Self, 2004, p. 131). There are no records showing Gerould’s statistics being used for decision-making for library services.

Charles R. McClure conducted many studies about data and decision-making in libraries, including a 1978 review of organizational information and decision-making research that found “when people who are information rich are included in decision-making, the organization will be more productive in meeting its goals” (Koufogiannakis, 2014, p. 79). In the 1970s, when library computer systems increased the amount of data available to librarians, libraries began to use this information to assess “performance measures on the basis that they will be used to make better decisions, develop better plans, and, ultimately, increase the overall effectiveness and efficiency of the library” (McClure, 1986, p. 323).

In 1983 and 1985, McClure worked with Alan R. Samuels on studies that used data collected from academic and public library staff in 1979 and 1980 (McClure & Samuels, 1985, p. 485; Samuels & McClure, 1983, p. 5). McClure’s studies focused on academic libraries. Samuels’ and McClure’s research focused on “information acquisition, information dissemination, information evaluation and library climate” in public libraries (1983, p. 5).

Samuels’ and McClure’s study was based on a survey sent to 18 public libraries with a total of 313 staff members (1983, p. 10). Results revealed internal information was mostly used for making decisions: “librarians tend to prefer … interpersonal communication [as a] first choice, followed by groups and committees, then by library produced documents” (1983, p. 13).
The survey also demonstrated that external information was preferred by “[s]eventy-five percent [of respondents] … for materials purchased decisions” (Samuels & McClure, 1983, p. 15).

Currently, decision-making in public libraries relies on the same practices Samuels’ research noted in 1983 (Koufogiannakis, 2014, p. 80).

Samuels’ and McClure’s study also found that “information processing for decision-making by public librarians is facilitated by open organizational environments … in which employees perceive … that morale is high, that decision making is shared, and that innovation and creativity are stressed” (1983, pp. 16-17). Unfortunately, “closed” public library environments are still hindering the use of data for decision-making. According to Hiller and Self, the effective use of data for decision making is still not an established library practice due to multiple “obstacles of organizational structure and inadequate leadership, librarian unease with quantitative analysis, lack of good data analysis and presentation skills, and the need to develop meaningful measures” (2004, p. 138).

Samuels and McClure pointed out the “rush to exploit automated information processing equipment (… for decision making)” as a challenge in his research (1983, p. 19). Abdus Sattar Chaudry supported “[a]utomated systems in libraries [because they] have made it possible to collect use data and other management information on a continuous basis at little cost and effort as a by-product of computerized library operations” (1993, p. 397). The issue according to Chaudry is that the information being produced by library systems is not useful and librarians do not understand the capabilities of these systems (1993, p. 408).

In 2000, Kim Guenther promoted data mining in libraries to help organize, synthesize, and analyze data. Data mining is a process that “identif[ies] patterns, trends, and correlations
across large amounts of collected data” and involves “three phases: data collection and
acquisition, data preparation and processing, and interpretation and integration” (p. 60).

Scott Nicholson suggested the term bibliomining to specify the use of data mining in
libraries (2003, p. 146). He defines bibliomining as the “application of statistical and pattern-
recognition tools to large amounts of data associated with library systems in order to aid
decision-making or justify services” (Nicholson, 2003, p. 146). Nicholson’s bibliomining
process includes “identifying internal and external data sources; collecting, cleaning, and
anonymizing the data into a data warehouse; selecting appropriate analysis tools; [and] discovery
of patterns through data mining and creation of reports with traditional analytical tools” (2003, p.
146). Both Guenther and Nicholson proposed methods for assisting librarians with consolidating
and applying data collected in library systems for use in their daily work.

Georges Grinstein and Bhavani Thuraisingham explained that “visualization techniques
[can be applied] to information that is extracted from the databases through data mining” and
promoted data mining, library systems vendors provided systems that primarily collected data
instead of offering ways to organize it for analysis and use. Library management systems have
moved from being “developed specifically for library operations focused on the selection,
acquisition, cataloging, and circulation of print collections” to a “suite of integrated functions to
manage a broad range of library processes” (Shea-Tinn and Walter, 2016, pp. 27, 29). Data
visualization can make the data collected through library systems accessible, clear, and useful in
decision making.

Data Visualization Defined
Data visualization research references the work of Edward Tufte and Stephen Few to explain the components of effective and impactful data visualizations and dashboards. Tufte promotes the use of data visualization for “displaying information for maximum effect and ease of comprehension” (Chen, 2017, p. 10; Finch & Flenner, 2016; Magnuson, 2016; Morton-Owens & Hanson, 2012; Sosulski, 2019). Few (2013) defined data dashboards as a “single-screen display of the most important information people need to do a job” (Morton-Owens & Hanson, 2012; Sosulski, 2019). Kristen Sosulski synthesizes Tufte’s, Few’s, and Dona Wong’s data visualization advice into ten necessary design standards (2019, p. 101): chart format, color, text and labels, readability, scales, data integrity, chartjunk (non-data or redundant data), data density, data richness, and attribution (2019, pp. 102-120).

Eric Phetteplace expands on Ben Fry’s steps for creating data visualizations by emphasizing the importance of preparing data for visualizations because “[p]oorly processed information can make creating an insightful visualization impossible or, even worse, mislead its audience” (2016, p. 1). Phetteplace recommended four plateaus: acquire/collect, filter/refine, format/process, and publish (2016). An example of the format/process plateau is custom scripting data from EZproxy, software libraries use to provide access to databases, to learn about user patterns to “inform purchasing decisions, argue for the library’s value, or modify … services” (Phetteplace, 2016, p. 11).

Libraries collect data through library management systems, EZproxy, and other data collection tools (Magnuson, 2016; Stone et al., 2015). Data from library management systems (also referred to as integrated library systems), such as SirsiDynix Symphony and OCLC Worldshare includes information about types of materials in a library and the number of times the materials have been checked out and used (Taylor & Mitchell, 2016). Discovery layers, such
as ProQuest’s Summon and EBSCO’s EBSCO Discovery Service, provide data about how users access library materials (Back & Bailey, 2016). EZproxy provides statistics about the use of electronic resources (Lewellen & Plum, 2016) and Springshare’s LibAnswers can be used to determine the quality and quantity of librarian and patron interactions (Buhler et al., 2016). Librarians can use data visualization to “leverage large amounts of data [from multiple systems] that were once impossible to efficiently access and manage” (Chen, 2017, p. 17). In addition, data visualization helps everyone who works in a library understand and use data for decision-making (O’Maley-Voliva, 2015). A dashboard provides instant access to information.

**Data Visualization in Libraries**

In her article with Jeremy Buhler and Rachel Lewellen, Sarah Anne Murphy (2016) explained how four data dashboards made using Tableau software became an essential part of library assessment, demonstrated the value of academic libraries, and supported decision making at the Ohio State University (OSU). A Research Services Trends dashboard for librarians, library staff, and reports was created using data from LibAnswers about the number of directional and research questions, and research consultations (Buhler et al., 2016). The line and bar graphs in the dashboard communicated an increase in research consultations and that, at the beginning and end of each academic quarter, directional questions increased (Buhler et al., 2016). Information in this dashboard helped librarians and library staff explain some of the research services the library offered, how many users took advantage of the services, and how often the services were used.

OSU’s Gate Count dashboard showed the number of visitors to each OSU library each quarter. This dashboard showed the number of visitors during a certain time period and focused
on one particular library location (Buhler et al, 2016). Murphy did not give the gate count software used to provide data for this dashboard.

Two ILLiad Borrowing dashboards were created by an OSU library project team and “allow[ed] subject librarians to interact with and understand borrowing trends for their assigned departments to better inform their collection activities” (Buhler et al., 2016, p. 24). The team started with questions they wanted the data dashboard to help them answer about graduate student use of interlibrary loans. The dashboards used data from OCLC’s ILLiad resource sharing software, the library’s Sierra integrated library system and other data sources. One dashboard showed borrowing patterns by department, year, month, and type of material (books, government documents, electronic resources). The second dashboard detailed the language of the materials borrowed. In addition to supporting the impact of academic libraries on student learning and decision making, all four of OSU’s Tableau dashboards were used as a “strategic asset in the library’s assessment program” (Kyrillidou, 2016, p. 2).

Researchers Jannette L. Finch and Angela R. Flenner used data visualization to determine what areas of an academic library collection needed to be increased to meet students’ curriculum needs (2016). Finch and Flenner referenced the data visualization work of Tufte and Katy Borner and used Microsoft Excel (version 2010) for their study’s data visualizations. The data variables that included titles purchased, course hours by major, and undergraduate enrollment numbers during the 2013-2014 academic year were compiled into “three-dimensional data bubble visualizations” (Finch & Flenner, 2016, p. 771).

Finch and Flenner found that the visualizations helped library staff and administrators make data supported collection development decisions more easily (2016). For example, the data bubble visualizations demonstrated a need to increase the math, statistics, communications,
and psychology collections. Overall, Finch and Flenner found that data visualizations helped them understand university library collection needs better than spreadsheets.

Librarians at New York University Health Sciences Libraries (NYUHSL) created a data dashboard that showed library use trends and how patrons used the library (Morton-Owens & Hanson, 2012). A MySQL database, widgets, Google Chart Tools, LibraryH3lp, EZproxy, and other custom coded data sources were used to create the dashboards. Emily Morton-Owens and Karen L. Hanson point out that the numerous software programs provided “customized versions [of the dashboard] for staff in different roles, restricting the display to show only data that is relevant to the individual’s work” (2012, p. 36).

Tufte’s, Nigel Holmes’ and Few’s data visualization and dashboard design principles were used to create dashboard components about gate count (number of visitors), number of library users helped, number of problems reported, website visits, number of chats with library users, interlibrary loan requests, and electronic resources used (Morton-Owens & Hanson, 2012). Bar charts illustrated gate count, reported problems, chat sessions, and number of interlibrary loan requests. A line graph showed the number of electronic resources accessed through EZproxy.

The dashboards were primarily used to help with strategic decision-making. For example, NYUHSL librarians decided not to invest time into adding free resources for mobile visitors to the website when they learned through the website visits dashboard that less than 3% of their website visits were through mobile devices (Morton-Owens & Hanson, 2012). At the time of the study, the dashboard had been available for less than a year and continued to evolve with feedback from users as a decision making and library impact tool.
An example of a public library data dashboard was Seattle Public Library’s “Making Visible the Invisible” project (Chen, 2017; Finch & Flenner, 2016; Legrady, 2020). Six LCD screens were installed behind the check out desk at the Seattle Public Library’s Central branch to display the dashboard from 2005-2014 (Legrady, 2020). Data about the number and types of non-fiction books checked out by library users were displayed on the LCD screens and updated each hour (Chen, 2017; Finch & Flenner, 2016; Legrady, 2020). Customized software created a dashboard that projected “good indicators of what the community of patrons consider[ed] interesting and useful information at any given point in time” (Chen, 2017, p. 22).

**Benefits of Data Visualization Use in Libraries**

Data visualization can demonstrate the value of library services, support decision making, show trends, and illustrate how patrons use libraries (Chen, 2017). The Ohio State University and New York University Health Sciences Libraries used data dashboards to understand how patrons use libraries, assess and market services, and address service trends (Buhler et al., 2016; Morton-Owens & Hanson, 2012; Murphy, 2015). Finch and Flenner found data visualizations of a library collection helped them learn what subject areas needed more materials to meet student learning needs (2016). Most importantly, data visualizations “effectively tell the story of a library’s impact on its users” (Magnuson, 2016, p. xi) to library stakeholders.

**Obstacles to Data Visualization Use in Libraries**

A lack of skilled staff, training opportunities, and a data governance strategy hinder the adoption of data visualization use in public libraries. Lisa Federer explained how an increase in research data has lead to libraries providing a “variety of data support services, including instruction and training, data management planning guidance, data stewardship and curation, and data visualization” (2018, p. 294). Eighty-two study participants who self identified as data
Librarians were surveyed by Federer to learn their job titles, experience in the data field, training, and the “skills, knowledge, and characteristics that data librarians consider most important to their work” (2018, pp. 296-297). Librarians surveyed ranked developing relationships as the highest skill needed for data librarians (94%) followed by instruction in the teaching category (87%); the data management skill development of data services and continuing education were tied at 81%; and support for general data management (78%) as the top five skills, knowledge and characteristics (Federer, 2018). In technology skills, data visualization skills were rated highest at 52%.

Within the group of study participants, Federer found two categories of data librarians: subject specialists (academic discipline focused librarians) and data generalists whose work mostly consists of data life cycle matters (2018). Based on Federer’s study, data generalists seem to be most suited for public libraries due to their broad knowledge about data life cycles and skill set (2018). The data life cycle includes planning, collecting, describing, preserving, discovering, synthesizing, and analyzing data (Burton et al., 2018; Koltay, 2016; Tenopir et al., 2014; Yoon & Schultz, 2017). The importance of ongoing training, changes in library science degree curriculum, and library leadership support was also found in Federer’s study (2018).

Hammad Rauf Khan and Yunfei Du performed a content analysis of job ads to define the role of data librarianship (2018). NVivo software was used to code 50 job posts for academic data librarian positions. Khan and Du found that the most popular job title was Data Services Librarian (2018). The top three out of ten required job skills were: “Research Assistance” (as in scientific research – 100%); “Critical Thinking/Problem Solving” (89%); and “Knowledge of U.S. federal and proprietary data sources” (82%) (Khan & Du, 2018, p. 6). Outreach (61%), data visualization (25%), and teaching (14%) made the required skills list in alignment with Federer’s
survey participants’ ranking of the importance of these skills in data librarianship (Khan & Du, 2018, p. 6).

Matt Burton, Liz Lyon, Chris Erdmann, and Bonnie Tijerina identified a “skills gap” because “many librarians lack the technical skills to be effective in a data-rich research environment” (2018, p. 4). The importance of continuous training in data management services for librarians is supported in data librarianship studies (Burton et al., 2018; Federer, 2018; Koltay, 2016; Tenopir et al., 2014; Yoon & Schultz, 2017). Burton, Lyon, Erdmann, and Tijerina pointed out three levels of recommended training. The first level included “lightweight guides and aggregated resources” that “can help libraries and individuals find already created resources and examples that can be tailored to a local setting” (2018, p. 22). An example of this is the Traverse Area District Library’s TADL Stats “About” page that explains the dashboard data sources, software, and where to get the code to replicate TADL’s dashboard (TADL, 2020, “About”).

The second level includes professional development workshops, and the third level refers to college degrees and certification (Burton et al., 2018). Indiana University-Bloomington and the University of California at Berkeley are two universities with library and information science schools offering master’s degrees in data science (Dority, 2016). The library and information science schools at Syracuse University, Florida State University, and the University of North Carolina offer data science certificates (Dority, 2016).

Burton, Lyon, Erdmann, and Tijerina also identified a “management gap” that hinders data use in libraries due to library leaders’ lack of understanding of the “benefits of in-house data science skills (e.g., to inform decision-making and enhance services)” (2018, p. 5). In addition
to training for librarians, leadership programs should incorporate training about managing data services (Burton et al., 2018).

Library leaders are essential to establishing a data informed organizational culture. In order to incorporate the use of data for decision-making into public library organizations, “leadership must champion the use of data and be intentional about tying data analytics into a future vision focused on [stakeholder] success and institutional sustainability” (Gagliardi, 2018, p. 5). Many higher education institutions have institutional research (IR) departments that oversee “data governance, stewardship, and compliance” (Gagliardi, 2018, p. 11). Public libraries could use a similar data governance division that works collaboratively with library leaders and the information technology (IT) department to develop a data-driven organizational culture.

Rob Karel (2014) recommended four processes to create a data governance plan that is applicable to public libraries: discover, define, apply, and measure and monitor (Chester, 2018). The discovery process assesses the production, consumption, and “cleanliness” of an organization’s data (Chester, 2018). In a public library, the discovery process would examine the current acquisition, collection, accuracy, and use of data (Gagliardi, 2018; Phetteplace, 2016). Also, the discovery phase sets the stage for creating data governance procedures based on a vision for data-based decision-making (Chester, 2018; Karel, 2014). Questions about an organization’s data life cycle are asked and answered in this part of the process.

In the definition stage, a plan for how data is produced and documented is determined (Chester, 2018; Karel, 2014). In a public library, the definition process would align an organization’s strategic goals with data supported performance indicators. In addition, data analysis and reporting methods should be created to measure the effectiveness of organizational
practices. According to Affelt (2015), a June 2013 Gartner survey of 720 IT and business leaders determined the following challenges for effective use of data: “determining how to get value from data, determining data strategy, hiring data scientists, integrating new platforms into existing IT architecture, and IT infrastructure issues” (p. 23). The challenges found in the Gartner survey for effective use of data should be addressed during the definition phase.

In the application stage, collaboration with the IT department is pertinent in implementing the data governance strategy created during the discover and define processes. This is also the phase when data is exported and shared (Chester, 2018; Karel, 2014). The measure and monitor process “ensure compliance with data standards and forces cross-functional teams to review exceptions and work together to resolve issues with data quality as they arise” (Chester, 2018, p. 63). Chester suggested the use of operational dashboards in this phase (2018, p. 62).

**Software Most Used for Data Visualization and Dashboards in Libraries**


Murphy defined Tableau as “data visualization and analysis software that improves decision-making by giving libraries the ability to query, blend, explore, discover, and then analyze and present data” (2015, p. 482). Murphy and the public libraries mentioned above use Tableau Public, free software that shares data visualizations publically through Tableau’s cloud (Sleeper, 2018). Tableau Desktop: Professional starts at $840 annually per user and allows for data security that Tableau Public does not. Tableau uses a drag and drop feature to simplify
creation of interactive data visualizations using multiple sources of data (Datig & Whiting, 2018; Sosulski, 2019).

Thea P. Atwood and Rebecca Reznik-Zellen created a data Visualization Software Evaluation Rubric to help librarians select free software for data visualization projects (2018). Six visualization software programs were evaluated in thirteen categories including “Ease of Use,” “Learning Curve,” “Built-in Analytics,” and “Aesthetics” (Atwood & Reznik-Zellen, 2018, p. 4). The rubric scores were 0 – 3 points with 0 being “poor” and 3 being “excellent”. Tableau Public scored second highest (behind raw Graphs) of the six visualization software programs evaluated with 25 out of 39 points. Tableau received excellent rankings in five categories: “Ability to Manipulate,” “Support Materials,” “Cost for ‘Full’ Version,” “Built-in Analytics,” and “Aesthetics” (Atwood & Reznik-Zellen, 2018, p. 7).

Back and Bailey (2016), Morton-Owens and Hanson (2012), and California State University (Cardoza & Gold, 2018) used Google Charts to create data dashboards in case studies. Lauren Magnuson explains how libraries can use Google Charts to create data visualizations in conjunction with Google Analytics and a Google superProxy application (2016). With a Google Analytics account, librarians can configure Google superProxy to “create multiple queries and reference the data in multiple visualizations [developed using Google Charts] that load on any web page” (Magnuson, 2016, p. 75). Google Charts is free software that works with JavaScript (Google Developers, 2019; Sosulski, 2019).

Literature Review Conclusion

Summary

Since the early 1900s, library data has been collected. Developing processes to use library data for decision-making has been promoted by researchers like McClure and Samuels
beginning in the 1970s. Their 1983 and 1985 studies about decision-making in libraries found “librarians preferred internal sources of information, such as personal communication and internal documents. Patron involvement in decision making was practically non-existent, and very few decisions used information from empirical research” (Koufogiannakis, 2014, p. 79). Thirty years later, McClure and Samuels’ (1985) study results apply to current library data and decision-making practices.

When library computer systems became data collection tools in the 1980s, Chaudry promoted the use of automated systems to improve the use of library data. Guenther’s data mining and Nicholson’s bibliomining processes helped organize and prepare data for analysis and visualization.

As Datig and Whiting explained, “the purpose of visualization is [to] take information, usually large data sets, and aggregate the information, so that it can be visually displayed in an image, chart or graph” (2018, p. 6). Buhler et al. (2016), and Finch and Flenner (2016) demonstrated how data visualizations and dashboards help librarians recognize collection development trends and potential purchasing needs. The Ohio State University’s two ILLiad borrowing dashboards assisted librarians with learning student borrowing patterns by academic department, time period, type of materials, and material language (Buhler, Lewellen, and Murphy 2016). Finch and Flenner (2016) found collection areas that needed more materials to meet student learning needs. These researchers effectively communicated the impact data visualizations and dashboards can have on collection development purchases and decision making.

The data dashboards in Morton-Owens & Hanson’s (2012) case study influenced decision-making at New York University Health Sciences Libraries by revealing data librarians
were not aware of such, as the low usage of their mobile website. Buhler et al. (2016), Legrady (2020), Lewellen and Plum (2016), and Murphy (2015) showed how data dashboards can reveal community interests to help librarians better meet their needs.

Burton et al. (2018) communicated a need for data skills training for librarians and library leadership. Federer (2018) and Khan and Du (2018) clarified the skills needed by data librarians in both studies, with relationship building, data visualization, and teaching skills ranking in the top ten skills. Karel’s data governance planning process provides a method for library leaders and librarians to build a data governance department and strategies.

Tableau is a popular choice for case study researchers and public librarians who develop data visualizations and dashboards because it is “rapid-analytics and data-visualization software that supports library assessment by enabling a library to query, explore, and visualize data in real time” (Buhler et al., 2016, p. 21). It is also free to use so it is an easy way to implement data dashboards for decision making projects.

The multiple data collection systems libraries use – library management systems, discovery layers, electronic resources usage tools, and research transaction applications – require librarians to acquire, collect, describe, preserve, discover, and synthesize data on a daily basis. Data visualizations and dashboards help librarians analyze and use collected data more easily to meet community needs.
Chapter III

Research Methodology

Research Design

This study used a survey created by the researcher to determine the data needs of Cleveland Public Library (CPL) branch managers for purchasing collection materials and program planning. In addition to aiding decision-making, this data can be used to demonstrate the impact of library services for stakeholders by incorporating the data visualizations into CPL’s public website. A survey method was used that was similar to the instrument used by Lisa Federer to learn about the skills and knowledge of data librarians and the importance of these skills in their daily work (2018).

Most of the case studies mentioned in this study developed data visualizations and dashboards based on library committee feedback about the questions librarians, staff, and stakeholders needed, the data visualizations, and dashboards to answer (Buhler et al., 2016; Finch & Flenner, 2016; Morton-Owens & Hanson, 2012; Murphy, 2015). A survey allows for feedback from potential data visualization and dashboard users.

The researcher identified three public library data dashboards that contain useful data variables for decision-making about collection materials purchases and program planning. Traverse Area District Library (TADL) has data dashboards with data for collection materials purchasing with traditional statistics (circulation and the number of materials added to the collections) and non-traditional statistics (the most popular books, movies, and music). Brooklyn Public Library’s Most Common Programs by Branch data dashboard shows program attendance for branch programs. TADL’s and Brooklyn Public Library’s data dashboards
provide pertinent data for decision-making about collection development and program planning to meet branch community needs.

Research Questions

The research questions investigated in this study were:

1. What data do branch managers need to help with purchasing library materials?
2. What data do branch managers need to help with program planning?
3. What is the best way to provide access to the data dashboard for branch managers?
4. What data should be included in a data dashboard to facilitate decision-making about library material purchasing and program planning?

Participants

The participants in this study were branch managers in the Cleveland Public Library (CPL) system. There are currently 27 branches in the CPL system. One manager supervises two branches, so the potential pool of survey participants included 25 current CPL branch managers (not including the author who manages a CPL branch).

Data Collection

A survey link requesting feedback on the data needs of CPL branch managers was emailed to current branch managers. The survey was created using Typeform, a people friendly online survey and form. The researcher selected Typeform because it allows for a “graphical and interactive [experience] that flows seamlessly and effortlessly as the respondent points and clicks” (Ruel et al., 2015) similar to a data dashboard experience. The online survey software recorded the survey responses and response rate as the branch managers completed the survey.
Three of the questions were multiple choice. The first two questions were accompanied by screenshots of the TADL collection management and Brooklyn Public Library program planning data dashboards:

1. What data in this dashboard would help you with purchasing library materials for your branch? (Please select all that apply)

2. What data in this dashboard would help you with program planning? (Please select all that apply)

3. What is the best way to provide access to a branch data dashboard? (Please select all that apply)

Two questions required written responses:

1. What, if any, other historical branch information would you like to have for purchasing library materials?

2. What, if any, other historical branch information would you like to have for program planning?

All of the survey questions were based on the research questions for this study.

Significance

This study made four contributions to data visualizations and dashboards in libraries research. First, this study determined the most useful data variables for data dashboards that help public library branch managers purchase collection materials that meet branch community needs.

Second, this study showed the most effective data dashboard variables for public library branch program planning based on past branch program patterns. Third, the easiest access to the data dashboards for branch managers was determined. Finally, a data governance plan for
creating data dashboards using Tableau for collection materials purchasing and programming for CPL branch managers was outlined. Tableau is the chosen software for creating these data dashboards because of the frequency of its use in the case studies mentioned in the literature review (Buhler et al., 2016; Lewellen & Plum, 2016; Murphy, 2015); its use by public libraries (Brooklyn [NY] Public Library, Connecticut State Library, Geauga County [OH] Public Library, and Kalamazoo [MI] Public Library); and because CPL owns licenses to use Tableau Desktop: Professional.

**Limitations**

There are two limitations to the study. First, the study was limited to one medium size public library system. This might make it difficult to replicate the research results in other library systems. Second, the sample of branch managers was small.
Chapter IV

Results

Introduction

Twenty out of 25 current library branch managers completed the Branch Data Needs survey resulting in an 80% response rate. Three of the questions were multiple choice. The first two questions were accompanied by screenshots of the TADL collection management and Brooklyn Public Library program planning data dashboards.

Quantitative Results

The results based on descriptive statistics for survey questions 1, 3, and 5 are presented below.

**Question 1 (Preferred Library Materials Purchasing Data).** What data in this dashboard would help you with purchasing library materials for your branch?

The data for purchasing library materials that branch managers found most helpful were collection statistics (70%) and most popular movies (70%). Sixty percent reported that collection distribution and most popular books were helpful while most popular music (55%) was least helpful in determining which materials to purchase (see Table 1).

Table 1

*Helpful Data for Library Materials Purchasing (N = 20)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection Statistics</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Most Popular Movies</td>
<td>14</td>
<td>70%</td>
</tr>
<tr>
<td>Collection Distribution</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>Most Popular Books</td>
<td>12</td>
<td>60%</td>
</tr>
<tr>
<td>Most Popular Music</td>
<td>11</td>
<td>55%</td>
</tr>
</tbody>
</table>
**Question 3 (Preferred Program Planning Data).** What data in this dashboard would help you with program planning?

Branch managers ranked the number of attendees (75%) as the most helpful variable for program planning. Access to all branch programs (65%) was the second most helpful variable for branch managers. The number of program sessions (35%) and being able to see all programs for the year (30%) were not considered that helpful. Knowing the highest attended programs was (15%) ranked lowest as a helpful program planning variable (see Table 2).

Table 2

*Helpful Data for Program Planning (N = 20)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Attendees</td>
<td>15</td>
<td>75%</td>
</tr>
<tr>
<td>All Branch Programs</td>
<td>13</td>
<td>65%</td>
</tr>
<tr>
<td>Number of Program Sessions</td>
<td>7</td>
<td>35%</td>
</tr>
<tr>
<td>All Programs for the Year</td>
<td>6</td>
<td>30%</td>
</tr>
<tr>
<td>Highest Attended Programs Only</td>
<td>3</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Question 5 (Preferred Branch Data Dashboard Access).** What is the best way to provide access to a branch data dashboard?

The majority of branch managers would prefer to access a data dashboard through a button on the intranet (55%). Thirty percent would prefer a branch manager home page. Fifteen percent would like to receive a data dashboard through email (see Table 3).
Table 3

*Data Dashboard Access (N = 20)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Button on Intranet</td>
<td>11</td>
<td>55%</td>
</tr>
<tr>
<td>Branch Manager Home Page</td>
<td>6</td>
<td>30%</td>
</tr>
<tr>
<td>Number of Program Sessions</td>
<td>3</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Qualitative Results**

Two Branch Data Needs survey questions required written responses.

**Question 2.** Is there any other historical branch information you would like to have for purchasing library materials?

Circulation and demographics information were most often cited as preferred historical branch information for purchasing library materials. Four out of 14 respondents asked for additional circulation information:

1. Circulation history for past 2 years by age and genre
2. Circulation by genre (total and percentage). Circulation by age group (total and percentage)
3. Circulation stats
4. Percentage of circulation by material type, and circulation trends over time

Four survey participants asked for demographics information:

1. Demographics
2. Yearly statistics and community demographics.
3. Historical demographics

4. Neighborhood Demographics

Most of the responses for preferred historical branch information for purchasing library materials demonstrated an interest in access to data about community members and their use of branch collections.

**Question 4.** Is there any other historical branch information you would like to have for program planning?

Out of the 15 responses to preferred historical branch information for program planning, three survey participants asked for branch information not provided on the screenshot in the preceding survey question:

1. Program attendance by time/day of the week
2. Yearly projected budget and outside programs designated to the branch
3. Numbers of youth in each age group and the same with the adults that utilize the location

Five survey responses requested organizational information about programs that was not branch specific:

1. Cost, partner, and expectations of library
2. How programs were promoted
3. Inventory lists and location of all technology that can be shared for interdepartmental programs and services
4. Past programs for all locations; strategies used for implementation
5. Trending topics in local, state, or national
One participant requested “demographics of the community” information and one respondent requested “types of programs”. Five survey responses asked for program attendance and success rankings.
Chapter V

Discussion, Recommendations and Conclusion

Introduction

During this study, the COVID-19 pandemic and quarantine occurred. Public libraries throughout the United States heavily advertised virtual services, such as e-books, music and movie streaming, and e-magazines while libraries were closed. The Cleveland Public Library (CPL) revitalized a virtual reference service and launched virtual Summer Literature League youth programming using Zoom and Facebook Live. Increasing and sustaining technology-based services will continue to be an ongoing disaster preparedness and response practice for libraries.

At CPL, the move towards technology-based services has not included feedback from branch managers or community members. Although many suburban school systems were able to transition to Google Classroom or other learning management systems to continue providing K-12 student learning, the Cleveland Metropolitan School District (CMSD) did not have the resources to do so and many students did not have the technology to participate in virtual learning even if it was offered. CPL and CMSD serve the same communities.

Ohio and many public library systems throughout the United States have “two main sources of library funding: state and local property tax revenue” (Peet, 2020; Wiegand, 2015, p. 268). Because public libraries are community funded, it is important that community needs be met. If many members of the CPL community do not have the technology (computers, laptops, internet, and hotspots) to use virtual library services, then community needs are not being met.

The coronavirus pandemic and quarantine has lead to over “4,250 [library workers] in the United States” losing their jobs and “[t]ax collections across [Ohio and throughout the country]
are predicted to shrink by 30 to 35 percent” (Peet, 2020). One of the ways the Cleveland Public Library (CPL) will reduce its budget is by cutting the materials purchasing budget for branch managers, relying more on a centralized material purchasing department, and putting more funding into e-books and streaming applications. This reduces branch managers’ materials purchasing input and, in turn, community members’ interests will less likely be met.

The purpose of this study was to survey CPL branch managers to learn their data needs for deciding which materials to purchase and programs to provide to meet community needs. A survey was designed to collect quantitative and qualitative responses from branch managers. Twenty-five current CPL branch managers were invited to participate in this survey. Twenty branch managers completed the survey providing an 80% response rate.

Given the need to better prepare to meet community needs during emergency situations, such as pandemics, blizzards, and heat waves, the results of this study will help public library administrators understand the need for data-based decision-making and plan effective organization data collection and usage methods. Also, decision makers will become more aware of the numerous community members who cannot afford technology, Internet access, and data plans to solely use virtual and digital library services. The data branch managers designated as essential will help CPL develop collections, programs, and services that align with and adapt to community members’ interests and needs.

**Discussion of Results**

This section provides a discussion of the results for each research question.

**Research question 1.** What data do branch managers need to help with purchasing library materials?
CPL branch managers selected collection statistics, popularity rankings, and community demographics as the most useful data dashboard variables for purchasing collection materials. CPL is a part of CLEVNET, which is a Northeast Ohio consortium of 45 library systems (CPL, 2020, “What is CLEVNET”). CLEVNET uses the Sirsi Symphony library management system. In order to ensure that the branch level data branch managers needs (including collection statistics and popularity rankings) are easily available through a data dashboard, CLEVNET should contract consulting services through SirsiDynix to reassess and redesign the information Sirsi Symphony collects. CPL will also be able to learn through these consulting services how to send Sirsi Symphony information to Tableau for instant data dashboard access.

Although some library management system companies offer their own data collection and visualization tools, such as SirsiDynix’s BLUEcloud Analytics, these modules often require consulting contracts to localize and adjust the information collected in the library management system. BLUEcloud Analytics works by collecting information from the Sirsi Symphony library management system. The data collection part of the data lifecycle is simplified and more accurate if essential data is collected in the primary source, in this case Sirsi Symphony, for use in data visualizations and dashboards for decision-making.

The Cleveland Public Library (CPL) relies on the United States Census for community demographic information. As of July 3, 2020, CPL’s service area, had a 46.8% census response rate (U.S. Census, 2020). In addition, CPL branch libraries are often located in “communities that have been more likely to be undercounted in the census includ[ing] young children, renters, and American Indian, Hispanic, and Black households” (McCleer, 2013, p. 268; Tippett, 2020), so the U.S. Census information may not be truly representative of a library branch’s diverse community members.
A community needs assessment or library usage survey would provide more useful data for decision-making than demographics because a community assessment is the systematic process of analyzing and understanding the characteristics of a community; the practices of a community; and, specific to libraries and information centers, what the information perceptions, behaviors, needs, and interests are in a community. (McCleer, 2013, p. 263)

Although demographics can show who lives in a community, a community assessment is able to help “[l]ibrarians and researchers … foster increased cultural awareness and understanding … through awareness and inclusion of diverse community members” (McCleer, 2013, p. 265). To effectively learn about the needs and interests of community members, libraries should include community members on community needs assessment planning teams.

**Research question 2.** What data do branch managers need to help with program planning?

Branch managers determined that the number of program attendees, number of programs, and popularity rankings of branch programs as the most useful data dashboard variables for program planning. The majority of qualitative responses pointed out a lack of understanding about the role of branch managers in program planning. For example, one survey participant requested information about the “expectations of the library.” A process for creating data dashboards for decision-making about program planning should include budget, technology, community partner, and more program vision and mission information from Cleveland Public Library’s centralized program planning and technology departments.

**Research question 3.** What is the best way to provide access to the data dashboard for branch managers?
Branch managers preferred to access a branch data dashboard through a button on CPL’s intranet.

**Research question 4.** What data should be included in a data dashboard to facilitate decision-making about library material purchasing and program planning?

Qualitative survey responses pointed out that basic library data, such as circulation and demographics information is not available to CPL branch managers for decision-making. In addition, branch managers demonstrated a lack of organizational direction regarding program planning and the role of branch managers in the process.

**Implications for Practice**

The results of this study identified a need for organizational development of shared visions for materials purchasing and program planning departments, clear communication of CPL departmental shared visions, a data informed culture, and increased collaboration between departments and administrators. Rob Karel’s (2014) four processes for creating a data governance plan, discover, define, apply, and measure and monitor, are applicable to developing collection development and program planning plans.

**Discover.** In public library data governance plan development, the discovery phase helps an organization learn more about current data collection processes and create procedures based on the shared vision of the organization. For example, learning how many data collection tools are being used; data collection systems the library owns but is not using; and mandatory data that needs to be collected for federal, state, and local reporting should be part of the discovery process.

**Materials Purchasing and Program Planning Discover Phases.** A community needs assessment should be developed and implemented with the assistance of community members
during the discover phase for materials purchasing and program planning. It is important to include community members in this stage because “[i]nvolving community members starting with the development stages of the community assessment will foster a collaborative relationship that will extend beyond the assessment” (McCleer, 2013, p. 271). The community needs assessment will also aid in the creation of departmental shared visions.

**Define.** The definition stage should align with Cleveland Public Library’s (CPL’s) shared organizational vision and strategic goals with data supported performance indicators. Detailed planning for data analysis and reporting methods should take place during this phase to measure the effectiveness of organizational practices. For example, reassessing and redefining the data collected by the Sirsi Symphony library management system should be apart of the process to ensure the data needed from this system for data dashboards is easily available to administrators, staff, and the community.

This would also be the time to hire personnel skilled in data analysis, communication, and use. Recently, some public libraries have hired data analysts. Columbus Metropolitan Library (CML) in Columbus, Ohio, hired a Director of Data Analytics and Insights in 2018, who has over 20 years of information technology experience (Columbus Metropolitan Library, 2018, “Library hires Director of Data Analytics and Insights”). His responsibilities are “tracking library data to help CML better understand customer usage behaviors, trends, and changing community demographics. These efforts will influence the library’s strategic initiatives and decision-making” (Columbus Metropolitan Library, 2018, “Library hires Director of Data Analytics and Insights”).

The Skokie Public Library, in Skokie, Illinois, posted a Data Analysis Coordinator position in June 2019 and currently employs a Data Analysis Coordinator (RAILS, 2020,

Leaders of the Columbus Metropolitan Library, Skokie Public Library and Oak Park Library, seem to understand the importance of data for decision-making in libraries by broadening their employment requirements to include experienced data analysts who may or may not have library science degrees.

In addition, how many data collection tools will send information to Cleveland Public Library’s (CPL’s) Tableau data visualizations and dashboards and in what format should be defined at this stage? Streamlining how many tools are used would be helpful in recognizing issues that should be resolved and sustaining data visualizations and dashboards when hardware, software, or cloud services need to be updated.

**Materials Purchasing and Program Planning Define Phases.** Departmental shared visions should correlate with CPL’s shared organizational vision and strategic goals, and include data supported performance indicators. A detailed plan and templates for implementing and sustaining materials purchasing and program planning objectives based on the results of effective past practices and the community needs assessment should be developed at this stage. Branch managers stated an interest in knowing the expectations of CPL related to program planning. This is the time to create a plan that can be clearly communicated.

**Apply.** In the application stage, collaboration with the IT department is pertinent in implementing the data governance strategy created in the discovery and definition phases. Exceptions to rules and the scrubbing of exported data for federal, state, or any other mandatory reporting should be tested and noted.
**Materials Purchasing and Program Planning Apply Phases.** Collaboration with branch managers and staff should occur at this phase. The departmental plans and templates should be communicated and the data from the community needs assessment that lead to the development of procedures should be shared at this point to create buy-in. Departmental plans should be implemented, and data related to the new plans should be regularly shared, reviewed, and enhanced.

**Measure and monitor.** Data should begin to be shared through data dashboards at this point. Data resulting from the procedures developed in the discovery and definition stages should be reviewed to ensure data integrity. Data should be used to learn if performance indicators are being met and support decision-making.

**Materials Purchasing and Program Planning Measure and Monitor Phases.** Data supporting performance indicators being met should be shared in an easily accessible manner (through Cleveland Public Library’s intranet) and continuous improvement plans should be in place. This stage should indicate internally and externally that community needs, and interests are being addressed.

**Recommendations for Further Study**

Since the majority of research about data dashboard use in libraries are case studies set in academic libraries, more research about data use in public libraries overall is suggested. Recommendations for future research include:

- Case studies that show the effect on decision-making and meeting community needs at public libraries that have developed data focused departments, such as Columbus Metropolitan Library, Skokie Public Library, and Oak Park Library.
- Studies on developing effective data governance plans for public libraries.
• Studies on the use of data dashboards for decision-making in public libraries.
• Research about data visualization and dashboard plans in public libraries
• Research on the effective use of data visualizations and dashboards with external stakeholders to increase funding.
• Studies on the effective use of data visualizations and dashboards to demonstrate public library impact.
• Research about whether or not there is a need to change the data variables public libraries collect through traditional data collection tools, such as library management systems, discovery layers, and EZproxy.

Conclusion

Since 1907, library leaders and librarians have understood the importance of library data in learning what libraries can do to support community learning and development. Library technology systems have increased the amount of data available to librarians and the need to find a simple way to interpret and utilize data to improve library services. Because the “ultimate goal of data visualization is to help viewers understand data better – by providing context, illustrating trends, showcasing patterns, and enabling interactive exploration of data”, it is an effective tool for librarians to use in their daily work (Magnuson, 2016, p. xi).

In addition to explaining the advantages of data visualization in libraries, this study determined the data needs of Cleveland Public Library (CPL) branch managers for materials purchasing and program planning. A strategy for developing a data governance plan to create data dashboards containing CPL branch managers’ preferred data variables was outlined.

This study also pointed out a difference between library leadership and branch managers’ perspectives about organizational vision, data needs, and community needs. A community
assessment and governance plans for data, materials purchasing, and program planning were recommended to help library leaders and branch managers learn and receive data supported evidence of library community needs.

Data from a community assessment and Rob Karel’s discover phase will help CPL build data and departmental initiatives that fulfill library users expectations “for the useful information [libraries make] accessible; for the public spaces … provided; and for the power of reading stories … that [help] users make sense of phenomena in the world around them” (Wiegand, 2015, p. 3). Data dashboards with community relevant information will assist branch managers with innovating and sustaining library collections, programs, and services that empower and uplift communities.
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Appendix A

Survey Instrument

1. What data in this dashboard would help you with purchasing library materials for your branch? (Please select all that apply)

Choose as many as you like

A. Collection distribution
B. Collection statistics
C. Most popular books
D. Most popular movies
E. Most popular music

2. What, if any, other historical branch information would you like to have for purchasing library materials?

Type your answer here...

Shift + Enter to make a line break
3. What data in this dashboard would help you with program planning? (Please select all that apply)

Choose as many as you like:

- A. Number of program sessions
- B. Number of attendees
- C. All programs for the year
- D. All branch programs
- E. Highest attended programs only

4. What, if any, other historical branch information would you like to have for program planning?

5. How do you prefer to access a branch data dashboard? (Please select one)

- A. Branch manager home page
- B. Button on intranet
- C. Through email
Appendix B

Permission to Survey CPL Managers

Request for Permission to Survey CPL Managers for Dissertation

Good morning Mr. Diamond,

Could you please let me know if I have your permission to send the following email to Cleveland Public Library (CPL) District Managers, Branch Managers and Assistant Managers to complete requirements for my doctoral degree through Wilmington University?

My dissertation is about using data dashboards to help CPL branch managers with decision making. In order to learn the most useful data dashboard components, I will ask branch managers to complete this survey: [https://bit.ly/3oP2w7Z](https://bit.ly/3oP2w7Z)

If you grant your permission, I will submit it with my record and review research protocol form to receive permission to proceed with my dissertation research. I will inform you when I’ve been given permission to proceed.

Please let me know if you have any questions.

Email Draft:

Dear Cleveland Public Library Manager:

I am a graduate student at Wilmington University. For my dissertation, I am examining what data dashboard components Cleveland Public Library branch managers need to support decision making about collection materials purchases and program planning. Because you are a Cleveland Public Library branch manager, I am inviting you to participate in this research study by completing a survey that can be found here: [https://bit.ly/3oP2w7Z](https://bit.ly/3oP2w7Z)

The questionnaire will require approximately 15 minutes to complete. There is no compensation for responding nor is there any known risk. In order to ensure that all information will remain confidential, please do not include your name or branch. Copies of the project will be provided to my Wilmington University dissertation advisor and dissertation committee members. If you choose to participate in this project, please answer all questions as honestly as possible. Participation is strictly voluntary and you may refuse to participate at any time.

Thank you for taking the time to assist me in my educational endeavors. The data collected will provide useful information regarding developing a data dashboard for Cleveland Public Library branch managers. If you would like a summary copy of this study please email me. Completion and return of the questionnaire will indicate your willingness to participate in this study. If you require additional information or have questions, please email me.

If you are not satisfied with the manner in which this study is being conducted, you may report (anonymously if you so choose) any complaints to the College of Education, (322) 327-4808.

Sincerely,

Tonya Briggs

Tonya Briggs
Branch Manager
Cleveland Public Library

http://www.cpl.org

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Ms. Briggs, I am sorry for the late reply to your message. It seems as though my email has tripled since we closed and I have lost track of some things. I do apologize.

Yes, you have permission to survey CPL managers for your research. Best wishes to you as you pursue your doctorate.

Tim Diamond

Cleveland Public Library

Timothy R. Diamond
Special Assistant to the Director
Cleveland Public Library

http://www.cpl.org
Appendix C

Human Subjects Review Committee Approval Form

WILMINGTON UNIVERSITY
HUMAN SUBJECTS REVIEW COMMITTEE (HSRC)  HSRC-10

PROTOCOL REVIEW

This section is to be completed by the HSRC Committee.

Researcher:  Tonya Briggs

Date Submitted:  5/4/2020

The protocol and attachments were reviewed:

The proposed research is approved as:

☐ Exempt  ☑ Expedited  ☐ Full Committee  ☐ Provisional (see External Research section)

The proposed research was approved pending the following changes:

☐ See attached letter

☐ Resubmit changes to the HSRC chairperson

The proposed research was disapproved:

☐ See attached letter for more information.

The HSRC representative sent a copy of the HSRC Protocol to the VP of Academic Affairs for research requiring access to Wilmington University students, employees, or data.

HSRC Chair or Representative  Todd Hackett-Slimm

Printed Name

Signature  Date  5/15/2020

HSRC Chair or Representative  Stephanie LoBiondo

Printed Name

Signature  Date  5/15/2020
Appendix D

Collaborative Institutional Training Initiative Certificates

This is to certify that:

Tonya Briggs

Has completed the following CITI Program course:

- Human Subjects Research
- Social-Behavioral-Educational - Human Subjects
- Research
- 1 - Basic

Under requirements set by:

Wilmington University

Completion Date: 26-Mar-2020
Expiration Date: 26-Mar-2023
Record ID: 36058886
COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2

COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- Name: Tonya Briggs (ID: 90279587)
- Institution Affiliation: Wilmington University (ID: 3867)
- Institution Email: tbriggs6002@my.wilmu.edu
- Institution Unit: Doctor of Education
- Curriculum Group: Human Subjects Research
- Course Learner Group: Social-Behavioral-Educational - Human Subjects Research
- Stage: Stage 1 - Basic
- Record ID: 36058886
- Completion Date: 26-Mar-2020
- Expiration Date: 26-Mar-2023
- Minimum Passing: 80
- Reported Score*: 94

REQUIRED AND ELECTIVE MODULES ONLY

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For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid independent Learner.

Verify at: [www.citiprogram.org/verify/2b4b4b33b0-5004-4c0e-9d7c-5d9d20a2d573-86058886](http://www.citiprogram.org/verify/2b4b4b33b0-5004-4c0e-9d7c-5d9d20a2d573-86058886)

Collaborative Institutional Training Initiative (CITI Program)

Email: support@citiprogram.org
Phone: 866-529-5929
Website: [https://www.citiprogram.org](http://www.citiprogram.org)
COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- Name: Tonya Briggs (ID: 9027957)
- Institution Affiliation: Wilmington University (ID: 3887)
- Institution Email: tbriggs902@my.wilmu.edu
- Institution Unit: Doctor of Education

- Curriculum Group: Human Subjects Research
- Course Learner Group: Social-Behavioral-Educational - Human Subjects Research
- Stage: Stage 1 - Basic

- Record ID: 360588886
- Report Date: 26-Mar-2020
- Current Score**: 94

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For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid independent learner.


Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888 529-8320
Web: https://www.citiprogram.org
Appendix E

Participant Invitation

May 6, 2020

Dear Participant:

I am a doctoral student at Wilmington University. For my dissertation, I am examining what data dashboard components Cleveland Public Library branch managers need to support decision making about collection materials purchases and program planning. Because you are a current or former Cleveland Public Library branch manager, I am inviting you to participate in this research study by completing a survey that can be found here: [CPL Data Dashboard Survey](#). The questionnaire will require 5-7 minutes to complete. The survey will be open for 10 week days. I will send a reminder within 5 week days. There is no compensation for responding nor is there any known risk. In order to protect your anonymity, I am not collecting names or branch locations.

Copies of the project will be provided to my Wilmington University dissertation advisor and dissertation committee members. If you choose to participate in this project, please answer all questions as honestly as possible. Participation is strictly voluntary and you may refuse to participate at any time.

Thank you for taking the time to assist me in my educational endeavors. The data collected will provide useful information regarding developing a data dashboard for Cleveland Public Library branch managers. If you would like a summary copy of this study please email me. Completion and return of the questionnaire will indicate your willingness to participate in this study. If you require additional information or have questions, please email me.

If you are not satisfied with the manner in which this study is being conducted, you may report (anonymously if you so choose) any complaints to the College of Education, (302) 327-4868.

Sincerely,

Tonya Briggs
tbriggs002@my.wilmu.edu