

It's Not Rocket Library Science:
Design Epistemology and American Librarianship

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Abstract

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Contemporary American librarianship is typically considered a social science. Yet libraries and librarians have a strong history of making tools and services that enable access to and use of information resources. Conceptualizing librarianship from a scientific perspective discounts its design roots, leaving the field to flounder in the face of other successful information tools and technologies. Reconceptualizing librarianship as a design discipline offers opportunities for empowering and supporting the continued relevance of libraries in the 21st century.

In this dissertation, I draw on the humanistic technique of critical inquiry to argue for design as an appropriate and useful epistemological framework for librarianship and further explore the nature of design in the field. Following a broader discussion of elements of design epistemology and their relationship to the library profession, the dissertation examines three critical cases in depth, each one representing a significant era of library history:

- *Poole's Index to Periodical Literature* (est. 1848)
- The Washington County (MD) Free Library book-wagon (est. 1909)
- The eXtensible Catalog (XC) project (est. 2006)

Design artifacts and supporting materials from each case were critically analyzed based on the framework of identified elements of design epistemology. Examination of the three cases shows ample evidence that much of librarianship aligns with fundamental epistemological approaches and tenets of design, including wicked problems, problem finding and framing, iteration, repertoire, service orientation, and evaluative approaches to design like critique, rationale, adoption, and reflection-on-action. Other elements of design epistemology, such as the use of representations, abductive reasoning, and reflection-in-action, were not observed in the cases; however, the absence of evidence of these elements is not equivalent to their actual absence in practice.

In addition to the presence or absence of these elements, a critical examination of the ways in which they manifested in these cases demonstrates that design epistemology tends to be implicit and passive in American librarianship. Even when design epistemology is explicitly included in these cases, it is often done so in a context that renders it external to librarianship—as something that other fields and other professions do. Elements of design epistemology present in librarianship also help to concretely support the idea of librarianship's focus on users. Examining American librarianship from a design-based standpoint reveals three major themes: 1) many forms of library knowledge not considered valid in scientific contexts are valid in design epistemology; 2) considerations of materiality reveal affordances, constraints, and limitations on innovation in library design; and 3) although many core values of librarianship are innately

embedded in library artifacts, evidence of other values, notably cooperation and standardization, is clearly present.

Finally, critical reflection on the cases in this study reveals that design may be implicit and externalized in librarianship due to both lack of support and character of leadership and that the normative and evangelical agenda of librarianship never really disappeared with the shift to an ostensibly neutral and objective scientific epistemology. Given these findings, the overarching recommendation for the field at large is to incorporate design epistemology explicitly into American librarianship in research, education, and practice.

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For librarians everywhere

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Chapter 1 Introduction and Problem Statement

1.1 Introduction

For thousands of years, libraries and librarians have made artifacts to enable access to and use of information resources. Tools and services enabling and assisting with access to information were the expert purview of libraries around the world for centuries. In the earliest known libraries of Sumeria, workers created cuneiform lists of holdings.¹ The famous library of Alexandria implemented the first known deposit model to foster access to knowledge.² The surge of books and other related resources that resulted from the development of printing in the Western world stimulated the enhancement of existing libraries and the creation of new ones, inspiring new work creating tools like catalogs and shelf lists.³ Innovations like the Bodleian Library's cataloging rules starting in 1620⁴ and the French cataloging code of 1791⁵ sought to standardize bibliographic information so as to provide accurate knowledge of and access to massive collections. Early American libraries also developed information access tools based on these examples. In the 19th century, as the number and size of libraries in American increased, so too did the number of service tools produced. Numerous catalogs, bibliographies, indexes, and classification systems were created to facilitate inventory and access to materials, while new models of service like open stacks, reference assistance, recommendations, and readers' advisory emerged. Dewey developed his famous decimal-based classification system to enable patrons to

¹ Andrew Dalby, "The Sumerian Catalogs," *The Journal of Library History* 21, no. 3 (Summer, 1986).

² Fred Lerner, *The Story of Libraries: From the Invention of Writing to the Computer Age*, 2nd ed. (New York, NY: Continuum International, 2009).

³ Ibid.

⁴ Dorothy M. Norris, *A History of Cataloguing and Cataloguing Methods 1100-1850: With an Introductory Survey of Ancient Times* (London: Grafton & Co., 1939).

⁵ Judith Hopkins, "The 1791 French Cataloging Code and the Origins of the Card Catalog," *Libraries & Culture* 27, no. 4 (Fall 1992).

browse shelves by subject rather than acquisition order.⁶ As libraries transitioned into the 20th century, additional tools and services were created. The formation of new cooperative models like the Library of Congress' Card Distribution program led the way for subsequent coordinated efforts, like the Cooperative Online Serials Program (CONSER), the Name Authority Cooperative (NACO), and the National Coordinated Cataloging Program (NCCP).⁷ Even modern library databases like NoveList were created specifically to support readers' advisory and recommendations.⁸ What separates a *library* from merely a *collection* is the creation of tools and services that unite users with information.

1.2 Problem statement

Despite overwhelming evidence of this history of innovative tool and service creation, as the 20th century progressed, new tools and services were increasingly created not by librarians, but by scientists and technologists.⁹ As librarians—for whatever reason—were reluctant to embrace technological developments of the 20th century, others stepped in to fill the gap, driving librarians to rely on vendors and automation marketplaces as sources of service tools.¹⁰ Libraries and librarians are increasingly no longer creators of tools for libraries, but users and consumers of them.¹¹

⁶ Melvil Dewey, *Classification and Subject Index for Cataloguing and Arranging the Books and Pamphlets of a Library* (Amherst, MA, 1876).

⁷ Beecher Wiggins, "The Program for Cooperative Cataloging," *Proceedings of the Taxonomic Authority Files Workshop, Washington, DC* (June 22-23, 1998), accessed October 22, 2014, <http://researcharchive.calacademy.org/research/informatics/taf/proceedings/wiggins.html>

⁸ "The NoveList Story," accessed September 25, 2015, <http://www.ebscohost.com/novelist/about-novelist/the-novelist-story>

⁹ Michael Buckland, "Documentation, Information Science, and Library Science in the USA," *Information Processing and Management* 32, no. 1 (1996); Robert V. Williams, "The Use of Punched Cards in US Libraries and Documentation Centers, 1936-1965," *IEEE Annals of the History of Computing* 24, no. 2 (2002).

¹⁰ W. Boyd Rayward, "A History of Computer Applications in Libraries: Prolegomena," *IEEE Annals of the History of Computing* 24, no. 2 (2002).

¹¹ Stuart Sutton, "Core Competencies for the Information Professions and the Evolution of Skill Sets," *Education Libraries* 18, no. 3 (1995).

Finding themselves in a subservient position to these external creators left most American libraries struggling to keep abreast of new technological developments. Other publically available information access tools of the late 20th and early 21st centuries captured users' attention. Google, for example, quickly outpaced library catalogs in both perceived ease of use and search functionality.¹² Retail websites like Amazon.com have established features like recommendations, reviews, ratings, and previews as the norm, and leave users expecting similar experiences from libraries.¹³ In addition to functionality, today's information seekers place a high value on ease and convenience,¹⁴ even sacrificing accuracy for accessibility.¹⁵ Even medical students—people who may someday make critical life-altering decisions about peoples' health and bodies—routinely favor more generic and populist tools like Google and Wikipedia when conducting biomedical research.¹⁶ Shachaf found that the quality of answers provided by Wikipedia's reference desk (a question-and-answer service provided by Wikipedia volunteer contributors) matched or even outperformed traditional library reference services.¹⁷ While librarians are quick to point out flaws in these services, they are not the ones designing them, therefore they are powerless to change them in ways that may better serve library users.

¹² Susan Jaworski and Roberta Sullivan, "Google's Evolution Leads to Library Revolution," *Journal of Educational Technology Systems* 39, no. 2 (2010).

¹³ Lynn Silipigni Connaway, Donna Lanclos, and Erin M. Hood, "I find Google a lot easier than going to the library website.' Imagine Ways to Innovate and Inspire Students to Use the Academic Library," *Imagine, Innovate, Inspire: The Proceedings of the ACRL 2013 Conference* (Association of College and Research Libraries, 2013), accessed October 28, 2014, http://www.ala.org/acrl/sites/ala.org/acrl/files/content/conferences/confsandpreconfs/2013/papers/Connaway_Google.pdf

¹⁴ Lynn Silipigni Connaway, Timothy J. Dickey, and Marie L. Radford, "'If It Is Too Inconvenient, I'm Not Going After It': Convenience as a Critical Factor in Information-Seeking Behaviors," *Library and Information Science Research* 33 (2011).

¹⁵ Kyung-Sun Kim and Sei-Ching Joanna Sin, "Selecting Quality Sources: Bridging the Gap between the Perception and Use of Information Sources," *Journal of Information Science* 37, no. 2 (April 2011), 186.

¹⁶ Terry Judd and Gregor Kennedy, "Expediency-based Practice? Medical Students' Reliance on Google and Wikipedia for Biomedical Inquiries," *British Journal of Educational Technology* 42, no. 2 (2010).

¹⁷ Pnina Shachaf, "The Paradox of Expertise: is the Wikipedia Reference Desk as Good as Your Library?" *Journal of Documentation* 65, no. 6 (2009).

American libraries and librarians ceded the ability and power to create innovative tools and services to external providers, leaving libraries on the trailing edge of technology. Given that tool and service creation is such an integral component of librarianship, libraries and librarians need a way to regain creative power if they are to remain relevant in the coming years. Librarians need to reclaim their professional identity as makers—as creators, not consumers, of tools and services—and the accordant methods, techniques, and conceptual approaches that underlie this kind of work. Librarianship is not a science. It is, and always has been, a design discipline, and therefore should be guided by design epistemology.

1.3 Research questions

In this study, I argue that design epistemology is a useful and appropriate lens through which to view, investigate, and understand American librarianship. To address both the conceptual problem of how to understand librarianship as a professional discipline rooted in design epistemology and the normative argument for such a paradigm shift, I propose the following research questions:

1. In what ways does design epistemology manifest in American librarianship?
2. What is uniquely revealed about librarianship when examining the discipline from a design standpoint?
3. What are the implications of reconsidering librarianship from a design standpoint, and how might these implications be explicitly made manifest?

In the spirit of humanistic inquiry, I approach this argument by first reviewing foundational literature of design in order to distill what I call fundamental elements of design epistemology. I draw on sources from a variety of disciplines with established demonstration of design practices, methods, methodologies. Subsequently, I examine specific examples of artifacts in American

librarianship to better understand the nature of these elements of design epistemology in the profession. Selected projects for examination represent the breadth of American librarianship, including multiple time periods and aspects of library service (reference, technical services, etc.). They have also been chosen for their formative and significant contributions to librarianship, judged by community recognition and/or longevity of use. Finally, a concluding discussion and reflection discusses implications of viewing these examples through a design lens, potential benefits and drawbacks for American librarianship, and future recommendations for library research, education, and practice.

My examples include the following:

- Poole's *Index to Periodical Literature* (est. 1848)
- The Washington County Free Library (MD) book-wagon (est. 1909)
- The eXtensible Catalog (XC) project (est. 2006)

More details, including a full explication and justification for this approach, along with detailed descriptions of the examples, appear in Chapter 3: Approach and Activities.

1.4 Significance of the work

If you accept the provocative statement that librarianship is a design discipline, then a number of significant implications for library work, education, and research follow. The first objective of this research is to understand the uses and roles of design artifacts, methods, and underlying ways of thinking and knowing throughout the course of American librarianship. An analysis of librarianship from the standpoint of design offers the potential to reveal alternative insights than those drawn from other traditional approaches, thus contributing a new perspective on and understanding of the field. Second, this research will demonstrate, through both intellectual

argument and artifactual evidence, that design epistemology is an appropriate and useful framework for conceptualizing the profession and work of librarianship. In addition to the aforementioned new insights that this epistemological perspective can offer, understanding the role design has played in the creation of previous library tools will help inform the use of design in future library work. Finally, the demonstration of the applicability of design as a fundamental approach to librarianship lays the groundwork for a paradigm shift in the field's ways of thinking and knowing, offering justification for new topics in library education and alternative legitimate avenues for research and assessment that dovetail more closely with the practical applications of library work and help bridge the theory/practice divide in librarianship.

Chapter 2 Literature Review and Project Rationale

2.1 Why does librarianship need a design epistemology?

The purpose of this chapter is two-fold: it addresses what is meant by design epistemology in the context of this study, and demonstrates the absence of explicit acknowledgement of this epistemological framework in librarianship. This dual purpose is achieved through a combination of approaches: a brief review of existing epistemological influences in American librarianship; an explication of the elements of design epistemology, especially those that distinguish it from other epistemologies common in librarianship; and a subsequent examination of the disconnect between a recent adoption of design methods and techniques (sometimes colloquially called “design thinking”) in the library domain and the lack of incorporation of underlying design epistemology alongside these applications. Thus this chapter reveals a gap between the existing work in librarianship and research surrounding design epistemology.

It should be noted that the aim of this chapter is to highlight this gap and to show how useful, relevant and important design epistemology is for the field. Therefore, holistic coverage such as an in-depth historical examination of the epistemological influences of librarianship, while certainly interesting, is outside the scope of this project.

Similar limitations apply to the realm of design. Entire books could be (and have been!) written on design, from techniques and artifacts to processes and research. This section is not intended to be thorough in-depth coverage, but identification of elements common across major authors, perspectives, and works specifically regarding the epistemology of design. I select from the well-established and recognized scholarship of design epistemology to illustrate major points, rather than provide a complete historical overview.

2.2 Existing epistemological approaches to librarianship

Although libraries and librarians have existed in various forms and contexts for thousands of years, most scholars concur that formal establishment of American librarianship began in 1876 with two defining concurrent events: the first American Library Association meeting in Philadelphia, and the publication of the first professional journal of librarianship, *American Library Journal* (later *Library Journal*). These events also opened the doors to formal education in librarianship, which helped solidify the existence and acknowledgement of librarianship as a professional discipline. Early American librarianship was not the library science of today, but a profession with more humanistic roots of reading and persuasive rhetoric. Reading was emphasized as a means of intellectual, moral, and social education and improvement.¹ Librarians assumed the roles of mediators: connecting readers to “good” books and discouraging them from partaking in problematic ones.² Even librarianship itself relied on reading for educational purposes: Justin Winsor’s advice to prospective librarians before 1887 was to read anything and everything published about libraries, and Charles Ammi Cutter “considered a reading of the [library] literature sufficient” preparation and self-education for a library career.³

How did librarians know which books would raise readers’ intellectual intelligence and moral judgment, and which would lead readers into trouble like drinking, crime and upheaval of society as we know it? Librarians didn’t know what the good books were through science—

¹ John Cotton Dana, “Hear the Other Side: 1896 ALA President’s Address,” in *Library Daylight: Traces of Modern Librarianship, 1874-1922*, ed. Rory Litwin (Duluth, MN: Library Juice Press, 2006); Gracia Alta Countryman, “The Library as Social Centre. Opening address at the Red Wing Meeting of the Minnesota Library Association,” in *Library Daylight: Traces of Modern Librarianship, 1874-1922*, ed. Rory Litwin (Duluth, MN: Library Juice Press, 2006); Wayne A. Wiegand, *The Politics of an Emerging Profession: The American Library Association, 1876-1917* (New York, NY: Greenwood Press, 1986), 12.

² Francis L. Miksa, “The Columbia School of Library Economy, 1887-1888,” *Libraries & Culture* 23, no. 3 (1988), 260.

³ Sarah K. Vann, *Training for Librarianship Before 1923: Education for Librarianship Prior to the Publications of Williamson’s Report on Training for Library Service* (Chicago, IL: American Library Association, 1961), 9-10.

librarians didn't conduct systematic studies.⁴ So how *did* librarians know? Like art and pornography, librarians presumed they would know it when they saw it. Librarians of the late 19th century relied on “a fixed standard in [their] minds” to guide their work in selecting, collecting, and providing materials.⁵ As individuals with formal education in reading and rhetoric and membership in the middle class, their standards and values—as influenced by the contemporary Victorian era—were surely the right ones to enforce. And enforce them they did: through editorial articles and letters putting forth claims about the benefits of reading and self-education. Such use of passionate rhetoric also reflects the influence of literature and reading, not science, on the formation of the profession.

However, as librarianship became increasingly established as a profession, other influences impacted these fundamental epistemological approaches. For instance, the increasing formalization of education for librarianship, especially its inclusion in the university system at the graduate level, shifted focus away from procedural training towards more scientific approaches.⁶ In 1948 the American Library Association passed a resolution calling for library education to only be offered at the graduate level⁷ and by 1951, the American Library Association had limited accreditation to programs offering masters (i.e., graduate level) degrees.⁸ Situating librarianship in the academy helped legitimize it as a profession rather than a vocation,

⁴ Dee Garrison, *Apostles of Culture: The Public Librarian and American Society, 1876-1920* (Madison, WI: University of Wisconsin Press, 1979).

⁵ George T. Clark, “Improper books. A paper delivered at the 1895 ALA Conference, Denver, Colorado,” in *Library Daylight: Traces of Modern Librarianship, 1874-1922*, ed. Rory Litwin (Duluth, MN: Library Juice Press, 2006), 86.

⁶ C. Edward Carroll, *The Professionalization of Education for Librarianship with Special Reference to the Years 1940-1960* (Metuchen, NJ: Scarecrow Press, 1970).

⁷ George Bobinski, *Libraries and Librarianship: Sixty Years of Challenge and Change, 1945-2005* (Lanham, MD: Scarecrow Press, 2007).

⁸ Mary Ellen Quinn, *Historical Dictionary of Librarianship*, (Lanham, MD: Rowman & Littlefield, 2014), xxxiv.

but also emphasized scientific research and publication over practice.⁹ Although many practitioners resisted the conceptualization of librarianship as a science and actively advocated for other conceptualizations (see for example Thompson, who suggested librarianship might be better considered as a fine art form¹⁰), librarians were increasingly educated in an environment steeped in science, research, and the academy, and in turn taking those epistemological understandings with them as they moved into practice.

This split between service-based library practice and research-based library science was not a black-and-white divide. Often they overlapped, as scholars and researchers in library science emphasized the need for scientific evidence to justify libraries' social and educational value, rather than reliance on experience-based assumptions and conclusions.¹¹ Various methods and methodological approaches to gathering this scientific evidence were drawn upon throughout the 20th century, such as positivistic approaches;¹² social epistemology;¹³ qualitative inquiry;¹⁴ hermeneutics;¹⁵ and evidence-based librarianship.¹⁶ Scholars often argue about the nature and underlying philosophical and epistemological assumptions of library science (see for example

⁹ John V. Richardson, Jr., *The Spirit of Inquiry: The Graduate Library School at Chicago, 1921-1951* (Chicago, IL: American Library Association, 1982).

¹⁰ C. Seymour Thompson, "Do we want a library science?" *Library Journal* 56 (1931).

¹¹ C. C. Williamson, "The Place of Research in Library Service," *The Library Quarterly* 1, no. 1 (1931).

¹² Pierce Butler, *An Introduction to Library Science* (Chicago, IL: University of Chicago Press, 1933); Douglas Waples, *People and Print: Social Aspects of Reading in the Depression* (Chicago, IL: University of Chicago Press, 1938); Douglas Waples, *Investigating Library Problems* (Chicago, IL: University of Chicago Press, 1939).

¹³ Margaret Egan and Jesse Shera, "Foundations of a theory of bibliography," *The Library Quarterly* 22, no. 2 (1952); Jesse Shera, "An epistemological foundation for library science," in *The Foundations of Education for Librarianship*, (New York, NY: Becker and Hayes, 1972).

¹⁴ Raya Fidel, "Qualitative methods in information retrieval research," *Library and Information Science Research* 15, no. 3 (1993).

¹⁵ John M. Budd, *Knowledge and Knowing in LIS: A Philosophical Framework* (Lanham, MD: Scarecrow Press, 2001).

¹⁶ Jonathan Eldredge, "Evidence-based Librarianship: An Overview," *Bulletin of the Medical Library Association* 88, no. 4 (2000); Jonathan Eldredge, "Evidence-based Librarianship: The EBL Process," *Library Hi Tech* 24, no. 3 (2006).

the published debates between Sandstrom & Sandstrom and Nyce & Thomas¹⁷ or Zwadlo and Radford & Budd¹⁸). Yet few since the beginnings of the 20th century have approached librarianship as if it was not a science at all.

In summary, despite the short history of the field, librarianship has been influenced by and understood within the context of various epistemological perspectives. Early approaches reflected somewhat humanistic epistemologies of bibliography and rhetoric. Scientific influences in the early part of the twentieth century influenced the evolution of the profession toward a positivistic epistemology of science. Later conceptions incorporated additional scientific perspectives and frameworks beyond positivism, but always reflected the idea that librarianship was the work that emerged from the discipline of library science.

2.3 A different approach: design

In the twentieth century, design epistemology has emerged as a legitimate alternative to traditional scientific epistemologies. Reviews of epistemological constructs in design based disciplines reveal significant epistemological differences. The major epistemological division between traditional science and design stems from the idea that science concerns itself with observing and describing the existing natural world with the goal of replicability and prediction.

¹⁷ Alan R. Sandstrom and Pamela Effrein Sandstrom, "The Use and Misuse of Anthropological Methods in Library and Information Science Research," *The Library Quarterly* 65, no. 2 (1995); James Nyce, "Qualitative Research in LIS: Redux: A Response to a [Re]Turn to Positivistic Ethnography," *The Library Quarterly* 68, no. 1 (1998); Alan R. Sandstrom and Pamela Effrein Sandstrom, "Science and Nonscience in Qualitative Research: A Response to Thomas and Nyce," *The Library Quarterly* 68, no. 2 (1998); James Nyce and Nancy Thomas, "Final comment: Can a "hard" science answer "hard" questions? A response to Sandstrom and Sandstrom," *The Library Quarterly* 69, no. 2 (1999); Alan R. Sandstrom and Pamela Effrein Sandstrom, "Antiscientific Approaches to the Study of Social Life: A Rejoinder to Nyce and Thomas," *The Library Quarterly* 69, no. 2 (1999).

¹⁸ Jim Zwadlo, "We Don't Need a Philosophy of Library and Information Science--We're Confused Enough Already," *The Library Quarterly* 67, no. 2 (1997); Gary Radford and John M. Budd, "We Do Need a Philosophy of Library and Information Science -- We're Not Confused Enough: A Response to Zwadlo," *The Library Quarterly* 67, no. 3 (1997); Jim Zwadlo, "Comment," *The Library Quarterly* 68, no. 1 (1998).

Design, on the other hand, centers on the artificial world: objects created by humans to institute change and solve problems. Science is about *what is*, while design is about *what could be* (or arguably *what should be*).¹⁹ The objectives of design are to “create things people want”²⁰ by “addressing problems or ideas in a situated context.”²¹ Thus design epistemology is one based in the creation of things that solve problems. Such an inherently different purpose calls for different methodologies and techniques of practice, and therefore requires a fundamentally different way of viewing and evaluating knowledge creation: what Cross calls a “designerly way of knowing.”²²

What are these ways of knowing? Scholars from the 1960s, when the first formal investigations of processes and methods of design began, to the present day, have identified consistent factors and aspects of design processes across a diverse range of disciplines. Designers from all fields—from architecture to engineering, from fashion to technology—undergo similar processes, revealing a common set of fundamental principles that underlie what constitutes knowledge in design epistemology.²³ While there are many perspectives from which designers approach this process, such as *user-centered design* or *participatory design*, and many concrete methods designers partake in, from A/B testing to word clouds,²⁴ the present discussion is not about the perspectives and hands-on activities that might differ among these approaches (such as what

¹⁹ Jeanne Liedka, “Design Thinking: The Role of Hypothesis Generation and Testing,” in *Managing as Designing*, ed. R. J. Boland and F. Collopy (Stanford, CA: Stanford University Press, 2004).

²⁰ Silke Konsorski-Lang and Michael Hampe, “Why Is Design Important? An Introduction,” in *The Design of Material, Organism and Minds* (Berlin Heidelberg: X.media.publishing, Springer-Verlag, 2010), 3.

²¹ A. Telier, *Design Things* (Cambridge, MA: MIT Press, 2011).

²² Nigel Cross, “Design Research: A Disciplined Conversation,” *Design Issues* 15, no. 2 (1999); Nigel Cross, *Design Thinking* (Oxford: Berg, 2011).

²³ John C. Thomas and John M. Carroll, “The psychological study of design,” *Design Issues* 1, no. 1 (July 1979); Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York, NY: Basic Books, 1983), 65.

²⁴ Bella Martin and Bruce M. Hanington, *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions* (Beverly, MA: Rockport Publishers, 2012).

kinds of personnel are included on a user-centered design team vs. a participatory design team, or whether a cognitive walkthrough is a more useful idea-generating method than concept mapping). Additionally, some authors discuss divergent views on design that at times may even directly conflict; however, this discussion is not intended to be a complete review of all perspectives, but rather an overview of the underlying principles common across design that comprise a unique way of knowing. These underlying principles—what I call “elements of design epistemology” in this study—include a variety of approaches to knowledge and what constitutes knowledge in design. See Table 2.1 for an organized list of these elements.

Table 2.1 Elements of design epistemology discussed in this research.

| | | |
|---------------------------------|--|--------------------------------------|
| Elements of design epistemology | Creation of problem solutions | Artifacts |
| | | Wicked problems |
| | | Problem finding, framing & reframing |
| | | Emphasis on service |
| | Generation of knowledge through making | Iteration |
| | | Repertoire |
| | | Reflection |
| | | Use of representations |
| | | Abductive reasoning |
| | Design evaluation methods | Rationale |
| | | Critique |
| | | Criteria-based evaluation |

Although they appear here to be very carefully categorized, many of these elements overlap and serve multiple purposes. For instance, reflection is a form of knowledge generation in design which may also serve as an evaluative method. Although I acknowledge the complexity inherent in articulating these elements, I group them this way purely for purposes of presenting an organized analysis.

These elements appear in in all design disciplines. I posit that these elements also appear systemically (if not systematically) throughout the discipline of librarianship. To support my argument, each of these elements will be defined and discussed in detail, drawing on examples from both traditional design fields as well as librarianship where applicable to illustrate the concepts.

2.3.1 Creation of problem solutions

2.3.1.1 *Artifacts*

The verb form of the word “design” means “to create, fashion, execute, or construct according to plan.”²⁵ One of the first to examine design in a rigorous way, Simon described the design process as “creating artifacts to obtain goals”²⁶ and claimed that this focus is a key factor in distinguishing professional disciplines from those of pure scientific research and inquiry.²⁷ While Simon comes from a more traditionally scientific perspective, similar definitions can be seen for design in more creative or craft-oriented domains, such as Charles Eames’ definition of design as “a plan for arranging elements in such a way as to best accomplish a particular purpose.”²⁸ Regardless of discipline or conceptual representation, design is “creating things people want.”²⁹ This squarely defines design as a creative domain; that is, one that hinges on the action of creation.

Creation results in some sort of output. Since the word “things” is often limited to the connotation of physical objects, Kline suggests using the term “artifacts” to refer to all

²⁵ *Merrriam-Webster Dictionary*, s.v. “design,” accessed October 28, 2015, <http://www.merriam-webster.com/dictionary/design>.

²⁶ Herbert Simon, *The Sciences of the Artificial*, 1st ed. (Cambridge, MA: MIT Press, 1969), 59.

²⁷ Herbert Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: MIT Press, 1996), 111-114.

²⁸ Charles and Ray Eames, *Design Q&A* [color film] (1972).

²⁹ Konsorski-Lang and Hampe, “Why Is Design Important,” 3.

products—tangible or intangible—made by humans that do not naturally occur on earth.³⁰

Design, therefore, centers on the creation of some artifact. In the most literal sense, artifacts are physical objects like axes, doors, telephones and cars. In libraries, physical space (architecture and interior space planning) is often an explicit focus of design. However, physical artifacts are not the only artificially-created things in our universe. People also create intangible conceptual systems. These designs may be represented by or documented in physical artifacts. Such intangible conceptual objects can also be considered artifacts, along with any techniques or records used to embed them. Myriad examples of these design artifacts exist in librarianship, such as the following, far from inclusive list of examples:

- Dewey Decimal Classification, est. 1876³¹
- Library of Congress Subject Headings, est. 1898³²
- Card Distribution Program, Library of Congress, est. 1901³³
- Reference Question File, Medical Library of the New York State Library, est. 1937³⁴
- Farmington Plan, a cooperative acquisitions program for foreign materials during the war era, est. 1942³⁵
- Machine-Readable Cataloging (MARC), Library of Congress, est. 1968³⁶

³⁰ Stephen J. Kline, “What Is Technology?” *Bulletin of Science Technology & Society* 5 (1985), 215.

³¹ Melvil Dewey, *Classification and Subject Index for Cataloguing and Arranging the Books and Pamphlets of a Library* (Amherst, MA, 1876).

³² Alva T. Stone, “The LCSH Century: A Brief History of the Library of Congress Subject Headings, and Introduction to the Centennial Essays,” *Cataloging & Classification Quarterly* 29, nos. 1-2 (2000).

³³ Martha M. Yee, “‘Wholly Visionary’: The American Library Association, the Library of Congress, and the Card Distribution Program,” *Library Resources and Technical Services* 52, no. 2 (April 2009).

³⁴ Heath Babcock, “Reference Question File,” *Medical Library Association Bulletin* 25 (May 1937).

³⁵ Abner Gaines, “Farmington Plan,” in *Encyclopedia of Library History*, ed. Wayne A. Wiegand and Donald G. Davis Jr., (New York, NY: Garland Publishing, 1994), 193.

³⁶ Henriette D. Avram, *MARC, Its History and Implications* (Washington DC: Library of Congress, 1975).

- Library Group Practice, a practice where upon entering, a patron is met by an information clerk who determines the level of service required and offers relevant direction to services, est. 1973³⁷
- Connecticut Library Line, telephone reference service, est. 1973³⁸
- Dial-A-Story, Carnegie Library of Pittsburgh, est. 1974³⁹
- INFORM, an experimental consortium of libraries to provide in-depth reference service, est. 1974⁴⁰
- “How to Search OCLC,” a computer instruction video game, University of Florida, est. 1985⁴¹
- Electronic Access to Reference Services (EARS), Health Science Library, University of Maryland, Baltimore, est. 1986⁴²
- Collaborative Digital Reference Service (CDRS), Library of Congress, est. 1998; evolved into the Global Reference Network and subsequently became QuestionPoint⁴³

These examples were chosen to illustrate the breadth and diversity of library design projects and because many of them are likely to be familiar or recognizable, but for each project listed here there are hundreds if not thousands of others, large and small, successes and failures. Arguably every tool and service created in librarianship is a design artifact, from individual bibliographic records to cooperative reference service plans spanning large numbers of libraries. The

³⁷ Larry Auld and Irene Volt, “Library Group Practice,” *College and Research Libraries* 34 (January 1973).

³⁸ “Library Line,” *American Libraries* 6, no. 1 (January 1975), 19.

³⁹ “Libraries: Dial-a-Story Experiments,” *American Libraries* 5, no. 6 (June 1974), 289.

⁴⁰ Grieg Aspnes, “INFORM: An Evaluation Study,” *Minnesota Libraries* 24 (Autumn 1974).

⁴¹ “Software Showcase: Program uses video games to train OCLC users,” *American Libraries* 16, no. 10 (November 1985), 749.

⁴² Frieda O. Weise and Marilyn Borgendale, “EARS: Electronic Access to Reference Service,” *Bulletin of the Medical Library Association* 74, no. 4 (October 1986).

⁴³ Library of Congress, “Global Reference Network: Project History,” accessed June 3, 2016, <https://www.loc.gov/rr/digiref/history.html>

knowledge and understanding that comes with and from the creation of such artifacts for problem-solving is a unique epistemological approach with ways of knowing and understanding that diverge from other traditional frames of knowledge.⁴⁴

2.3.1.2 *Wicked problems*

Creation in design serves a very specific purpose: to solve problems. Although design artifacts are created with the intention of solving problems, not all problems need design solutions. The problem “ $2 + 2 = ?$ ” does not require a creative solution; it requires a mathematical one. Many problems can be solved with the application of traditional scientific methods. “After all,” Archer notes, “if the solution to a problem arises automatically and inevitably from the interaction of the data, then the problem is not, by definition, a design problem.”⁴⁵ Unlike rational, scientific problems, design problems are ill-defined from the outset.⁴⁶ These unique, interconnected, and ill-defined problems that cannot be definitively described are referred to as “wicked problems.”⁴⁷ Rittel and Webber identify at least ten characteristics that qualify a problem as “wicked”:

1. There is no definitive problem or known solution
2. The problem has no stopping rule
3. There are no true or false solutions to the problem, only good or bad solutions
4. No scientific test exists for a solution
5. Each solution is a “one shot” effort (that is, every solution attempt changes the problem)

⁴⁴ Leif E. Östman, “Design Theory is a Philosophical Discipline – Reframing the Epistemological Issues in Design Theory,” *Design System Evolution – EAD 06 Proceedings of the 6th International Conference of the European Academy of Design*, (Bremen, Germany: University of the Arts, 2005); Darius Mahdjoubi, “Epistemology of Design,” in *Integrated Design and Process Technology*, ed. S.M. Becker and B. Westfetschel (2003).

⁴⁵ L. Bruce Archer, *Systematic Method for Designers* (London: The Design Council, 1965).

⁴⁶ Nigel Cross, “The Structure of Design Problems,” in *Developments in Design Methodology* (Chichester: John Wiley and Sons, 1984), 105.

⁴⁷ Horst W. J. Rittel and Melvin M. Webber, “Dilemmas in a general theory of planning,” *Policy Sciences* 4, no. 2 (1973).

6. There is no complete list of acceptable moves
7. The problem is unique
8. The solution is a symptom of another problem
9. There is more than one explanation or framing for the problem
10. The designer is liable for the actions they take in attempting a solution

By saying ‘at least ten,’ they imply that there may be additional characteristics. For instance, implicit in their work is the idea that wicked problems are social problems. They do not indicate whether all 10 conditions must be met to classify a problem as wicked, but the nod to additional conditions implies that there is no complete number of conditions that must be met. Because these wicked problems cannot be solved through traditional scientific means, and may only have better or worse resolutions rather than a single “correct” answer, creative approaches like design are necessary.⁴⁸ Design is often relied upon to tackle wicked problems that have failed to be solved via more traditional research approaches.⁴⁹

Many problems in professional disciplines display the characteristics of wicked problems, and librarianship is no exception. Professional practice in American librarianship has centered on problem-solving from the beginning, from overarching problems like how to provide the best books to the most people at the lowest cost (put forth by Dewey in 1892 and still the motto of ALA today⁵⁰) to specific instantiations at local institutions, like how to increase circulation or teach information literacy. For example, what is the definition of the problem contemporary online library catalogs attempt to solve? Is it a question of materials inventory, or information

⁴⁸ Jeff Conklin, Min Basadur and G.K. VanPatter, “Rethinking Wicked Problems: Unpacking Paradigms, Bridging Universes (part 1 of 2),” *NextD Journal* 28 (2007).

⁴⁹ Roel Wieringa, “Design Science Methodology: Principles and Practice,” *Proceedings - International Conference on Software Engineering* 2 (2010).

⁵⁰ American Library Association, “Mission & Priorities: Motto,” accessed June 16, 2015, <http://www.ala.org/aboutala/missionpriorities>

access? If it is access, is it ease of access, universality of access, remote access, or something else entirely? Perhaps it includes all of the above, as well as issues of integration with circulation and statistical reporting. It must include consideration of backend architecture, display, descriptive cataloging, subject analysis, and authority control. Not only is the problem ill-defined and interconnected, but it also impacts a wide variety of stakeholders—library patrons, librarians, organizational management, software vendors and developers. Even Patrick Wilson writes that library catalogs are not faulty because of poor workmanship or outmoded organizational schemes, but rather a deeper inherent complexity.⁵¹ Due to such complexity, many problems addressed or attempted to be addressed by libraries could be considered wicked. Since scientific approaches are not appropriate approaches to these wicked problems, this leaves design as the only currently established appropriate approach to addressing these library problems.

2.3.1.3 Problem finding, framing, and reframing

Because wicked problems—the kinds of problems that can be addressed by design—are by nature ill-defined, it makes sense that thorough investigation and understanding of a problem would be a key component of the design process. Early scholars of design conceptualized design as a rational and systematic process. Design was generally characterized as a multi-stage progression with variations of the following stages: 1) analysis; 2) synthesis; 3) evaluation.⁵² The first stage, analysis, consisted of activities that have subsequently come to be known in

⁵¹ Patrick Wilson, *Two Kinds of Power: An Essay on Bibliographical Control* (Berkeley, CA: University of California Press, 1968), 70.

⁵² J. Christopher Jones, “A Method of Systematic Design,” in *Conference on Design Methods*, ed. J.C. Jones and D. Thornley (Oxford: Pergamon Press, 1963); Archer, *Systematic Method*; John Luckman, “An Approach to the Management of Design,” *Operational Research Quarterly* 18 no.4 (1967); Thomas and Carroll, “The Psychological Study of Design.”

design as “problem finding.” The second synthesis stage represented the actual creation or formulation of a solution and the final stage addressed how well the solution fit the problem. Tasks like compiling exhaustive lists of requirements⁵³ and identifying goals and constraints⁵⁴ were primitive attempts to define and scope design problems. Additional early strategies for problem identification and definition relied on hierarchical decomposition, or the rational division of a complex problem into increasingly narrower subsets. We might think of this as akin to hierarchical classification, where topics are increasingly subdivided more narrowly. Then, after rank-ordering these sub-problems and deciding on acceptable sub-solutions and combinations of sub-solutions, these combinations of partial solutions would lead to larger, overall solutions.⁵⁵ This was the common understanding of the design process at the time. However, it quickly became evident early in this area of research that design could not be reduced so simply. For instance, Darke found ethnographic evidence refuting the idea that designers identify constraints in a formalized way.⁵⁶ Instead, designers impose a “generating concept” or a set of objectives from one particular perspective in order to find a “way in” or to frame the problem a certain way. Again to use a knowledge organization example, we might think of this as akin to access points: metadata like title, author, and subject are common “ways in” for users to access a collection. This idea of framing and reframing—looking at the problem from different angles or points of view—recurs throughout the literature on design and across fields like industrial product design, software and technology development, and architecture.⁵⁷

⁵³ Christopher Alexander, “The Determination of Components for an Indian Village,” in *Conference on Design Methods*, ed. J.C. Jones and D. Thornley, (Oxford: Pergamon Press, 1963).

⁵⁴ Archer, *Systematic Method*.

⁵⁵ Alexander, “Determination of Components”; Archer, *Systematic Method*; Luckman, “Management of Design”; Simon, *Sciences of the Artificial*, 1st ed.

⁵⁶ Jane Darke, “The Primary Generator and the Design Process,” *Design Studies* 1 (1979).

⁵⁷ Cross, *Design Thinking*.

For instance, the problem of accessing e-books in libraries can be looked at from many different perspectives: how patrons find and download titles is a very different approach than how library staff acquire titles and make them accessible. How might we reframe this? Viewing an issue from the point of view of both patrons and library staff is a common occurrence in library projects. What other views could we take on this issue? How about different types of patrons: adults, children, teens? How about different environments those patrons are in: the library, work, school, home, on the road commuting? Other methods for reframing problems include setting boundaries around the issue (“How do children use library e-books?”); selecting particular aspects of the problem to pay attention to (“How can we make the download process quick and easy?”); and imposing coherence (“What is the process children follow to find a library e-book?”). The way in which a problem is framed will guide subsequent design decisions.

Schön also specifically discusses the role that design domains play in understanding, reframing, and designing solutions for problems.⁵⁸ Design domains are clusters of concepts, like elements, features, norms, relations, actions, and constraints, that designers draw upon throughout the design process. To continue our knowledge organization comparison, we might think of these like facets representing different aspects and concepts that affect and shape how a designer understands and therefore addresses the problem under consideration. Goel and Pirolli observe that designers not only interpret problems through the lens of their own personal experience, they also “explicitly try to change the problem situation so it more closely fits their expertise, knowledge, and experience.”⁵⁹ Such reframing affects the entire process of design, since rather than changing from the initial state to a preferred state, as is the traditional conceptualization of

⁵⁸ Donald A. Schön, *Educating the Reflective Practitioner* (San Francisco, CA: Jossey-Bass, 1987).

⁵⁹ Vinod Goel and Peter Pirolli, “The Structure of Design Problem Spaces,” *Cognitive Science* 16, no. 3 (1992).

the design process, here designers actually change the initial state itself. Problem finding, framing, and reframing is such an integral part of the design process that Lawson points out it is designers' abilities to find the problems—not solutions—that distinguishes good from bad design.⁶⁰

2.3.1.4 *Emphasis on service*

An emphasis on service seems self-evident for a field mainly concerned with solving complex and wicked problems. However, the element of service in design is deeper than just problem solving. For one thing, the service orientation of design is intentional compared to other traditional approaches from science and art.⁶¹ These other epistemologies certainly offer contributions to others in the form of knowledge from scientific discoveries that in turn affect social policy or emotional experiences that influence personal behavior. But as Nelson and Stolterman argue, these are secondary outcomes. Preliminary motivation in science and art are typically in the service of self in terms of curiosity and expression. Design, on the other hand, intentionally targets the needs of others, and this specific intention separates it from other forms of inquiry. Science and art set out to “find meaning”; design aims to “make meaning.”⁶²

Design “makes” meaning literally through artifact creation and metaphorically through contributing to service in the lives of others. Although Konsorski-Lang and Hampe define design as “creating things people want,”⁶³ Nelson and Stolterman argue that to truly offer intentional service, design offers people more than what they want, a “surprise of self-recognition.”⁶⁴ This

⁶⁰ Bryan Lawson, *Design in Mind* (Oxford: Butterworth-Heinemann, 1994).

⁶¹ Harold G. Nelson and Erik Stolterman, *The Design Way: Intentional Change in an Unpredictable World*, 2nd ed. (Cambridge, MA: MIT Press, 2012), 41.

⁶² *Ibid*, 43.

⁶³ Konsorski-Lang and Hampe, “Why Is Design Important,” 3.

⁶⁴ Nelson and Stolterman, *The Design Way*, 42.

design creates knowledge through intentionally understanding and manifesting desiderata. In other words, design is not necessarily about solving a problem as stated, but empathetically understanding the situation and context so that underlying and potentially unknown problems can be solved, thus demonstrating a dedication to service by going beyond a surface level. We see this time and again in librarianship, which also explicitly calls out service as a core value of the profession.⁶⁵ One illustrative example is the reference interview, where librarians are trained to delve, explore, and determine a patron's true underlying information need, because it is not necessarily directly stated.⁶⁶ For example, a patron may ask a librarian, "Do you have *Time* magazine?" Solving the direct problem as presented, the answer would be a simple "yes" or "no." However, the patron may be a student looking for articles about the U.S. war in Iraq, and associate *Time* magazine with articles of that genre and topic. Or the patron may be a senior citizen looking for a recent article about new cancer treatments who recalled the article being published in *Time* magazine, but it actually appeared in *Newsweek*.⁶⁷ It is the explicit job of the librarian to give the patron more than what they have expressed as their need, to solve the problem beyond its presentation.

2.3.2 Generation of knowledge through making

2.3.2.1 Iteration

Unlike the linear phases identified in early design research, where one first defines a problem and then creates a solution, researchers increasingly note that problem finding in design is

⁶⁵ American Library Association, "Core Values of Librarianship," accessed October 27, 2015, <http://www.ala.org/advocacy/intfreedom/statementspols/corevalues> Michael Gorman, *Our Enduring Values: Librarianship in the 21st Century*, (Chicago, IL: American Library Association, 2000), 74-87.

⁶⁶ Anne M. Fields, "Ill-structured Problems and the Reference Consultation: The Librarian's Role in Developing Student Expertise," *Reference Services Review* 34, no. 3 (2006).

⁶⁷ Example from Stephanie Willen Brown, "The Reference Interview: Theories and Practice," *Library Philosophy and Practice* (2008), accessed October 25, 2015, <http://www.webpages.uidaho.edu/~mbolin/willenbrown.htm>

ongoing throughout the process. Even early proponents of the three-stage model of design noted that designers continually cycle through these stages, rather than progressing linearly.⁶⁸ Archer also observed confusion and overlapping activities among stages,⁶⁹ while Levin noted numerous feedback loops and cycles of decisions⁷⁰ and Akin saw constant regeneration of new goals, problems, and sub-problems throughout all stages of the design process.⁷¹ Subsequent work shows that design problems and solutions develop together, concurrently, in an interconnected and interdependent way.⁷² Designers move quickly back and forth between explorations of the problem and ideas for solutions⁷³ and hone definitions of problems by making attempts at solutions.⁷⁴ In fact, there is actually a danger in settling on a problem definition too early, as it may preemptively narrow the focus, eliminating opportunities for other perspectives and forcing designers to jump to solutions too quickly.⁷⁵

Much of this iterative process in design stems from the idea that finding and identifying the problem to be addressed is just as important—if not more so—than creating a solution. Because wicked problems—the kinds of problems that can be addressed by design—are by nature ill-defined, it makes sense that iterative investigation and understanding of a problem would be a key component of the design process. Additionally, wicked problems are also characterized as interconnected: every attempt at a solution changes the problem. This is reflected in the design process as well, where requirements may be interdependent.⁷⁶ This interdependent iteration is

⁶⁸ Luckman, “Management of Design.”

⁶⁹ Archer, *Systematic Method*.

⁷⁰ Peter H. Levin, “Decision-making in Urban Design,” Building Research Station note EN 51/66 (1966).

⁷¹ Omar Akin, “An Exploration of the Design Process,” *Design Methods and Theories* 13, no. 3 (1979).

⁷² R. Davies, “A Psychological Enquiry into the Origination and Implementation of Ideas,” (masters thesis, University of Manchester, 1985).

⁷³ Peter Rowe, *Design Thinking* (Cambridge, MA: MIT Press, 1987).

⁷⁴ Bryan Lawson, *How Designers Think*, 2nd ed. (London: Butterworth Architecture, 1990); Lawson, *Design in Mind*.

⁷⁵ Levin, “Decision-making in Urban Design”; Rowe, *Design Thinking*.

⁷⁶ Jones, “Systematic Design.”

also reflected in what Schön called a “web of moves”: every action, choice, or move a designer makes affects the next move and all subsequent moves down the line, therefore designers must consider all possible future moves when considering the move at hand.⁷⁷ We see similar evidence of moves and effects of moves in other design studies, such as Rowe’s study of architectural designers.⁷⁸

2.3.2.2 *Repertoire*

Repertoire is the name given in design to previous experiences and bodies of knowledge.⁷⁹

Designers draw on repertoire both to guide current choices and to evaluate decisions and artifacts. Schön describes repertoire as the “capacity to see unfamiliar situations as familiar ones, and to do in the former as we have done in the latter, which enables us to bring our past experiences to bear on the unique case.”⁸⁰ He points out that a designer’s ability to create increasingly better solutions hinges on the scope and diversity of his or her repertoire: the more past experiences a designer has, the more familiar situations he or she can draw upon, and thus then be more informed in making decisions in uncertain situations. Lloyd and Snelders highlight the idea that repertoire need not be limited solely to previous design experiences, but to other external factors such as passive information reception.⁸¹ Their case study of Phillippe Starck’s *Juicy Salif*⁸²—a lemon squeezer shaped like a squid after Starck partook in a lunch of calamari—showed that a designer’s ability to create analogies between present problems and external ideas also shaped decision making. A prime example of repertoire in librarianship might be in the

⁷⁷ Schön, *The Reflective Practitioner*, 101.

⁷⁸ Rowe, *Design Thinking*.

⁷⁹ Schön, *The Reflective Practitioner*, 60.

⁸⁰ *Ibid*, 68.

⁸¹ Peter Lloyd and Dirk Snelders, “What was Philippe Starck thinking of?” *Design Studies* 24, no. 3 (2003).

⁸² An image of the lemon squeezer may be viewed at <http://www.powerhousemuseum.com/collection/database/?im=9354>.

work of reader's advisory, a service requiring librarians to supply reading recommendations to patrons.⁸³ There is not one authorized list librarians memorize and use to suggest reading materials. Rather, to perform this work, a librarian must draw on her own personal experience: every book she has read herself, as well as reviews of books she's read; recommendations and reports from other professionals, friends, and family; advertisements on television and magazines; and all manner of unpredictable sources. Her range of knowledge will differ from another librarian's, who may end up offering different suggestions based on his own repertoire. Greenberg and Buxton point out that repertoire is a crucial aspect that separates rigorous design evaluation from mere personal opinion, as designers draw on extensive repertoires to evaluate new artifacts.⁸⁴

2.3.2.3 Reflection

This idea that designers iteratively frame and reframe, making choices about each subsequent move based on previous moves and future "what if" moves demonstrates what Schön calls "reflection-in-action."⁸⁵ Many of us are familiar with reflection, or the idea that we look back on a completed project or past situation with serious thought and consideration, such as a reflective essay we might write for English class. There is also some evidence of reflection occurring in librarianship, such as in the Valuable Initiatives in Early Learning that Work Successfully (VIEWS2) project, which found that purposeful reflection is a key component in the continuous improvement of storytimes intended to increase literacy skills.⁸⁶ Designers, too, look back on projects in a reflective manner, often drawing on such reflection as an evaluation technique.

⁸³ Joyce Saricks, *Readers' Advisory Service in the Public Library*, 3rd ed. (Chicago: ALA, 2005), 1-13.

⁸⁴ Saul Greenberg and Bill Buxton, "Usability Evaluation Considered Harmful (Some of the Time)," *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems* (CHI 2008).

⁸⁵ Schön, *The Reflective Practitioner*, 66-75.

⁸⁶ "Storytimes Matter! Building early literacy in YOUR public libraries," VIEWS2 website, accessed October 27, 2015, <http://views2.ischool.uw.edu/welcome-directors/>

Reflection can help designers learn from their experiences, become more conscious about design activities and choices, and analyze what worked well vs. what did not.⁸⁷ This type of after-the-fact “reflection-on-action” is familiar to most people. It is arguably designers’ engagement in “reflection-in-action,” or the ongoing, continual reflection throughout the process of creation that is one of the major aspects distinguishing design from other epistemology. Design is often attributed to innate talent or intuition by people unfamiliar with design epistemologies, both people external to design processes as well as some designers themselves who are ignorant of ways to explain their knowledge. Numerous studies show that designers refer to relying on their personal discretion or intuition when making choices.⁸⁸ Tacit understanding of what is meant by “personal discretion” or “intuition” often contributes to the mystery perceived to surround the design process. But what is commonly attributed to intuition has been dissected and teased out by design scholars and researchers as a type of knowledge based in reflection-in-action.⁸⁹ Many scholars have identified creation and making as a fundamental element of design epistemology.⁹⁰ Reflection-in-action can only occur during creation: any subsequent reflection is, by nature, reflection-on-action. Therefore, the process of making is mandatory for reflection-in-action to exist, and therefore a key component of design epistemology.

⁸⁷ Isabelle Reyman and Dieter K. Hammer, “Structured Reflection for Improving Design Processes,” *Proceedings of the International Design Conference – Design 2002, Dubrovnik* (May 14-17, 2002), 888.

⁸⁸ Levin, “Decision-making in Urban Design”; Davies, “Psychological Enquiry.”

⁸⁹ Cross, *Design Thinking*.

⁹⁰ Steven Scrivener and Peter Chapman, “The Practical Implications of Applying a Theory of Practice Based Research: A Case Study,” *Proceedings of the Research into Practice Conference: Working Papers in Art and Design Vol. 3* (Hertfordshire: University of Hertfordshire, 2004); Maarit Mäkelä, “Knowing Through Making: The Role of the Artefact in Practice-led Research,” *Knowledge, Technology & Policy* 20, no. 3 (2007); Richard Sennett, *The Craftsman* (New Haven, CT: Yale University Press, 2008).

2.3.2.4 Use of representations

Throughout the process of creating an artifact to solve a problem, designers create what are called design representations. Such representations make take a variety of forms, depending on the discipline and context in which a designers is working, including notes, sketches, models, prototypes, etc. Regardless of format, these representations serve a variety of purposes throughout the design process. One of the most obvious uses is to serve as an informational record. Jones advocated recording and storing ideas, past solutions, requirements, etc., for later use.⁹¹ However, using design representations as “memory backups” or communicative vehicles is actually a limited and superficial view of how designers use representations.⁹² The representations used during the design process are not formal records, such as those that might be used to communicate finished work to the chairman of the board after a solution has been finalized. Process representations are a fast, spontaneous, transient process allowing designers to experiment with ideas on the fly without prematurely committing to one.⁹³ When working with a representation—unlike working with the actual product itself—no moves are irreversible.⁹⁴ When I draw a picture of a house, it is easy for me to erase and replace lines representing walls, floors and roofs. But during the actual construction of the house, it is difficult—if not impossible—to change the foundation after it has been laid or substitute one type of shingle for another without worrying that the roof may cave in, or how much more money the second set of shingles will cost (and this after I’ve already paid for the first ones). The flexibility and malleability of working with representations affords designers the ability to explore and

⁹¹ Jones, “Systematic Design.”

⁹² Eric Blanco, “Rough Drafts: Revealing and Mediating Design,” in *Everyday Engineering: An Ethnography of Design and Innovation*, ed. Dominique Vinck (Cambridge, MA: MIT Press, 2003), 177-202.

⁹³ Bill Buxton, *Sketching User Experiences: Getting the Design Right and the Right Design* (New York, NY: Morgan Kaufmann Publishers, 2007).

⁹⁴ Schön, *The Reflective Practitioner*, 76.

experiment with a variety of options. Olpe notes that drawing itself is a process that facilitates discoveries, mistakes, and successes.⁹⁵ It is through such exploration and experimentation that designers make progress toward solutions: the interaction of creating representations and reflecting on them constitutes knowledge through the clarification of ideas; discovery of new and alternative ideas; refinement of current ideas and provision of specific points to which designers can respond.⁹⁶ Thus representations like drawings are not created with graphical communicative output as their ultimate goal, but are used to foster knowledge in the form of criticism and discovery that helps designers understand the problem as much as it helps generate a solution.⁹⁷ Recent studies even show that creating more representations, especially concurrently and parallel to one another, can spur more divergent ideas and thus better design solutions.⁹⁸ Representations also play a role in the design process by supporting interactions among people. The design process is a social one, consisting of interaction and negotiations between and among various parties with differing sets of knowledge, experience, and awareness.⁹⁹ Representations can play a mediating role among these diverse parties and affect group dynamics as representations change according to idea evolution.¹⁰⁰

2.3.2.5 *Abductive reasoning*

Scientific epistemologies rely on conventional forms of inductive and deductive reasoning (analytical and evaluative activities that prove something *must* be or demonstrate that something

⁹⁵ Peter Olpe, *Drawing as Design Process* (Schule Für Gestaltung Basel: Verlag Niggli AG, 1997), 7.

⁹⁶ Davies, "Psychological Enquiry"; Greenberg and Buxton, "Usability Evaluation."

⁹⁷ Lawson, *Design in Mind*.

⁹⁸ Steven P. Dow and others, "Parallel prototyping leads to better design results, more divergence, and increased self-efficacy," *ACM Transactions on Human-Computer Interaction* 17, no. 4 (2010), Article 18.

⁹⁹ Dianne Murray, "An Ethnographic Study of Graphic Designers," in *Proceedings of the Third European Conference on Computer Supported Cooperative Work*, eds. G. de Michelis and C. Simone (Dordrecht: Kluwer, 1993); Louis Bucciarelli, *Designing Engineers* (Cambridge, MA: MIT Press, 1994).

¹⁰⁰ Blanco, "Rough Drafts."

is *actually* operative).¹⁰¹ But design relies on abductive reasoning (sometimes called “productive reasoning” because designers produce things, or “appositional reasoning” because designers propose apposite responses to problems). This kind of reasoning is not based in analysis or evaluation, but synthesis, or the suggestion that something *may* be possible.¹⁰² Gedenryd provides a comprehensive analysis from a cognitive science perspective of why induction and deduction are inappropriate reasoning methods in design, as they represent abstract thought alone, and thought alone cannot address the actual task of designing—creating an artifact.¹⁰³ This reinforces the idea of making as knowing, since it is only through the actual manifestation of making that we can discover whether something is really possible.¹⁰⁴ Scholars across all eras in systematic studies of design emphasize the idea of synthesis inherent in abductive reasoning. Lawson discusses the difference between scientists who tackle problems through analysis (that is, breaking a problem apart to understand its “rules” before proposing a solution) and designers who tackle problems through synthesis (that is, by discovering more about the problem by proposing solutions and discovering “acceptable” solutions).¹⁰⁵ Kolko details how designers use frames and constraints to shape synthesis and solutions.¹⁰⁶

2.3.3 Design evaluation methods

Such alternative approaches to knowledge generation naturally will not hold up to scrutiny and critical evaluation based in scientific epistemologies. Unlike science, which aims for predictable,

¹⁰¹ Lionel March, “The Logic of Design and the Question of Value,” in *The Architecture of Form* (Cambridge, UK: Cambridge University Press: 1976), 29.

¹⁰² Cross, *Design Thinking*, 27.

¹⁰³ Heinrik Gedenryd, “How Designers Work - Making Sense of Authentic Cognitive Activity,” (doctoral dissertation, Lund University, 1998).

¹⁰⁴ Scrivener and Chapman, “Practical Implications of Applying a Theory of Practice Based Research.”

¹⁰⁵ Lawson, *How Designers Think*, 30-32.

¹⁰⁶ Jon Kolko, “Abductive Thinking and Sensemaking: The Drivers of Design Synthesis,” *Design Issues* 26, no. 1, (Winter 2010).

consistent results, design specifically aims for deviations and variations.¹⁰⁷ Because what counts as legitimate knowledge in design is different, then so too must any evaluation methods be different. While science relies on specific epistemological constructs of evidence, design considers interpretation as a valid form of epistemological evidence.¹⁰⁸ Scientific evidence may be of assistance to designers by describing existing situations so as to inform frames, conditions, and constraints. But the purpose of design itself is not to describe the existing world in a factual or objective manner; rather it seeks to change situations and add meaning to them. Therefore, subjective interpretation is a valid form of evidence in design, manifesting through evaluative elements like rationale and expert critique.

Just because design evaluation is not objective in the traditional sense does not mean it is less valid or invalid. What may seem like arbitrary subjectivity to outsiders is actually evaluation based on an extensive repertoire of personal knowledge.¹⁰⁹ The lack of pre-established and explicitly defined criteria does not automatically mean that an evaluator's subjective opinion comes arbitrarily from thin air. Understanding of values and norms of evaluative criteria have built up over time, from a designer's first critique through all subsequent design evaluations and experiences. It is conformance to—not deviance from—these values that demonstrates and reifies an evaluator's authoritative role. Anyone who attempted to arbitrarily assess a design according to their own personal criteria would lose their community status as a reliable and expert evaluator. This idea of community-based affirmations of rigor and value are not limited to design: even the notion of objectivity in scientific epistemologies breaks down when viewed

¹⁰⁷ Wolfgang Jonas, "Exploring the swampy ground," in *Mapping Design Research: Positions and Perspectives* (Basel: Birkhäuser, 2012), 12.

¹⁰⁸ Nelson and Stolterman, *The Design Way*, 121-122.

¹⁰⁹ Adrian Snodgrass and Richard Coyne, *Interpretation in Architecture: Design as a Way of Thinking* (London: Routledge, 2006), 123.

from the perspective of social construction. Pinch and Bijker posit that “there is nothing epistemologically special about the nature of scientific knowledge: it is merely one in a whole series of knowledge cultures.”¹¹⁰ They reference “‘primitive’ tribes” and other indigenous ways of knowing,¹¹¹ but there is no reason that the epistemology of design is not also a different, yet legitimate, knowledge culture. At minimum, design evaluation should consist of a reflective critique by the design’s creators.¹¹² The following sections describe some additional examples of evaluative techniques in design epistemology, all of which are considered valid, rigorous criteria in any design school or firm, across a variety of design disciplines.¹¹³

2.3.3.1 Rationale

If design consists of a web of moves, with each move shaping the next, then the reason behind each choice becomes critically important. Design rationale, in the broadest sense, refers to the reasons and justifications for designing an artifact, the notation or documentation of justifications and reasons, and explanations of why an artifact is the way it is.¹¹⁴ In a casual application of design, these reasons may be tacit or unarticulated. However, capturing the artifacts created in design with the reasoning behind the decisions for creating them is critical in the idea of design rationale. Again to use a knowledge organization example, we might think of this as akin to warrant, or the justification and verification of decisions in the creation of classification systems.¹¹⁵ Although not specifically framed in the language of design, Beghtol specifically

¹¹⁰ Trevor J. Pinch and Wiebe E. Bijker, “The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other,” *Social Studies of Science* 14, no. 3 (1984), 401.

¹¹¹ Ibid, 402.

¹¹² Greenberg and Buxton, “Usability Evaluation,” 118.

¹¹³ Ibid.

¹¹⁴ Thomas P. Moran and John M. Carroll, “Overview of Design Rationale,” in *Design Rationale: Concepts, Techniques, and Use* (Mahwah, NJ: Lawrence Erlbaum Associates, 1996), 8-9.

¹¹⁵ Claire Beghtol, “Semantic Validity: Concepts of Warrant in Bibliographic Classification Systems,” *Library Resources and Technical Services* 30, no. 2 (April/June 1986), 110.

refers to warrant as the “semantic rationale” underlying a classification system.¹¹⁶ The congruency or divergence of articulated rationale with the artifact itself offers evaluative information. For example, classification systems can be evaluated on the basis of warrant: if justification for terms in a vocabulary is based on presence in the literature (known as “literary warrant”), but terms in the vocabulary are not found to be present in the literature, the disconnect between the stated rationale and the execution of the artifact offers evaluative insights as to the vocabulary’s success. In addition to merely evaluative uses, design rationale can also refer to a method of design wherein the reasons for the design are made explicit.¹¹⁷ Thus rationale becomes part of the knowledge-making process, contributing to greater theory, rather than just a technique for assessment.¹¹⁸

2.3.3.2 Critique

For those not embedded in design epistemologies, critique may call to mind scary memories of harsh, negative criticism, perhaps in front of a large peer group, like reading a poem aloud in a creative writing class only to have the instructor and classmates rip it to shreds. Such experiences are often the extent of knowledge about critique for non-designers. However, although some similarities exist (much of design education is conducted via classroom and studio critiques¹¹⁹), critique in design extends beyond simple criticism. Design critique serves as an epistemological process of knowledge formation.¹²⁰ This knowledge formation may be used to offer evaluative insight, where designers with large, well-developed repertoires (Eisner calls them

¹¹⁶ Ibid.

¹¹⁷ Moran and Carroll, “Overview of Design Rationale,” 8-9.

¹¹⁸ John M. Carroll and Mary Beth Rosson, “Design rationale as theory,” in *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science* (New York, NY: Morgan Kaufmann Publishers, 2003).

¹¹⁹ Marvin J. Malecha, *The Design Studio* (La Verne, CA: Architecture and Research Press, 1985).

¹²⁰ Eli Blevins and others, “Using Design Critique as Research to Link Sustainability and Interactive Technologies,” *Online Communities and Social Computing*, Lecture Notes in Computer Science vol. 4564 (Berlin: Springer, 2007).

“connoisseurs”¹²¹) are able to discern complex and subtle qualities and characteristics of a design and make fine-grained discriminations that others may not be able to express.¹²² Despite the apparent harshness of stereotypical perceptions of critique, the value inherent in negative commentary and feedback can be essential to furthering both artifact and knowledge. Kolko notes that well-executed critique is not simply subjective negativity: it systematically articulates a framework for evaluation and then compares the work against that framework in the form of an ongoing, interactive conversation.¹²³ Frameworks are often drawn for repertoires of experience, and may be based on a variety of aspects, such as rationale, or other criteria such as those described in the following section.

2.3.3.3 *Criteria-based evaluation*

Other criteria like novelty, innovation, and relevance to users may also be used for evaluative purposes, and may vary based on context.¹²⁴ For example, market adoption might be a viable criteria for commercial viability of a design, but the number of diverse solutions designed might be more applicable in other situations such as early brainstorming for new products. The consideration of context in design evaluation is critical, whereas scientific knowledge mechanisms purposefully try to detach from context with techniques like controlled laboratory conditions and identification and separation of confounding variables.

Because design creates artifacts to solve problems, the implication is that such artifacts did not previously exist. Therefore, one criteria used to assess design is novelty and innovation. Scholars

¹²¹ Elliot W. Eisner, *The Enlightened Eye: Qualitative Inquiry and the Enhancement of Educational Practice* (Upper Saddle River, NJ: Merrill, 1998), 63.

¹²² Nelson and Stolterman, *The Design Way*, 177.

¹²³ Jon Kolko, “Endless Nights—learning from design studio critique,” *Interactions* 18, no. 2 (March/April 2011), 80-81.

¹²⁴ Jody Forlizzi, John Zimmerman and Shelley Evenson, “Crafting a Place for Interaction Design Research in HCI,” *Design Issues* 24, no. 3 (2008), 27-28.

of design note that some level of originality must be present for something to be considered design.¹²⁵ Design focuses on initiating new and novel forms and aims for new phenomena.¹²⁶ If such innovation is an underlying objective, then it should certainly be a valid assessment criteria. However, novelty is not binary, but may be assessed along a spectrum. For instance, newness may be context dependent: a pre-existing idea implemented in a new setting may be considered novel. So many libraries now circulate non-traditional materials such as tools, musical instruments, and cake pans that the idea of circulating non-bibliographic materials may seem to lack novelty. But even though the Charles County (MD) and Great Bend (KS) libraries have all been circulating cake pans for a while,¹²⁷ the service could still be considered new if implemented at Seattle Public Library or King County Library, or another library not yet providing such services.

Because design hinges on creation, creativity and imagination plays an integral role. In addition to new solutions, design hinges on creativity, and therefore innovation can be an appropriate criteria for design assessment. Rather than just being new, designs should exhibit and communicate imagination.¹²⁸ I admit that discerning boundaries around what is imaginative or creative is difficult, if not impossible. However, there may be other indicators of assessment in this area, such as recognition from others. For example, the Los Angeles (CA) Public Library “Book Bike”—a custom built bicycle that can carry up to 200 pounds of books as well as internet-enabled technology that can sign citizens up for a library card on the spot—won the

¹²⁵ Luckman, “Management of Design.”

¹²⁶ March, “Logic of Design”; Jonas, “Exploring the Swampy Ground,” 12.

¹²⁷ Meredith Schwartz, “Let Them Lend Cake Pans,” *Library Journal* (June 14, 2012), accessed October 27, 2015, <http://lj.libraryjournal.com/2012/06/library-services/let-them-lend-cake-pans/>; “Kansas libraries let people check out cake pans,” *Topeka Capital-Journal* (August 26, 2012), accessed October 27, 2015, <http://cjonline.com/news/state/2012-08-26/kansas-libraries-let-people-check-out-cake-pans>

¹²⁸ Nelson and Stolterman, *The Design Way*, 127-138.

2015 Mayor's Civic Innovation Award for creating a new way of reaching city residents who previously did not partake of or participate in library services.¹²⁹

2.3.4 Summary

All of the elements of design epistemology discussed here—artifact creation; wicked problems; problem finding, framing and reframing; an emphasis on service; iteration; repertoire; reflection; use of representations; abductive reasoning; and alternative evaluation methods like rationale, critique, and criteria-based evaluation—are common threads that underscore a design epistemology. Design offers a unique epistemology, one based in the making of artifacts rather than the observation and measurement of the natural world. Instead, the design process is characterized by its constantly iterative nature, as well as a significant emphasis on problem finding rather than simply solution generation. The use of representations in the design process serves a different purpose than the traditional information record and communication mechanism in other disciplines; in the design process, representations are used to explore and experiment with ideas. An orientation toward service and a reliance on abductive reasoning also underscore a unique epistemological approach based in addressing complex wicked problems. This unique approach means that traditional methods of knowledge and assessment based in scientific epistemologies are inappropriate, and so evaluation of design knowledge is carried out through alternative means such as rationale, and critique, and alternative criteria like adoption, novelty, and innovation.

¹²⁹ “Librarian Connects 4,000 L.A. Residents to Books with Book Bike, Earns Sixth Mayor’s Civic Innovation Award,” accessed October 27, 2015, <http://www.lamayor.org/librarian-4k-la-books-bookbike-sixth-mayors-civic-innovation-award>

2.4 Where is the design in librarianship?

In addition to its use in traditional design fields like architecture and graphic design, design epistemology is specifically called out as underlying professional fields that include both theoretical and practical contributions, such as engineering, medicine, education, and yes, even librarianship.¹³⁰ These practice-based professions need practice-based epistemologies.¹³¹ Even the information systems discipline is increasingly recognizing design research and epistemology alongside social science.¹³² Buckland agrees that even information science (which in his view encompasses librarianship) is a “science of the artificial” focused on the creation and study of design objects that affect change.¹³³

Although I have referred to many examples of design in librarianship in the previous section, the profession itself does not seem to have acknowledged—much less embraced—a design perspective. A recent methodological analysis of library practitioner research does not even mention design,¹³⁴ and design is conspicuously absent from research methods books for librarians, even recent publications.¹³⁵ Even though librarianship has fostered the creation of innumerable innovative tools, the idea of design is explicitly conceptualized in specific, practical ways. Mentions of design are almost exclusively in the context of architecture/interiors design (see for example *American Libraries*’ annual “Library Design Showcase,” which only covers

¹³⁰ Simon, *Sciences of the Artificial*, 3rd ed., 112.

¹³¹ Chris Calvert-Minor, “The Inescapability of Theorizing Practices within Epistemology,” *Kritike* 6, no. 1 (2012).

¹³² Salvatore T. March and Veda C. Storey, “Design Science in the Information Systems Discipline: An Introduction to the Special Issue on Design Science Research,” *MIS Quarterly* 32, no. 4 (2008).

¹³³ Michael Buckland, “What kind of science can information science be?” *Journal of Information Science and Technology* 63, no. 1 (2012).

¹³⁴ Charles R. Hildreth and Selenay Aytac, “Recent Library Practitioner Research: A Methodological Analysis and Critique,” *Journal of Education for Library and Information Science* 48, no. 3 (2007).

¹³⁵ Lynn Silipigni Connaway and Ronald R. Powell, *Basic Research Methods for Librarians*, 5th ed. (Westport, CT: Libraries Unlimited, 2010); Susan E. Beck and Kate Manuel, *Practical Research Methods for Librarians and Information Professionals* (New York, NY: Neal-Schuman, 2008); Alison Jane Pickard, *Research Methods in Information*, 2nd ed. (Chicago, IL: Neal-Schuman, 2013).

innovative architecture or new and newly renovated libraries¹³⁶), graphic design (such as Librarian Design Share,¹³⁷ a website where librarians can share and trade flyers, handouts, signage, etc.) and technology (such as web design). Other, broader references to design, such as Buckland's *Redesigning Library Services: A Manifesto*,¹³⁸ discuss aspects of library services without ever drawing upon or discussing design epistemology.

Recent years have shown some evidence of the use of design methods and techniques in librarianship. An interest in what is popularly called “design thinking” (not to be confused with Cross’ “designerly ways of knowing”) has begun to emerge, evidenced in conference presentations¹³⁹ and toolkits.¹⁴⁰ The technique of participatory design, a form of design process that supports cooperation and collaboration between participants (such as potential users of a system) and designers, researchers, and developers,¹⁴¹ has recently been popular in librarianship. Grant-funded workshops from the Council on Library and Information Resources (CLIR) and subsequent publications¹⁴² focus on the method and technique of participatory design, but do not seem to broach the underlying epistemological assumptions that support and contribute to it. While the implementation of the techniques put forth by these advocates, such as thinking about patrons experiences first, can and have certainly helped libraries, they are still centered in ways

¹³⁶ Phil Morehart, “The 2014 Library Design Showcase,” *American Libraries* (September 3, 2014), accessed September 25, 2015, <http://americanlibrariesmagazine.org/2014/09/03/the-2014-library-design-showcase/>

¹³⁷ “Librarian Design Share: Inspiration for Library Creatives,” accessed September 25, 2015, <http://librariandesignshare.org/>

¹³⁸ Michael Buckland, *Redesigning Library Services: A Manifesto* (Chicago, IL: American Library Association, 1992).

¹³⁹ Stephen Bell, “2011 Conference Review: Design Thinking for Better Libraries: excerpt from presentation by Stephen Bell,” *Information Outlook* 15, no. 6 (2011).

¹⁴⁰ “Design Thinking for Libraries: A Toolkit for Patron-Centered Design,” accessed September 15, 2015, <http://designthinkingforlibraries.com/>

¹⁴¹ Douglas Schuler and Aki Namioka, *Participatory Design: Principles and Practices* (Hillsdale, NJ: L. Erlbaum Associates, 1993), xi.

¹⁴² Council on Library and Information Resources, *Participatory Design in Academic Libraries: Methods, Findings, and Implementations* (Washington, DC: Council on Library and Information Resources, 2012).

for working, not ways of thinking and knowing, and thus lack the underlying epistemological shift required to fully harness the power of design. This leaves libraries still beholden to evaluating and assessing tools and services created in one paradigm according to the criteria of another—an inevitably unsuccessful prospect. Using criteria based in traditional scientific epistemologies to assess library tools and services is like using a ruler to measure a two-liter bottle: it may tell you something, but it may not offer all of the relevant and useful information. Others in librarianship have embraced the empowerment of creation—but for library users, not the profession itself. The advent of makerspaces and other opportunities to foster creation in libraries certainly lends credence to the idea of knowledge via making. Resources like the *Let's Make Guide* from the Gates Foundation¹⁴³ emphasize the value of making in libraries, but they are couched in the context of the value of making by users, not librarians. Lankes emphasizes this transition, advising that the future of libraries rests in the shift from passive information consumption to active information creation.¹⁴⁴ However, the focus in all of these endeavors is on library users (i.e., patrons) as creators—there is no acknowledgement, much less encouragement, for librarians to reconceptualize themselves as creators and their field as one of design. Other innovative efforts to reconceptualize the library blatantly ignore design, even as they describe its very nature: Schnapp and Battles specifically call out for “a way of talking about what libraries are” and refer to Dewey as a “gadget creator.” They use metaphors of creation (like cooking) and references from design (like Alexander’s pattern language) to describe libraries, but somehow never make the connection to frame these discussions in epistemology of design.¹⁴⁵ Perhaps “the

¹⁴³ “Let’s Make Guide,” accessed September 25, 2015, <http://letsmakeguide.com>

¹⁴⁴ R. David Lankes, *The Atlas of New Librarianship* (Cambridge, MA: MIT Press, 2011).

¹⁴⁵ Jeffrey Schnapp and Matthew Battles, *The Library Beyond the Book* (MetaLABprojects, 2014), 123.

way of talking about what libraries are” is not as absent as Schnapp and Battles think: perhaps it already exists in the world of design.

Chapter 3 Approach and Activities

3.1 General approach

In this study, I argue that design is systemic in the entire scope of the library profession, and therefore design epistemology is a useful and appropriate lens through which to view, investigate, and understand American librarianship. I have previously shown that elements of design epistemology are present throughout the work of the library profession; however, librarianship does not see itself nor is it perceived by outsiders as a design profession. In this study, I more closely examine the role and nature of design epistemology in American librarianship to better understand this disconnect and advocate for change. To construct and support this argument, this work examines the role of design in American librarianship through the investigation of the following research questions:

1. In what ways does design epistemology manifest in American librarianship?
2. What is uniquely revealed about librarianship when examining the discipline from a design standpoint?
3. What are the implications of reconsidering librarianship from a design standpoint, and how might these implications be explicitly made manifest?

Because research is about the creation of new knowledge, it too depends on design. In designing this investigation, I do not limit myself to any one single normative methodological approach. Rather, I propose a combination of research techniques that, in my opinion, best allow me to fully answer my research questions. Therefore, this research employs close critical analysis of examples of design artifacts from American librarianship and their relevant contexts to

understand the role of design in the profession and argue for its consideration as an epistemological foundation for the profession.

Although I may refer to these examples as “cases,” I use this term in the loosest sense. They are not case studies in the traditional social science definition, although they do share some characteristics, such as depth of investigation,¹ capacity for addressing complexity,² and consideration of context.³ Instead, I draw on a more humanistic approach, often referred to as critical inquiry or close reading, to analyze the artifacts and contexts in these examples for indications of evidence or absence of design epistemology and themes. The term “critical” as it appears in research literature may have two common meanings. It is often used to describe a case of significant or strategic importance, such as the “critical incident technique.”⁴ Or it may be used to describe studies that reflect on current practices, question taken-for-granted assumptions, and critique the status quo.⁵ In this study, I draw on the second meaning. Rather than simply offering description and understanding, the main task of critical research is to challenge prevailing paradigms and offer suggestions and recommendations for change.⁶ Therefore, this research seeks not only to understand librarianship from a design perspective, but it takes an explicitly activist perspective to advocate for reconceptualizing the field as a design-based field.

¹ Charles H. Busha and Stephen P. Harter, *Research Methods in Librarianship: Techniques and Interpretation* (New York, NY: Academic Press, 1980); Sharan B. Merriam, *Case Study Research in Education: A Qualitative Approach, 1st ed.*, (San Francisco, CA: Jossey-Bass, 1988).

² Helen Simons, “The Paradox of Case Study,” *Cambridge Journal of Education* 26, no. 2 (1996).

³ Robert K. Yin, *Case Study Research: Design and Methods, 4th ed.*, (Los Angeles, CA: Sage Publications, 2009).

⁴ John C. Flanagan, “The Critical Incident Technique,” *Psychological Bulletin* 51, no. 4 (1954).

⁵ Michael D. Myers, *Qualitative Research in Business and Management, 2nd ed.* (Los Angeles, CA: Sage Publications, 2013), 43.

⁶ Ibid.

Such critical approaches have been used in material culture studies and studies of technology, where artifacts may be “read” as texts,⁷ or even analyzed from a design perspective⁸ (see for example Plotnick’s article examining the case of electric push buttons in the years between 1880 and 1923⁹ or Robertson’s case analyzing the design of the American passport¹⁰). Scholars such as Petroski have explored the design of artifacts like bookshelves, pencils, eyeglasses, and other objects through historic examples that incorporate the interplay of social and technical factors.¹¹ Studies of design history draw on the similar technique of script analysis to demonstrate what an artifact reveals about itself through a physical script (its design, including its form, material properties, affordances, etc.¹²) as well as a sociotechnical script (messages conveyed via surrounding contextual materials, such as marketing, brand identity, etc.¹³). Related to librarianship, scholars like Bowker & Star and Feinberg use critical approaches to understand how the design, creation, and implementation of standards like classification systems and controlled vocabularies shape domains like professional fields and communicate values.¹⁴

In this study, I propose to closely analyze examples of tool and service creation in American librarianship in a similar manner to the above mentioned examples to better understand the nature of design epistemology in the profession. Based on my earlier review of the literature, I

⁷ Keith Grint and Steve Woolgar, *The Machine at Work: Technology, Work, and Organization* (Cambridge, UK: Polity Press, 1997).

⁸ Ian Hutchby, “Technologies, Texts, and Affordances,” *Sociology* 35, no. 2 (2001).

⁹ Rachel Plotnick, “At the Interface: The Case of the Electric Push Button, 1880–1923,” *Technology and Culture*, 53, no. 4 (2012).

¹⁰ Craig Robertson, *The Passport in America: The History of a Document* (Oxford, UK: Oxford University Press, 2012).

¹¹ Henry Petroski, *The Book on the Bookshelf* (New York: Knopf, 1999); Henry Petroski, *The Pencil: A History of Design and Circumstance* (New York: Knopf, 1990); Henry Petroski, “The Evolution of Eyeglasses,” *American Scientist* 101, no. 5 (2013); Henry Petroski, *The Evolution of Useful Things* (New York: Knopf, 1993).

¹² Madeline Akrich, “Comment décrire les objets techniques?” *Techniques et Culture* 9 (1987).

¹³ Kjetil Fallan, *Design History: Understanding Theory and Method* (London, UK: Berg, 2010).

¹⁴ Geoffrey Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, MA: MIT Press, 2000); Melanie Feinberg, “Classification as Communication: Properties and Design,” (doctoral dissertation, University of Washington, 2008).

have identified the following elements of design epistemology to look for in each case (Table 3.1):

Table 3.1 Elements of design epistemology discussed in this research.

| | | |
|---------------------------------|--|--------------------------------------|
| Elements of design epistemology | Creation of problem solutions | Artifacts |
| | | Wicked problems |
| | | Problem finding, framing & reframing |
| | | Emphasis on service |
| | Generation of knowledge through making | Iteration |
| | | Repertoire |
| | | Reflection |
| | | Use of representations |
| | | Abductive reasoning |
| | Design evaluation methods | Rationale |
| | | Critique |
| | | Criteria-based evaluation |

Close examination of artifacts and surrounding contextual materials looking specifically for these elements will not only demonstrate that this type of design analysis is possible and appropriate in librarianship, but also allow the use of the findings to further the understanding of how design epistemology is present or absent in librarianship. Discussion of and reflection on the analysis that arises will address the critical perspective, specifically by suggesting recommendations alternative to the contemporary status quo of research, teaching, and practice in the field.

3.2 Description and justification for selection of examples

Because this research examines the role of design in librarianship, it makes sense to study instances of designs themselves, as well as their creation, reception, and other surrounding contexts. Therefore, each example case in this study reflects the story of an artifact—a tool or service created for the purpose of library service. Artifacts are common objects of study in art,

material culture and design research. Common lines of inquiry around artifacts investigate the lifecycle of the artifact or its use and meaning in a cultural context.¹⁵ This research uses both of these approaches by investigating in each case the artifact itself, its design process (i.e., the creation of the design), as well as any reception or interpretation in the cultural context of the library profession. This process-oriented analysis examines both the artifacts and their surrounding contexts over time to gain a more thorough and holistic understanding.

I have previously argued that American librarianship is rife with design artifacts. Although it would be ideal to examine all of these examples in depth, every study must have some boundaries, if only for practical reasons of time and resource limitations. Therefore, I will select three prominent examples to investigate in depth. Criteria used to select examples include the following:

- Close ties to librarianship. All examples should be created in the context of American libraries, for use in those organizations, ideally by librarians.
- Illustrative power. Examples with greater ability to clearly and reliably demonstrate aspects of design under consideration will be selected to illustrate and argue points.
- Historical and topical breadth. Examples will be chosen to cover a broad range of time within American librarianship and diverse projects and focus within the profession (e.g., reference, technical services, etc.).
- Formativeness and significance. Examples should consist of noteworthy projects that demonstrate influence, possibly via reception or longevity.

¹⁵ Maggi Savin-Baden and Claire Howell Major, *Qualitative Research: The Essential Guide to Theory and Practice* (New York, NY: Routledge, 2013).

- Availability of source materials. While more of a practical limitation than an intellectual concern, evidence can only be drawn from examples with existing documentation and source materials, which may include the artifact itself, supplementary documentation, sources such as design sketches and prototypes, personal records, correspondence, official corporate records, reports, publications, etc., depending on the specific artifact under examination and its historical and organizational context. Personal sources may also be consulted where relevant, prompting the use of interviews with people who participated in an artifact's creation.

Based on the criteria outlined above, the following examples have been selected for close analysis:

- *Poole's Index to Periodical Literature* (est. 1848)
- The Washington County (MD) Free Library book-wagon (est. 1909)
- The eXtensible Catalog (XC) project (est. 2006)

3.2.1 Poole's Index to Periodical Literature

Commonly referred to simply as "Poole's Index," this case covers the development of *Poole's Index to Periodical Literature*, the first American library tool created to provide subject access to articles within periodicals. When we think of Poole's Index today, we often think of the massive multi-volume work encompassing an entire shelf in the library stacks. However, the Index got its start as a small manuscript created for the library of the Brothers in Unity Society, a debating club at Yale University. While a student at Yale, Poole joined the Society and found a position in the library as assistant librarian. In late 1847 or early 1848, Poole created a handwritten manuscript subject index to all the periodicals held in the Society library. The manuscript was so

useful that the Society voted to print, publish and sell the work.¹⁶ *An Alphabetical Index to Subjects, Treated in the Reviews, and Other Periodicals, to Which No Indexes Have Been Published* was published by G.P. Putnam & Sons in June 1848, and orders exceeded expectations.¹⁷ Poole immediately went to work on a subsequent edition of the Index during his final year at Yale, since at least one publisher had shown interest in a new version.¹⁸ This second edition, this time simply titled *An Index to Periodical Literature*, was published in October 1853 by Charles B. Norton. By the time it was published, Poole was working as assistant librarian at the Boston Mercantile Society library.

Despite the popularity and perceived usefulness of the Index, nearly thirty years passed before a new edition was published. In December 1882, a third edition was published as *Poole's Index to Periodical Literature* by James R. Osgood and Company. Although Poole is credited as the author, this edition was a collaborative endeavor headed by Poole with the assistance of William I. Fletcher and the cooperation of the American Library Association and the Library Association of the United Kingdom. In addition to publishing this third edition of the Index, the cooperative plan also included the publication of regular supplementary works at five year intervals covering periodical volumes appearing after the publication of the third edition. The first of these, *Poole's Index to Periodical Literature: The First Supplement, from January 1, 1882 to January 1, 1887*, again headed by Poole with the assistance of Fletcher, was published by Houghton Mifflin & Company in October 1888. By 1889, the third edition of the Index was nearly sold out, and plans

¹⁶ Manuscript records of Brothers in Unity (April 18, 1848), quoted in Anson Phelps Stokes, *Memorials of Eminent Yale Men: A Biographical Study of Student Life and University Influences During the Eighteenth and Nineteenth Centuries* (New Haven, CT: Yale University Press, 1914), 294.

¹⁷ William Frederick Poole, *An Alphabetical Index to Subjects Treated in the Reviews and Other Periodicals to Which No Indexes Have Been Published* (New York, NY: G.P. Putnam, 1848), iv.

¹⁸ Manuscript records of Brothers in Unity (May 31, 1848), quoted in William Landram Williamson's unpublished research notes, Box 1, Folder 6, W.L. Williamson - William F. Poole Research Papers, The Newberry Library, Chicago.

were set in motion to reprint copies of it.¹⁹ Legal disputes over copyright privileges slowed this plan, but eventually in 1893 a reprint of the 1882 edition was published by Houghton Mifflin & Company, this time in a two-part set with Part I covering subjects A-J and Part II covering subjects K-Z. With this reprint, which matched the first Supplement in publisher and style, the works were relabeled for consistency: the third edition would now be called “Volume 1” (comprised of Parts I and II); the first Supplement would henceforth be called “Volume 2,” and subsequent Supplements would be named accordingly.²⁰

In August 1892, during the preparation of the second Supplement, Poole withdrew his involvement in the project, although he continued to allow the use of his name and affiliation.²¹ Therefore, authorship of *Poole's Index to Periodical Literature, The Second Supplement from Jan. 1, 1887, to Jan. 1, 1892*, published in 1893 by Houghton Mifflin & Company, is attributed to Fletcher with the cooperation of the library associations. One year later, in 1894, Poole passed away. *Poole's Index to Periodical Literature, Third Supplement from Jan. 1, 1892 to Dec. 31, 1896* by William I. Fletcher and Franklin O. Poole (Poole's nephew) with the cooperation of the American Library Association was published in 1897; *Poole's Index to Periodical Literature, Fourth Supplement from January 1, 1897, to January 1, 1902*, by William I. Fletcher and Mary Poole (Poole's daughter) with the cooperation of the American Library Association in 1903; and *Poole's Index to Periodical Literature, Fifth Supplement, from January 1, 1902, to January 1, 1907*, by William I. Fletcher and Mary Poole with the cooperation of many librarians in 1908; all published by Houghton Mifflin. Fletcher and Mary Poole also published an abridged version of

¹⁹ Letter, Houghton Mifflin and Company to W.F. Poole (August 23, 1889), Box 11, Folder 826, Newberry Library Archives, The Newberry Library, Chicago.

²⁰ Letter, Houghton, Mifflin & Company to W. F. Poole (January 2, 1891), Box 11, Folder 826, Newberry Library Archives.

²¹ Memorandum of Agreement between William F. Poole, William I. Fletcher, and Houghton, Mifflin, & Co., 31 August 1892, Box 11, Folder 826, Newberry Library Archives.

the Index in 1901 and supplements to the abridged version were printed annually until 1905. The set of Poole's Index (the third edition in two volumes plus the five supplements) was reprinted by Peter Smith (Glouster, MA; known for reprinting hard-to find books for libraries²²) in 1938, 1958, and again in 1963. In 1998, Paratext LLC released a digitized, searchable version of Poole's Index called "Poole's Plus," which later incorporated additional resources and is now called "19th Century Masterfile."²³

Implementation of indexing techniques developed for the first manuscript version at Yale and used in subsequent editions, the coverage and scope ambitions of the 1853 edition, and the new cooperative modeling of outsourcing work among libraries implemented in the 1882 edition make the Index an example worth investigating. Poole's Index is also representative of librarianship because it was created in the context of libraries. Not only did it seek to solve a reference issue specifically of interest to libraries, it was created by a librarian and originally based not on all existing published periodicals, but on those held by the library for which it was created. The Index is also a critical case: Poole's Index was a formative, significant work that a) provided the first means of access to periodical content in American libraries; b) influenced how and in what ways libraries index periodicals; and c) is still in use today in the form of 19th Century Masterfile from Paratext LLC. Poole's Index "inaugurated a bibliographical form which became one of the basic cornerstones of library service in the United States."²⁴ Finally, Poole's Index makes an appropriate case because there is much that can be learned from the existing historical data. The Newberry Library in Chicago holds 13 linear feet of primary source

²² "Peter Smith, 85, a Publisher Of Hard-to-Find Books, Dies," *New York Times* (July 29, 1982), accessed September 22, 2015, <http://www.nytimes.com/1982/07/29/obituaries/peter-smith-85-a-publisher-of-hard-to-find-books-dies.html>

²³ Eric M. Calaluca, e-mail message to author (September 25, 2015).

²⁴ William Landram Williamson, *William Frederick Poole and the Modern Library Movement* (New York, NY: Columbia University Press, 1963), 11.

materials from William Frederick Poole, including drafts, personal notes, and correspondence with publishers and participating libraries. Additionally, the Newberry Library also holds the papers of Poole's two biographers and their notes, as well as other archival sources covering reception of and commentary on the Index by the contemporary American library community.

3.2.2 The Washington County (MD) Free Library book wagon

Bookmobiles may seem ubiquitous and commonplace in today's libraries, but prior to the 20th century, such a concept did not yet exist in American librarianship. This case covers what is now generally considered to be the first bookmobile program in the United States: the development of the traveling book-wagon of the Washington County Free Library (WCFL) in Maryland. At the turn of the 20th century, Washington County, a region approximately 75 miles northwest of Baltimore, was experiencing a period of growth and prosperity. The convergence of railroads and the development of local industry influenced the rapid growth of the county. The city of Hagerstown, the county seat, increasingly acted as a hub for the local farmers and other citizens in the rural areas surrounding the town. In 1900, the population of Washington County numbered almost 50,000 people, with almost 50% living in Hagerstown and the others distributed throughout the county (an area of approximately 450 square miles).²⁵

²⁵ American Library Association, *Book Wagons: The County Library with the Rural Delivery* (Chicago, IL: American Library Association, 1922).

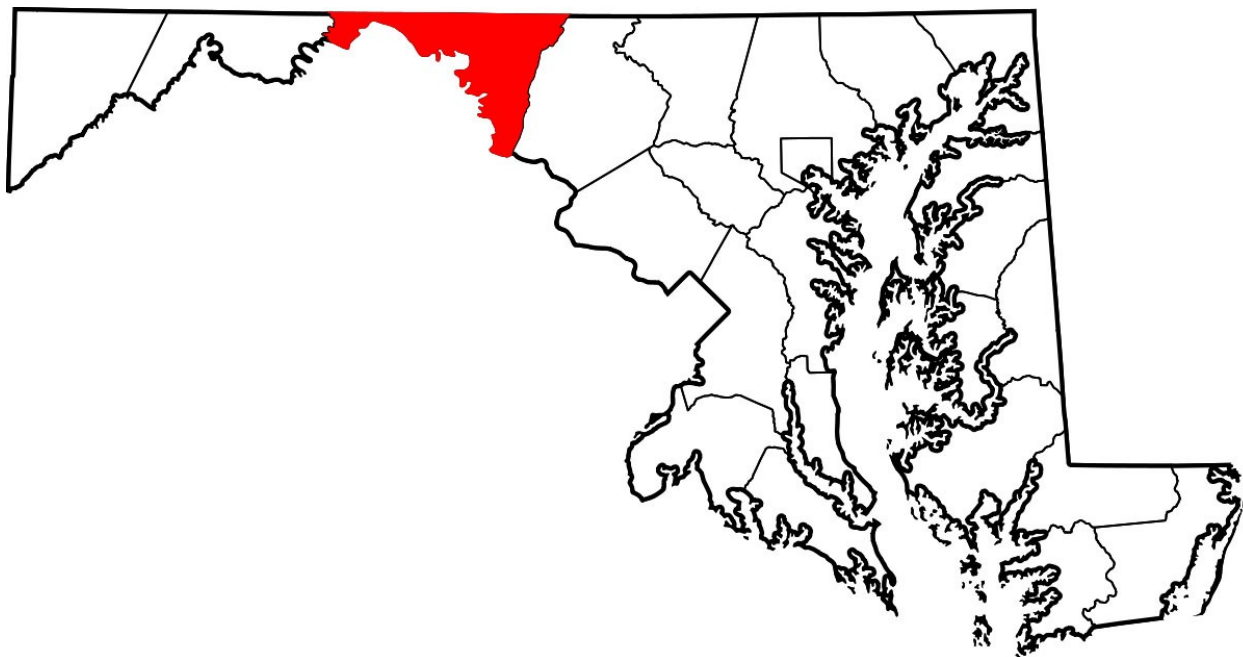


Figure 3-1. Map of Maryland highlighting Washington County. Created by David Benbennick, Wikimedia Commons, https://commons.wikimedia.org/wiki/File:Map_of_Maryland_highlighting_Washington_County.svg

Inspired by the “Thursday Club of Hagerstown,” a local literary society,²⁶ two wealthy men, Edward Mealey and Benjamin Newcomer, concerned with a lack of high culture they felt necessary for the up-and-coming town, decided that a public library was just the thing to help bridge the perceived cultural void.²⁷ Together they pledged money and land for a free public library. But because the main unit of government in Maryland is at the county level, this library was specifically intended to serve the dual demographics of the area: the citizens of the town and the rural residents in the surrounding county, “the latter, being in my judgement a most important feature of the work, as there is no class of the community to be more benefited [sic] than farmers’ sons and daughters during long winter evenings by a supply of useful reading matter.”²⁸

²⁶ Draft of speech, Simms Jamieson (1965), Mary Lemist Titcomb Vertical File, Western Maryland Room, Washington County Free Library, 1.

²⁷ Deanna Marcum, “The Rural Public Library: Hagerstown, Maryland, 1878-1920,” (doctoral dissertation, University of Maryland, 1991), 7.

²⁸ Letter, Benjamin Newcomer to Edward Mealey (1897), quoted in Mary Lemist Titcomb, “Story of the Washington County Free Library,” in *The Washington County Free Library 1901-1951* (Hagerstown, MD, Washington County Free Library: October 4, 1951), 5.

From the outset, the entirety of the Washington County Free Library and all of its collections, tools, and services, was intended to serve not only the citizens of Hagerstown, but residents throughout the county, including far-flung rural areas. Hired in 1901 as the inaugural WCFL librarian, Mary Lemist Titcomb, a 44-year-old librarian from New England, was tasked with serving these dichotomous sets of patrons. She attempted to address this issue through the implementation of a system of book deposit stations strategically placed throughout the county in places easily accessible to rural dwellers like local post offices, general stores, tollgates, and even private homes.²⁹ The success of these deposit stations—which were serviced through the exchange of books brought by wagon every 60-90 days—quickly evolved into more frequent and direct delivery of books.

Although Titcomb did not invent the idea of “travelling libraries,” what sets this case apart is the creation of a comprehensive, systematic plan for delivering books to remote locations as well as the influential impact of the project on both libraries and other organizations in the United States and around the world.³⁰ In addition to its embeddedness in librarianship and evidence of influential impact, abundant records regarding the development and deployment of the WCFL book wagon are held by the Western Maryland Regional Library, including annual reports from the years of book wagon service and scrapbooks containing letters, press clippings, and other correspondence regarding Titcomb.

²⁹ Mary L. Titcomb, “‘A County Library’ and ‘On the Trail of the Book Wagon’: two papers read at the meeting of the American Library Association at Breton Woods, White Mountains, New Hampshire, June 1909,” (Hagerstown, MD: Herald Publishing Company, 1909), 4.

³⁰ Deanna B. Marcum, *Good Books in a Country Home: The Public Library as Cultural Force in Hagerstown, Maryland, 1878-1920* (Westport, CT: Greenwood Press, 1994), 101; Jill Craig, “The Book Goes to the Man: The First Bookmobile,” *Catoctin History* 10 (Spring/Summer 2008), 12-21.

3.2.3 The eXtensible Catalog (XC)

This case investigates the design and development of the eXtensible Catalog (XC), open-source software intended to connect library users with resources in a more user-friendly way.³¹ XC is not a catalog in the traditional sense of library catalogs. XC is a suite of software tools that transform, synchronize, and afford the display of library metadata representing multiple resource formats and collections of library resources, ostensibly in a way that is more usable by librarians and patrons in modern academic and research libraries. While this may seem old hat when viewed in the context of contemporary systems for searching and accessing library materials, at the time of XC's development in the early 21st century, systems that supported robust library metadata informed by new standards and models and provided more user-friendly interfaces were still relatively new and not yet ubiquitous in library systems, even those from commercial vendors.³²

The eXtensible Catalog consists of the following four software products:

- The XC OAI Toolkit, which synchronizes MARC metadata within a library's integrated library system (ILS) to ensure it remains current with other instances of metadata in other systems
- The XC NCIP Toolkit, which provides the capability to display circulation status and data and synchronize with the data in the ILS

³¹ Nancy Fried Foster and others, "Introduction," in *Scholarly Practice, Participatory Design and the eXtensible Catalog* (Chicago, IL: Association of College and Research Libraries, 2011).

³² See for example the difference between the current technology trends in Marshall Breeding's "Automation Marketplace 2002," *Library Journal* 127, no. 6 (April 1, 2002) and "Automation Marketplace 2003," *Library Journal* 128 no. 6 (April 1, 2003).

- The XC Metadata Services Toolkit, which aggregates, normalizes, and transforms metadata from various sources and of varying quality into a standardized schema that enables interface interactions like faceted browsing and resource relationships
- The XC Drupal Toolkit, which supplies a customizable, feature-rich end-user library interface

These products may be used together to create new interactions with library resources, or they may be used individually or in smaller combinations to provide varying levels of function according to a particular organization's need.

Like the previous cases, XC is representative of librarianship because it was created by libraries, for libraries. XC seeks to solve specific library problems involving unification and display of resources for end users, as well as offering tools to librarians to enable and manage these improved user experiences. It also represents the user-centered turn that became increasingly prominent in the 21st century, as opposed to previous notions that focused on internal efficiency that would eventually benefit users down the line.³³ Additionally, this case is critical, as it is a rare example of a self-identified design project in librarianship that is not architectural (i.e., buildings or furniture). XC explicitly describes itself as design:

“The University of Rochester libraries have long followed a user-centered design process for improving existing systems, adding new features, and dreaming up new tools...we were not simply conducting a study; we were conducting a participatory, collaborative process of co-creation. We were designing and developing XC—a software suite for

³³ Christine L. Borgman, “From Acting Locally to Thinking Globally: A Brief History for Library Automation,” *The Library Quarterly* 67, no. 3 (1997).

harnessing the power of library metadata to search simultaneously across multiple silos and present unified results in more useable ways...”³⁴

Additionally, the recent nature of the project contributes diversity to the time frames covered in this study, and also means that the software is still available and functional for review and analysis, and documentation has not yet become unavailable. Project participants are still available for consultation via interviews (see the Appendix for sample interview questions).

3.3 Project activities and expected outcomes

Unlike a traditional scientific study, where analysis of data leads to a singular set of generalizable findings, the goal of this research is to offer a unique interpretation to help further understanding. When I argue that design is an appropriate lens through which to view American librarianship, I do not intend to imply that it is the singular correct way to understand librarianship. In the tradition of more humanistic inquiry, I offer one possible interpretation—that of librarianship as a design epistemology—and I rely on credible sources of evidence to justify my interpretation. As such, the expected outcome is not a definitive conclusion, but a reliable and legitimate interpretation, meaning that that sources of data drawn on in the study are trustworthy and dependable, and that I as the researcher demonstrate sufficient insight regarding the data.³⁵ Unlike traditional scientific research that aims to generate predictive theories and prove hypotheses, this line of research need not rule out other competing interpretations to demonstrate the validity of this one. Rather, this research relies on two factors for assessing outcomes: 1) that the interpretation is novel (that is, it has not been put forth previously), and 2) that the interpretation is possible and legitimate because of its basis in trustworthy and credible

³⁴ Foster and others, “Introduction,” vi-vii.

³⁵ Pickard, *Research Methods*, 175-176.

sources of evidence. The former point is demonstrated in the review of literature and research in the field. The latter point is demonstrated through triangulation of evidence from multiple sources, careful authentication of source materials through provenance, and continued documentation of such provenance so lines of evidence can always be traced.³⁶ I implement these aspects of rigor by consulting as many primary and secondary sources as possible for each case, verifying the provenance of those sources, and carefully documenting and referencing them. To ensure sources are explicitly documented in my own work, I use Chicago Manual of Style footnotes, which are appropriate when “immediate knowledge of the sources is essential to readers.”³⁷ This style of reference also more clearly represents both the citation and provenance of archival, manuscript, and other documentary sources drawn upon in this work. Such attention to reliability of evidence is key to composing a thorough and persuasive argument.

To demonstrate and communicate my interpretation of American librarianship as a design field, I rely on descriptive narrative relating the identified elements of design epistemology to artifacts, processes, actions, and other occurrences in each case. Subsequent to the descriptive narratives, I synthesize the understandings drawn from my analysis by reflecting on the cases, both individually and holistically, and how the ways in which they do (or do not) represent design epistemology impact librarianship, especially how it is conceptualized today and how it might be in the future. Finally, I conclude with a list of suggested recommendations for integrating design epistemology into library research, education and practice, and proposed ideas for future work in

³⁶ Busha and Harter, *Research Methods in Librarianship*, 99; Barbara M. Wildemuth, “Existing Documents and Artifacts as Data,” in *Applications of Social Research Methods to Questions in Information and Library Science*, (Westport, CT: Libraries Unlimited, 2009): 158-165; Pickard, *Research Methods*, 173.

³⁷ *Chicago Manual of Style*, 15th ed., s.v. “16.21 Footnotes: virtues,” 599.

this area, thus advancing my normative standpoint for moving the field forward by reconceptualizing it as a design discipline.

Chapter 4 Elements of Design Epistemology in American Librarianship

4.1 Introduction

This chapter discusses the ways in which elements of design epistemology identified and defined in previous chapters manifest in the three cases under critical analysis in this study: Poole's Index to Periodical Literature, the Washington County (MD) Free Library (WCFL) book wagon, and the eXtensible Catalog (XC) project. The presence and nature of elements of design epistemology previously identified and defined in Chapter 2 (see Table 2.1) will be discussed in the context of each case with examples drawn from across the cases where relevant and applicable.

4.2 Creation of problem solutions

4.2.1 Artifacts

As mentioned in Chapter 3.2, each example case in this study reflects the story of an artifact—a tool or service created for the purpose of library service. The first artifact is Poole's Index, although the artifact of the Index is represented by multiple editions, printings, and other variations. In this case the artifact is not necessarily solely the physical object, such as the set of books that instantiates the Index, but rather the intangible conceptual artifact that is the Index. We might be able to think of this in terms of the FRBR work level – an intellectual creation that subsequently becomes instantiated in various editions, manifestations, and items.¹ But, as previously noted in the discussion of artifacts, physical materiality is not a requirement to be considered a design artifact.

¹ For more information on the FRBR model, see for example Barbara Tillett, *What is FRBR? A Conceptual Model for the Bibliographic Universe* (Library of Congress Cataloging Distribution Service, 2004), accessed June 3, 2016, <https://www.loc.gov/cds/downloads/FRBR.PDF>

Unlike the abstract work of Poole's index, the WCFL book wagon itself is a physical artifact. Yet in addition to being a physical artifact, the book wagon service is also an intangible intellectual construct of procedures, schedules and routes. Thus, like Poole's index, it is an intangible conceptual service design instantiated through physical media like wood, metal, and wheels.

Artifacts in the XC project are also intangible conceptual artifacts, in that they represent a service for transforming and displaying metadata and other library bibliographic information. However, unlike the previous two cases, XC artifacts are instantiated in digital form. Although digital forms seem intangible in that we as humans cannot directly touch the electronic bits and bytes, digital objects are also physical objects. Digital media have physical materialities, such as the physical infrastructure that enables them to be viewed and manipulated.² Thus even digital artifacts can in a way be considered as physical artifacts.

4.2.2 Wicked problems

Each of the design artifacts in the three cases under review reveal clear evidence of attempts to solve what is known as a "wicked problem"—a large social problem that is highly complex and interconnected. Wicked problems have no right or wrong solutions, only better or worse ones. Every solution changes the problem, and every solution is a symptom of another problem, therefore, wicked problems have no stopping rule.³

² Paul Dourish and Melissa Mazmanian. "Media as Material: Information Representations as Material Foundations for Organizational Practice," *Third International Symposium on Process Organization Studies* (Corfu, Greece: 2011).

³ Horst W.J. Rittel and Marvin M. Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4, no. 2 (1973).

Poole's Index set out to solve an important problem of information access: how to find and access articles within periodicals by subject.

“Although we have every General index that has been issued by the publishers of the several Reviews and Magazines, yet several hundred volumes of Standard Periodicals in our library, are comparatively useless, as works of reference, from the want of proper Indexes. Nearly all of these have been issued within the last twenty years, and contain the most elaborate discussions of those questions that have interested the literary and political world, during that period. The object of this work is, to bring within the reach of the general reader, the contents of these volumes.”⁴

The informational content within periodical articles—very current and useful information—was inaccessible, unless you already knew in which periodical to look. This is a complex problem, interconnected with other aspects of the time. One major complexity affecting access to periodical information was the rise in popularity of periodical publications in the first half of the 19th century.⁵ Periodicals were a relatively new format for disseminating information. Unlike books and pamphlets of the time, which usually focused on one topic and were published in one self-contained volume, periodicals covered a vast variety of subjects within a single volume, and printed ongoing volumes. Because they were printed so frequently, periodicals also offered insights into very contemporary thoughts and scholarship. Periodicals were also more accessible to everyday society, while books were more often limited to the literary elite, and so periodicals could reach (and influence) a much larger and more diverse group of readers.⁶ The growth and

⁴ William Frederick Poole, *An Alphabetical Index to Subjects Treated in the Reviews and Other Periodicals to Which No Indexes Have Been Published* (New York, NY: G.P. Putnam, 1848), iii.

⁵ John C. Hepler, *Muted Voices from the Past*, ACRL monograph no. 19, (Chicago, IL: Association of College and Research Libraries, 1957): 55-61.

⁶ “The Utility of the Periodical Press,” *Yale Literary Magazine* 13 (July 1848).

influence of periodicals is highly interconnected with the problem of providing intellectual access to them.

Some periodical titles did offer access to intellectual content within their own volumes by printing regular indexes for specific titles. However, there was no tool that provided intellectual access across multiple periodical titles. The 1848 edition of the Index was Poole's solution to this problem. However, while it was useful in solving the problem of subject access to periodicals within the Society library, like all wicked problems, this solution demonstrated the symptom of another problem, one of local coverage vs. universal access. Non-Society members who purchased the Index for use in their libraries soon found that both the holdings and the location information for the periodicals were local to the Society library; that is, the Index only included entries for articles contained in periodical titles and volumes possessed by the Society library (so if your library had other additional titles, the Index could not help you locate information within them). The pagination information given in the Index was local to the bound volumes in the Society library (which differed from the pagination information in the periodicals themselves): "If the Index is used with other editions than those in our Library, the *pages*, of course, will not correspond, but the *volumes* will..."⁷

The next edition of the Index in 1853 addressed a larger scope of periodicals and used universally accessible volume and pagination information, but the high growth rate of periodical literature was unanticipated. Even as it was published, it was already out of date. Several solutions were attempted to address this issue. Some libraries bound or rebound their copies of

⁷ Poole, *Alphabetical Index* (1848), iv. Emphasis original.

the Index with blank sheets interleaved at regular intervals so as to provide room to handwrite in additional references, such as the copy now held by the Newberry Library (see Figure 4-1).

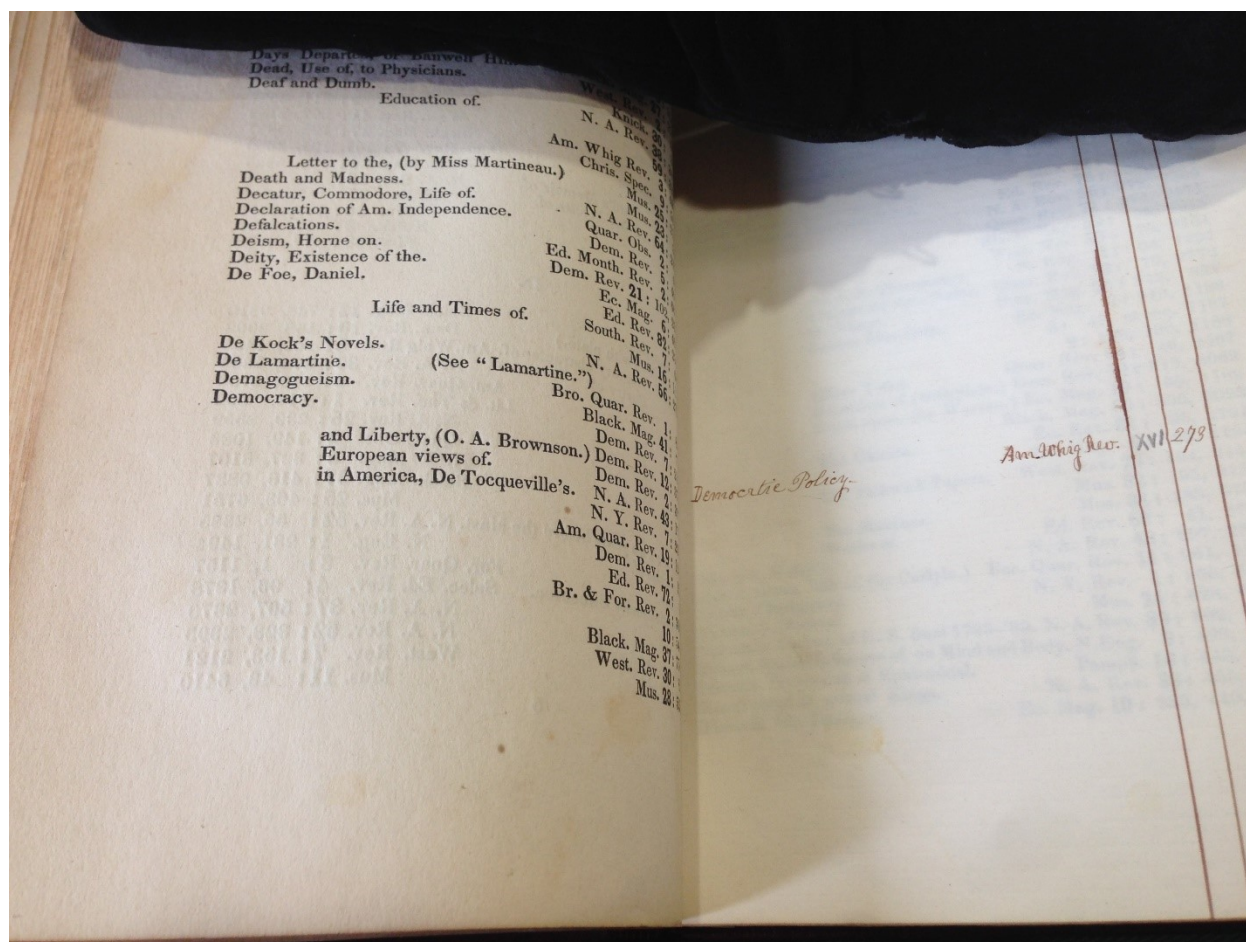


Figure 4-1. Copy of the 1848 edition of Poole's Index held by the Newberry Library, Chicago. The volume has been rebound with blank sheets interleaved, on which new and additional entries were added in by hand.

Poole kept determinedly working toward a new edition of the Index, “much enlarged and entirely remodeled, and the references brought down to the close of the year 1863,” incorporating a plan to issue future supplements to address the ever-continuing nature of periodical publication.⁸ And if periodical publications had remained at a consistent number, with the same amount of titles publishing new volumes, this plan might have worked. But new periodical titles—not just new

⁸ “Bibliography,” *American Publishers' Circular and Literary Gazette* (Octavo Series) 1, no. 1, (Philadelphia, PA: George W. Childs, May 1, 1863), 13.

volumes of existing titles, but entirely new publications—multiplied like rabbits.⁹ Poole quickly became overwhelmed by this “wealth of new material that has appeared since [the] last edition,”¹⁰ despite consecrating all his spare time to indexing work.¹¹ New titles covered heretofore unaddressed topics, and Poole observed that the diversity of subject coverage also increased,¹² thus contributing to the problem. Preparation of a new edition was still underway in 1869. It is unknown how much of the indexing work had been completed, but Poole hoped that if financial support and commitment from a publisher could manifest, the new edition could be in out in two years’ time.¹³ But no such support was found (despite attempts in 1870 to persuade the Smithsonian to take on the role).¹⁴ In the meantime, other librarians were compiling indexes and supplementary materials individually, creating an inefficient duplication of work across libraries.¹⁵ The inability to produce a new index in twenty years of trying was a symptom of the new wicked problem of how periodical indexing could keep up with the growth of periodical literature.

In 1876, at the first meeting of what would subsequently become the American Library Association, members agreed that the earlier editions of Poole’s Index had been useful solutions

⁹ Frank Luther Mott, *A History of American Magazines, 1741-1930* (Cambridge, MA: Belknap Press of Harvard University Press, 1958), 337-379.

¹⁰ Letter, W.F. Poole to C.E. Norton (December 14, 1864), Box 1, Folder 9, W.L. Williamson - William F. Poole Research Papers.

¹¹ Letter, W. F. Poole to C.E. Norton (December 24, 1864), Box 1, Folder 9, W.L. Williamson - William F. Poole Research Papers.

¹² Index Society (London), “Report on the Progress of Poole’s Index,” *Third Annual Report of the Council* (July 1881), 9-11.

¹³ Transcript of letter, W.F. Poole to R.L. Guerney (March 12, 1869), Box 4, Folder 17, W.L. Williamson - William F. Poole Research Papers.

¹⁴ Letter, W.F. Poole to Justin Winsor (January 12, 1871), Box 4, Folder 18, W.L. Williamson - William F. Poole Research Papers.

¹⁵ “The Proceedings [of the conference of librarians at Philadelphia]: Co-operative Indexing,” *American Library Journal* 1, nos. 2-3 (November 30, 1876), 113-117.

for library periodical access, despite their flaws.¹⁶ A plan was devised to create a third edition, a cooperative venture with indexing help from librarians across the country.

“The plan, in brief, was this: I would print and send to all the principal libraries a list of periodicals which it was desirable to index, on which such complete sets as the library had would be checked and the lists returned to me. Having received these lists, I would make an equitable distribution of the work, taking a full share of it myself, and giving to the larger libraries more, and to the smaller libraries less. Each library would engage to index according to a code of rules which would be furnished the set or sets of periodicals allotted to it, and send the references to me, who would revise, arrange, and incorporate the same with the matter of the edition of 1853 and with the work of all the other contributors. I would assume all the pecuniary responsibilities incurred, employ such assistance as was needed, print the work, and furnish a copy to each contributing library.”¹⁷

The work took six years and was not without exposing other interconnected problems, such as how to standardize forms of entry amongst more than 50 indexers.

Poole’s Index also revealed symptoms of the interconnectedness inherent in wicked problems in the conflation of access, inventory and location information. While the Index may communicate to a user which articles were in which magazines, it did not communicate whether a library had those materials in its collection or, if it did, where they could be found within the library. We know these problems emerged from Poole’s Index because evidence of solution attempts exist. For instance, a librarian at Drexel University noted in 1902 the creation of “a list of the indexed

¹⁶ Ibid.

¹⁷ William Frederick Poole, *Poole’s Index to Periodical Literature* (Boston, J.R. Osgood & Co., 1882): iv.

periodicals contained in the library posted in a conspicuous place near the indexes.”¹⁸ At the Newberry Library, a date and volume key to Poole’s Index published by ACRL¹⁹ includes call numbers penciled in next to the each title held in the Newberry’s collection (see Figure 4-2). Even as late as 1997, a binder of information documenting the holdings at the Newberry, including the date runs of each journal held, was created by Anna Smith (see Figure 4-3). All of these solution attempts reveal symptoms of new problems documenting and communicating desirable inventory and location information and demonstrate their interconnectedness to the problems of subject access.

¹⁸ Alice B. Kroeger, “Dictionary Catalogs vs. Bibliographies,” *Papers and Proceedings of the Twenty-Fourth General Meeting of the American Library Association held at Boston and Magnolia, Mass., June 14-20, 1902* ([Boston, MA]: American Library Association, 1902), 182.

¹⁹ Marion V. Bell and Jean C. Bacon, *Poole’s Index: Date and Volume Key* (Chicago, IL: Association of College and Reference Libraries, 1957).

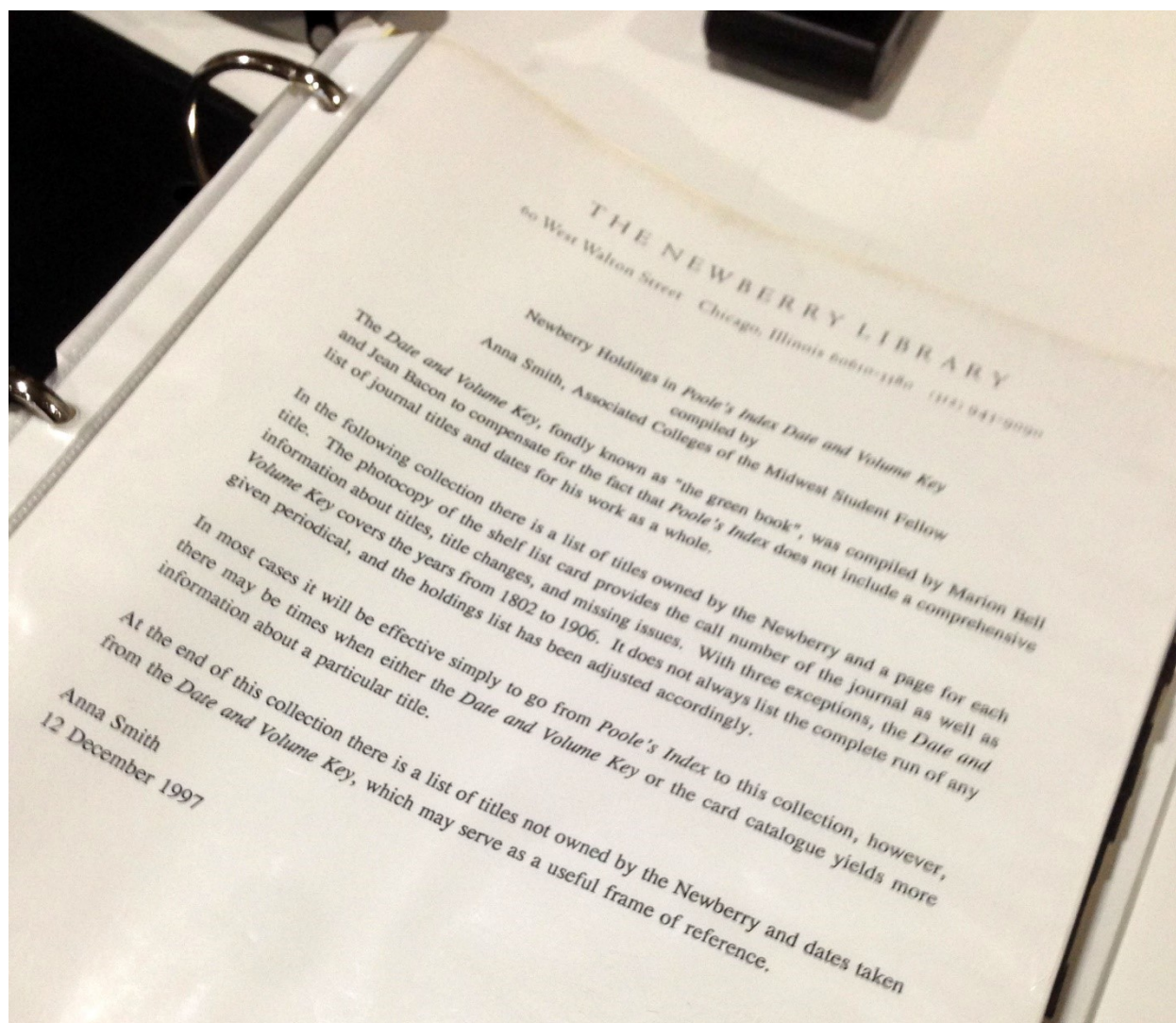


Figure 4-3. Newberry Holdings in Poole's Index compiled by Anna Smith. Newberry Library, Chicago.

Poole's Index, as well as its affiliated tools, offers many attempted solutions to solve the wicked problem of periodicals access. But, like all wicked problems, no solution is final: there is no stopping rule. Even today, libraries and other information providers struggle with providing access to periodicals, which is interconnected with even more aspects, such as models of publishing, content ownership questions, and intellectual content creation. And like all wicked problems, we cannot go back to the beginning and start over from a clean slate—everything that

occurred in the design of Poole's Index, from the intellectual constructs of which metadata to record and how, to the materials used to instantiate it, changes the problem for the next attempt.

* * *

The Washington County (MD) Free Library (WCFL) book wagon also represents one solution in an ongoing attempt to solve what can only be viewed as a wicked problem. One characteristic of wicked problems is that they have multiple stakeholders and various potential framings. Such differing influences and perspectives can be seen in WCFL from the start. The founders of the library and the members of the Board of Trustees had a very different understanding than the librarian of exactly what problem the library was intended to solve.

The founders and board members viewed the library itself as a solution to the problem of lack of cultured citizenship in the burgeoning area:

“We believe our community to be one of many noble capabilities. Its people are characterized by industry, energy and enterprise. Just at present one of its predominant characteristics is its steady and steadily increasing material and commercial prosperity. Just on this account however it needs and is likely to need increasingly in the future the complementing and correcting influence of that culture for which, among other instructions, a Free Public Library is rightly regarding as standing.”²⁰

However, Mary Lemist Titcomb, WCFL librarian from 1901 until her death in 1932, had a different interpretation of the problem. Like many librarians of the time period, she was interested in educating and uplifting the populace through reading. At the time of the library's

²⁰ Copy of letter, Board of Trustees to B.F. Newcomer (June 1, 1899), Minutes of the Washington County Free Library Board of Trustees, Western Maryland Room, Washington County Free Library.

founding and Titcomb's arrival in Hagerstown, there was only one private high school, which was unaffordable by most families.²¹ School attendance was not mandated in the Washington County area until 1915, leaving many of the residents illiterate or poorly educated.²²

Characteristic of the contemporary tenets of the library profession, Titcomb believed educating the underprivileged was best accomplished via reading library books.²³ Although on the surface the concerns of increasing culture and education seem similar, and are arguably related, the Board of Trustees was actually more concerned about projecting a positive image to counter the perceived lack of cultural cache stemming from the negative consequences of urban growth,²⁴ while Titcomb was less concerned with appearances and more interested in social enlightenment and progressive library services.²⁵

From the outset, WCFL was intended to serve all Washington County residents—urban and rural alike. Funding for the library came from both the Board of County Commissioners and the Mayor and Council of Hagerstown: in fact, more financial support came from the county (\$1500 per year as opposed to Hagerstown's \$1000), indicating an obligation and a commitment to serving the rural population.²⁶ Some librarians would have been content to open the doors of the central library building in Hagerstown on August 27, 1901 and consider their work done by offering access to all patrons, city and county alike. But although the opening day of the

²¹ Draft of speech, Simms Jamieson (1965), Mary Lemist Titcomb Vertical File, Western Maryland Room, Washington County Free Library, 1.

²² "Mary Lemist Titcomb," in *Outstanding Women of Washington County, 1926-1976*, prepared by the Hagerstown Branch of the American Association of University Women, [1976], 67.

²³ Deanna Marcum, "The Rural Public Library: Hagerstown, Maryland, 1878-1920," (doctoral dissertation, University of Maryland, 1991), 4.

²⁴ *Ibid.*, 7.

²⁵ Deanna Marcum, *Good Books in a Country Home: The Public Library as Cultural Force in Hagerstown, Maryland, 1878-1920* (Westport, CT: Greenwood Press: 1994), 3.

²⁶ Copy of the Washington County Free Library Charter, Chapter 248, Minutes of the Board of Trustees, Washington County Free Library, 7; Copy of the Washington County Free Library Charter, Chapter 317, Minutes of the Board of Trustees, Washington County Free Library, 9.

Washington County Free Library was popularly attended, Titcomb immediately noticed a demographic discrepancy. In the first six months the library was open, nearly 3,000 Hagerstown residents had registered with the library, while only a mere 455 rural residents had joined.²⁷

The board was concerned with the lack of arrangements for providing library resources to country citizens, but seemed to have no solutions, and decided to defer action “until a more perfect system could be devised.”²⁸ Titcomb, who had not been present at the meeting where the decision to defer was made,²⁹ decided to respond to this perceived need by establishing what she called “branch libraries” in each of the 26 voting districts of the county.³⁰ Despite the title, these were not branches as we think of them today, but rather as follows:

“For want of a better title we dignify by the name of branches the small collections of books placed at various points in the county for the use of the public. Each Branch consists of an assortment of fifty fresh readable books, in a case somewhat after the traveling library order, placed, as a rule, in the general store or post office. The books remain either sixty or ninety days in charge of the merchant or postmaster, as the case may be, and are then returned to the central library for an exchange.”³¹

Patrons could browse books at the branches, or send requests for specific items to the library to be delivered when the books at the branches were exchanged and replaced. The branch service was provided for free to the public, with the library taking responsibility for the cases, transportation and postage.³² Approximately 10% of the total library circulation in the first year

²⁷ Minutes of the Board of Trustees (April 26, 1902), Washington County Free Library, 61.

²⁸ Minutes of the Board of Trustees (September 28, 1901), Washington County Free Library, 52.

²⁹ Ibid, 48.

³⁰ Washington County Free Library, First Annual Report 1901-1902, 7.

³¹ Ibid.

³² Ibid.

of operation occurred via these branches. In the following year, circulation to these “deposit stations” (as they became known) nearly doubled, and the number of stations rose from 23 to 38.³³

“Requests for books on special topics from individuals living in the villages in which branches were established last year have become more frequent showing that the library is coming to be regarded as an integral part of the county at large. 5262 volumes have gone from the central library to these stations with a circulation record of 12291, or an average of one book for every three persons in the county exclusive of Hagerstown.”³⁴

Circulation via deposit station continued to rise over the next five years (although not to the same extent as that first year). These deposit stations were certainly a solution to the problem of distributing reading material to county residents. If this were a tame problem, the deposit stations might have indicated a complete, perfect solution. However, like all wicked problems, there are no good or bad solutions, only better or worse ones. Given the choice between accessibility of reading materials solely at the Hagerstown library building vs. at deposit stations throughout the county, the implementation of deposit stations was certainly a better solution than the Hagerstown branch alone. But it was still not an ideal solution. Titcomb knew that people living on isolated farms or far back in the mountains were not inclined to purposefully go to the deposit stations, much less the Library itself.³⁵ She notes that “at no time was [a deposit station] an economical way of serving the country for there was too little opportunity to consult the individual tastes of the borrowers, and it sometimes happened that cases of books would go out

³³ Washington County Free Library, Second Annual Report 1902-1903, 6.

³⁴ Ibid.

³⁵ Jean R. Moser, “Mary Lemist Titcomb, 1857-1932, Creator of the Bookmobile,” in *Notable Maryland Women*, ed. Winifred G. Helmes (Cambridge, MD: Tidewater Publishers, 1977), 378.

and remain for the allotted sixty days, to have it discovered upon return that most of them had never been taken from the shelf.”³⁶ The cost of the deposit service was high, and many people in the remotest parts of the county were still not reached.³⁷ New problems had emerged: the deposit stations could not reach everyone, and even when they did place books in the remote areas, there was no guarantee the country people would read them. Titcomb herself, in a history of the WCFL, wrote:

“On the whole a review of the work of the first year of the Library’s existence shows that it at once established itself as an educational, recreational and democratizing influence in the community, bringing all classes of people to it and entering all types of homes...But it had not yet become a *County* Library. Here indeed the management embarked upon an uncharted sea. How best to manage the practical distribution of the books? How most quickly to dispel the feeling in the country that the library would only benefit the professional classes?”³⁸

Although the problem of getting books to rural regions had certainly been solved, the problem of getting books to rural people—and therefore encouraging and supporting their reading—had not. The solution to one problem had become the symptom of another problem. Titcomb realized that it wasn’t enough to bring books to the country, but that country dwellers were unaware and uninterested in books and reading.³⁹ As the quote above notes, rural residents felt that the library was inapplicable and irrelevant to their lives and work, demonstrating not just a problem of marketing and public relations on the part of the library, but an ongoing tension between city and

³⁶ Mary Lemist Titcomb, “Story of the Washington County Free Library,” in *The Washington County Free Library 1901-1951* (Hagerstown, MD: Washington County Free Library, October 4, 1951), 18.

³⁷ Jamieson, draft of speech, (1965), 2.

³⁸ Titcomb, “Story of the Washington County Free Library,” 10. Emphasis original.

³⁹ Moser, “Mary Lemist Titcomb,” 378.

county class levels and structures. The problem in this situation thus becomes not just about distributing reading material to patrons, but navigating and even changing people's sentiments and perceptions—no easy task.

These above identified and articulated problems come from the perspectives of the trustees and the librarian—not the rural citizens (i.e., the end users served by the design solution). Had the rural patrons been asked, they likely would not have seen any problem present that a library would solve. Rather, they originally felt they might be better served by their tax support money going towards a hospital or mill.⁴⁰ Such vastly differing perspectives from various stakeholders are another indication of a problem's wickedness.

In addition to complicated diverging and overlapping beliefs about the mission and purpose of the library and how it could serve both city and county as well as educate the uninformed citizenry, other interconnected factors afforded and constrained the problem. Budget limitations were an ongoing issue. In the early years of the library, the trustees realized that the library budget was insufficient to pay for itself. In 1902, early attempts to secure funding from Andrew Carnegie were denied on the grounds that Carnegie limited funding to construction of a physical building, which WCFL already had.⁴¹ The problem of serving the county was also interconnected with the problem of access—specifically physical geographical access. By 1904, the number of deposit stations had increased to 55, 25 of which were inaccessible by railroad, trolley, or stage coach.⁴² To reach these stations for restocking and delivering requested

⁴⁰ Edward I. Farrington, "A Public Library on Wheels," *Suburban Life* 9, no. 6 (December 1909), 299-300.

⁴¹ Titcomb, "Story of the Washington County Free Library," 12; Letter, [James] Bertram (secretary to Andrew Carnegie) to E.W. Mealey (April 3, 1902), Washington County Free Library Administrative Archives.

⁴² Washington County Free Library, Third Annual Report 1903-1904, 6.

materials, the library's janitor,⁴³ Joshua Thomas, was required to make an average of three trips per month over rocky roads through rough mountainous terrain in a hired horse-drawn wagon.⁴⁴ "It was then that the idea of a wagon designed especially for this purpose began to ferment in the mind of the librarian. The visits of the janitor had already done much to establish cordial relations between the Library and its patrons."⁴⁵

Titcomb pitches her potentially "better" solution idea to the trustees:

"A 'Library Wagon' constructed purposely for the transportation of the cases and also built to carry an assortment of books which could be left at houses along the route is another step in the county work which the librarian is anxious to attempt. Families could in this way select directly from the wagon and when Mr. Thomas returned two months or three months later as the case might be these books could be returned and a fresh assortment loaned. In the meantime neighborhoods could lend books thus borrowed among themselves."⁴⁶

This clearly demonstrates both the lack of stopping rule and the search for ever better solutions. In addition to book delivery, Titcomb intended the wagon to be an "outward and visible sign" advertising library services and also to facilitate building trust and friendship through interpersonal interactions.⁴⁷ Thus the idea of the book wagon aimed to solve not only the problem of delivery and access to library materials, but also to assist with outreach, marketing, advocacy, and public relations—a set of entangled interconnections indeed.

⁴³ Author's note: although the term "janitor" may be considered pejorative in contemporary discourse, I use the term here and throughout this work in order to accurately represent the historical documentation.

⁴⁴ Washington County Free Library, Third Annual Report 1903-1904, 6-7.

⁴⁵ Titcomb, "Story of the Washington County Free Library," 13.

⁴⁶ Washington County Free Library, Third Annual Report 1903-1904, 6-7.

⁴⁷ Titcomb, "Story of the Washington County Free Library," 13-14.

* * *

The case of the eXtensible Catalog reveals multiple wicked problems that motivated its design and development. The idea for XC began at the River Campus Libraries at the University of Rochester in upstate New York, around 2005. Inspired by several other projects already underway at the library, as well as ongoing dissatisfaction with the ability of commercial library vendor products to meet the desires of library users, two staff members—Jennifer Bowen, then head of cataloging and currently associate dean, and David Lindahl, the library’s webmaster and director of digital initiatives at the time—applied for a grant from the National Science Foundation to create an alternative solution to current library catalog products: an open source library catalog interface that would offer a unified display resources from a variety of the library’s collections, both physical and digital.⁴⁸

“I think the initial impetus for the project was that we were so frustrated with our vendor... there were several projects all getting started at the same time that really were born out of developers who were just so frustrated with the OPACs and the limitations of what we could do to show our patrons what was in our collections and the relationships between the things in our collections. So that was the initial reason we did it.”⁴⁹

However, they were met with an issue right away when their grant was rejected by NSF: although they intended to create something more useful to library users, feedback from the granting agency indicated the beginnings of a wicked problem: they needed to include more, and more robust, user research to demonstrably ensure that whatever they created would legitimately

⁴⁸ Jennifer Bowen, interview with the author (January 29, 2016); Nancy Fried Foster, interview with the author (February 8, 2016).

⁴⁹ Bowen, interview.

reflect real users' needs.⁵⁰ Right off the bat, the problem of creating a new catalog showed signs of being tightly interconnected with issues of thoroughly understanding users' needs. It also demonstrated the idea of problem-finding, and how integral it is to tackling wicked problems: the recommended user research would assist the XC team in finding and defining what the real problem (or problems) underlying current library catalogs and related research interactions were.

The original goal of the project was to “support the development of an open source public access catalog system for research and college libraries.”⁵¹ More specifically, this open source catalog would “unify access to traditional and digital library resources.”⁵² Much of the focus was on a user interface that would offer the potential to allow library users to “get more out of academic library collections” and “give academic libraries more control over how best to help people gather information.”⁵³

After consideration of this feedback, Bowen and Lindahl incorporated a significant user research component to the project. This component was headed by Nancy Fried Foster, an anthropologist who had been temporarily hired by the University of Rochester Library to work on a previous grant funded project. Her contributions to that project were so successful that the Library hired her full-time, and she is now known within the American library community for holding the first permanent full-time anthropologist position in a library. After adding the anthropological user research portion to the grant, it was resubmitted to and subsequently funded by the Andrew W.

⁵⁰ David Lindahl, interview with the author (March 2, 2016).

⁵¹ The Andrew W. Mellon Foundation. Grants Database, “Developing the XC System – Improving Access to Library Resources,” accessed June 3, 2016, <https://mellon.org/grants/grants-database/grants/university-of-rochester/10600636/>

⁵² “Mellon Grant Funds Planning Analysis for Future Online Services.” Press release from University of Rochester (April 14, 2006), accessed February 16, 2016, from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/Get/Document-22096/Mellon%20Phase%201%20press%20release.pdf>

⁵³ Ibid.

Mellon foundation in March 2006.⁵⁴ “Developing the XC System – Improving Access to Library Resources,” (also referred to as the “Phase I” grant by the XC team) supported the development of an open source public access catalog system for research and college libraries through the provision of funds not for building or developing the catalog itself, but rather for planning that development.⁵⁵

Early goals of XC were ill-defined from the outset: XC was going to allow library users to “get more out of academic collections” and “give academic libraries more control over how best to help people gather information”⁵⁶—but neither of these offered solid definitions. What did it mean to “get more” out of a library collection? Did it mean patrons could check out more books? Did it mean patrons would see more search results on a single screen? Did it mean patrons would see more diverse types of resources in their search results? Many readers probably assumed that “getting more” out of a library catalog meant that users would get more of whatever they wanted—types of formats, connections among resources, semantic responses, intellectual insight and assistance—but the way this solution was articulated reflects the epitome of an ill-defined wicked problem. If the solution is “getting more,” what, exactly do current catalogs offer less of?

Thankfully, the description of XC and its goals quickly and continually evolved, each time attempting to articulate problems more concretely. At the start of the planning stage in early 2006, XC was described “in a nutshell” as “an open source system that libraries can download and install as an alternative way for users to access their resources.”⁵⁷ XC was described to potential project partners in a late 2006 letter as “both an end-user application and a platform to

⁵⁴ Mellon Foundation, “Developing the XC System.”

⁵⁵ Lindahl, interview.

⁵⁶ “Mellon Grant Funds Planning,” University of Rochester press release.

⁵⁷ “What is XC, in a Nutshell?” News post from eXtensible Catalog website (May 26, 2006), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/what-xc-nutshell>

be available as open source software,” functioning alongside an ILS to provide library users with access to all formats of library resources with an easier, more intuitive, customizable interface that also provided connections to other applications, such as learning management systems or other courseware.⁵⁸ By the end of Phase I, XC was described as:

“an open-source system that will unify access to traditional and digital library resources. XC will help research library users at any level of proficiency get more out of diverse library collections through a simple yet powerful interface that provides comprehensive results sorted into useful categories. For libraries, XC will provide an extensible metadata platform supporting multiple schemas that can be searched simultaneously to support FRBR-like functionality and navigation. XC will integrate easily with functionality from other library applications, such as metasearch. And XC will search across digital and legacy content.”⁵⁹

The wickedness of the problems in the XC project become clear when we look at the change in aims over the course of the project. Note the changes in focus from the broad and somewhat vague high-level description of XC as “alternative access to resources” compared with the following year’s more concrete description of exactly what solutions XC will provide. Early descriptions of the project, such as the first grant application and subsequent announcements about approval and funding described the goals of XC in terms of academic library end users, allowing them to “get more out of academic collections”⁶⁰ by bringing together physical and digital library materials in a single interface for access. Partway through Phase I we can see

⁵⁸ “XC Letterhead,” Blank form letter inviting partners to participate (last edited April 27, 2007), accessed June 3, 2016 from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/View/Collection-4051>

⁵⁹ David Lindahl, Jennifer Bowen and Nancy Fried Foster, “University of Rochester eXtensible Catalog Phase 1 Final Report,” (September 14, 2007), University of Rochester Institutional Repository, 1.

⁶⁰ “Mellon Grant Funds Planning,” University of Rochester press release.

increasing references to metadata—a back-end function—rather than just a discussion of end user interactions, as it became clear to the team that interface and metadata were inseparably interconnected. Any attempt to solve the former problem must involve an attempt to solve the latter. Bowen discussed the five overarching goals of XC during this phase:

1. Provide access to all library resources, digital and non-digital;
2. Bring metadata about library resources into a more open Web environment;
3. Provide an interface with new Web functionality such as Web 2.0 features and faceted browsing;
4. Conduct user research to inform system development;
5. Publish the XC code as open-source software;

and their tight interconnections and implications for metadata and metadata requirements.⁶¹ For instance, to achieve the goal of providing access to all physical and digital resources, the system must be capable of acquiring and managing metadata in a variety of formats from a variety of sources, and handle multiple metadata schemas. That is, bringing together descriptions of resources of disparate formats and collections (such as physical books, digital journal articles, digital images; special collections materials, etc.) to be represented together in a single user interface depended on standardized metadata among all those resources. But differing formats and collections by their very nature often use different metadata standards, such as MARC for books; Dublin Core for institutional repositories; EAD for archival collections, and so on. Thus a new, interconnected problem of how to achieve metadata that described all of these resources needed to be addressed in order to solve the problem of presenting those resources together.

⁶¹ Jennifer Bowen, “Metadata to Support Next-Generation Library Resource Discovery: Lessons from the eXtensible Catalog, Phase 1,” *Information Technology and Libraries* 52, no. 2 (June 2008), 6-19.

Creating an interface that displayed results from all collections required more than just interface design—it required specific metadata, thus adding another level of complexity to the problem that, as the XC team quickly learned, could not be separated out. Bowen’s detailed requirements for XC metadata reveal a number of interconnected, wicked problems. The influence of this wicked interconnection is also revealed in the descriptive shift in XC rhetoric. The 2007 press release for the Phase 2 grant funding announcement describes XC as “a set of open-source software applications libraries can use to share their collections.”⁶² By 2008, XC was being referred to as “a unique set of software toolkits” that “provide a metadata infrastructure which will facilitate the reuse of metadata in any number of web applications and systems,”⁶³ demonstrating a shift of emphasis to metadata and back-end functionality rather than previous descriptions which focused on patrons’ interactions with library collections. And by the press release in July 2009, XC was described as “a common open-source framework for enhancing and enriching metadata for libraries and other cultural institutions,”⁶⁴ relegating user interfaces and interactions to the background.

As discussed in previous chapters, another characteristic that makes problems wicked is differing perspectives among stakeholders. Examination of any software development process is likely to uncover multiple primary and secondary stakeholders, and XC was no exception. Lindahl, in charge of software architecture for the project, was astutely aware of this issue. He notes that stakeholders for a given design put forth specific requirements and then want to know what the solution will look like. But, he added, “the problem is that they’re not only one with a

⁶² “XC Phase 2 Grant Awarded,” news post from eXtensible Catalog website (October 23, 2007), accessed June 3, 2016 at <http://www.extensiblecatalog.org/news/xc-phase-2-grant-awarded>

⁶³ Jennifer Bowen, “Supporting the eXtensible Catalog through Metadata Design and Services,” University of Rochester Working Paper (January 8, 2009), accessed June 11, 2016 at 1 <http://hdl.handle.net/1802/6377>, 1-2.

⁶⁴ “Serials Solutions Joins eXtensible Catalog Project,” news post from eXtensible Catalog website (July 3, 2009), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/serials-solutions-joins-extensible-catalog-project>

requirement.”⁶⁵ Multiple stakeholders have differing needs, some of which may come into tension with one another, and all of which certainly influence what the ultimate design result will be.

Conflicting requirements from diverse stakeholders often contribute to a problem’s wickedness, but with XC some interesting shifts became evident. From the outset, it was clear that the goals of XC served at least two potentially conflicting masters: library patrons and library staff.

Although the original goals of XC focused more on interfaces to serve end users, as the focus shifted to the metadata necessary to support those goals, so too did the influence of the stakeholders:

“The interesting thing about the eXtensible Catalog is a lot of the interfaces were interfaces for librarians. Like, metadata experts who would manipulate metadata. Or system admins who might run the processing steps, schedule them.”⁶⁶

Other stakeholder interactions occurred with the shifting aims to incorporate interaction between XC and other applications such as learning management systems. For example, the Dublin Core Education Application Profile Task Group⁶⁷ use case for XC identifies primary actors, demonstrating evidence of additional stakeholders beyond library patrons and staff.⁶⁸

⁶⁵ Lindahl, interview.

⁶⁶ Ibid.

⁶⁷ One activity of the Dublin Core Education Community is developing an application profile module describing usage of DCMI properties specifically relevant to education. The phrase “application profile module” refers to the scope of the profile: it only includes properties relevant to describing the educational aspects of any resource, and/or the educational context within which it has been or may be used. The intention is that the DC-Education Application Profile will be usable with other application profiles. See <http://dublincore.org/groups/education> for more information.

⁶⁸ Jennifer Bowen and Diane Hillman, “DC-Ed Application Profile Use Case,” (last edited February 22, 2008), accessed June 3, 2016 from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/View/Collection-4804>

Wicked problems are also characterized by the lack of a stopping rule. That is, every solution attempt creates new problems and opportunities for solutions, rather than offering a complete, ultimate solution. XC clearly demonstrates this idea throughout its course of progress. As attempts were made to solve problems with catalog user interfaces, new problems of metadata needs and requirements emerged. As solutions were put forth for new metadata, software to transform and share metadata became necessary. When asked how she knew XC was done, Bowen commented not on the release of software or deployment of new catalog interfaces, which could presumably could always be ongoing with new developments, but rather that she knew the project was done because the grant funding had ended.⁶⁹ Even as XC moved toward the release of the software toolkits, issues of sustainability and maintenance arose, prompting the formation of a new institutional entity, the eXtensible Catalog Organization (XCO), to manage the project beyond the end of the allotted grant funding.⁷⁰

4.2.3 Problem finding, framing and reframing

The characteristics of wicked problems make them difficult to tackle. After all, if I asked you to sit down and solve the problem of periodicals access, where would you even begin? Design epistemology offers knowledge and techniques to address wicked problems through problem finding, framing, and reframing. In design, finding the problem can be just as important, if not more so, than solving the problem. Finding a problem is not so much going into the world finding a wrong to be righted, but finding the specific context (often called a *domain*) in which a problem is situated. Identifying design domains is a key part of the design process, bringing a larger abstract wicked problem into a specific, concrete context that is explicitly addressable.

⁶⁹ Bowen, interview.

⁷⁰ “XC Management Transferred to CARLI,” news post on eXtensible Catalog website (October 6, 2014), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-management-transferred-carli>

Making decisions regarding these domain aspects, such as which are flexible, which are fixed, and which to prioritize, helps designers frame a problem. Poole's Index demonstrates excellent examples of framing. From its first edition on, Poole frames the problem of periodicals access in a very specific way: as he saw it, the issue stemmed from lack of *subject* access to these materials. "The plan of the work is to furnish a *concise* and convenient reference to the contents of these volumes, and to this end, generally but a *single* reference is made to an article, under the most prominent *Word* of its *Subject*."⁷¹ Poole also specifically framed the problem within the domain of the Society library. Poole says "The first edition of my Index...was intended only for use in that library,"⁷² and that "the work was begun with no reference to publication, but merely to furnish for the Library [of the Brothers in Unity] a manuscript copy containing about one-third of the matter of the present volume."⁷³ Framing the problem squarely in the Society library affected not only the scope and content coverage (only periodicals owned by the Society library were indexed), but also set the framing of the problem for a particular user group: students who were members of the Society of Brothers in Unity,⁷⁴ and thus a group of users with vastly different characteristics than, say, genteel ladies of the time. Poole explicitly adhered to the student-as-user throughout all the editions of the Index to which he contributed, directing contributors to index only the articles of interest to the "general student."⁷⁵ But even he clarifies his framing of that domain in a very specific way: "By 'general student' I mean the very cultured general student."⁷⁶ In the same letter, he also describes how he frames scope: he directs

⁷¹ "Publisher's Circular: Indexes," *The Literary World* 3, no. 13/whole no. 65 (April 29, 1848), 250. Emphasis original.

⁷² "Fourth Sitting: A Universal Index of Subjects," *Transactions and Proceedings of the Conference of Librarians in London, 1877*, (London, UK: Chiswick Press, 1878), 163.

⁷³ Poole, *Alphabetical Index* (1848), iv.

⁷⁴ "Universal Index of Subjects," *Transactions of the Conference of Librarians* (1878): 163.

⁷⁵ Letter, W.F. Poole to Morrison (March 1, 1878), Box 4, Folder 20, W.L. Williamson - William F. Poole Research Papers.

⁷⁶ *Ibid.* Emphasis original.

contributing indexers to exclude highly scientific and technical articles.⁷⁷ This leaves others to take up alternatively framed attempts at solutions, such as H. F. Bassett's work on a catalogue of more than 5,000 papers within scientific journals, none of which were included in Poole's Index.⁷⁸

Despite the influence of the ongoing publication of periodicals to the wicked problem of access, Poole easily frames this factor so that it is essentially eliminated from consideration:

“The reason you note for not finishing, that, after the 3rd supplement appears, you will have to go on and make a 4th, & so ad infinitum, I don't see. It is the reason of the woman didn't wash her dishes. Go on, and make the 4th, and the 20th if need be...”⁷⁹

This particular framing essentially eliminates many of the problems that stemmed from material limitations of printed catalogs and indexes. Although this made problem solving highly accessible in the context of a printed index tool—issuing supplementary volumes became the clear solution—Poole's framing of the problem in this assumption may arguably have limited creative alternative approaches to the design of these information tools. Had the framing of the problem included the need to address ongoing publications and acquisitions, certainly Poole's Index in the form we know it would not have sufficed.

Although Poole's Index demonstrates evidence of problem framing, there is less direct evidence of problem reframing, which allows designers to look at problems in new contexts or from new angles. Like the example above, Poole appears very committed to his framing of the problem.

⁷⁷ Ibid.

⁷⁸ H.F. Bassett, “Librarian's Report,” *The Twelfth Annual Report of the Board of Agents of the Bronson Library Fund, of Waterbury, Conn., and the Treasurer's Thirteenth Annual Report, 1880-81* (Waterbury, CT: F.P. Steele, 1881), 14.

⁷⁹ Letter, W.F. Poole to Justin Winsor (October 4, 1871), Box 4, Folder 18, W.L. Williamson - William F. Poole Research Papers.

However, some evidence of reframing does exist. For example, others reframed the problem in terms of alternative access points. R.R. Bowker founded *The Library Index*, a comparable tool for accessing articles in periodicals, explicitly drawing on the work of Poole's Index, but adding additional access points for title and author.⁸⁰ C. Edward Wall created the *Cumulative Author Index for Poole's Index to Periodical Literature 1802-1906*, saying that "The need for an author approach to Poole's Index has been the 'mote' troubling the eye of every indexer, scholar, researcher, librarian and general reader ever to come in contact with the tool."⁸¹

Like Poole's Index, the WCFL was influenced by a particular problem framing. Titcomb repeatedly emphasizes the goal of serving the rural residents of Washington County, as opposed to other goals. This offers a particular specific framing of library service, one which is reinforced by the founders and financial supporters of the library, who emphasized serving the entire county as well as the town.⁸²

Although the evidence of how Titcomb's specific framing of library services is well-evident, less can be said for evidence of reframing. In fact, Titcomb's stance regarding the library as outreach service changed very little during her tenure as WCFL librarian. Although there is little evidence of problem reframing, if the reframing is interpreted more broadly we can see how it may have occurred in the WCFL book wagon case. Instead of reframing the problem, Titcomb seems to possibly reframe the possible boundary of potential solutions—what we might describe today as "thinking outside the box." Titcomb reframed the idea of the traditional library "branch" (the

⁸⁰ R.R. Bowker, Preface to *The Library Index* 1, no. 1 (January 1905), 1-3.

⁸¹ C. Edward Wall, *Cumulative Author Index for Poole's Index to Periodical Literature 1802-1906* (Ann Arbor, MI: Pierian Press, 1971), vii.

⁸² Letter, Benjamin Newcomer to Edward Mealey (1897), quoted in Mary Lemist Titcomb, "Story of the Washington County Free Library," in *The Washington County Free Library 1901-1951* (Hagerstown, MD, Washington County Free Library: October 4, 1951), 5.

term for deposit station at the time) by looking beyond the possibilities of a set physical space people needed to visit to acquire books. “The book goes to the man not waiting for the man to come to the book.”⁸³ While this may not be the typical approach to reframing, Titcomb’s ability to reframe potential solutions arguably offers the potential for innovative ideas.

Although there is little evidence of reframing in Poole’s Index and the WCFL book wagon, reframing is much more clearly evident in the case of XC, especially in the previously mentioned shift in the project’s focus from user interface interactions to library staff tools.

“We were trying to develop an open source discovery system but then we quickly realized that we needed an open source metadata platform that was pretty robust to be able to deliver the kind of front end that we wanted to deliver.”⁸⁴

The reframing of XC from a patron-focused discovery system to a staff-focused toolkit had an immense impact on the design and development of XC and its ultimate outcomes. One interesting aspect of the XC is that this front-end-to-back-end reframing is conscious and explicit. XC demonstrates not only evidence that reframing occurred, but evidence of how that reframing affected the future of the project, which artifacts were ultimately created and which features were included.

The reframing of XC was influenced by several factors. The first significant influence stemmed from the awarding of the Phase I grant from the Mellon Foundation. Lindahl specifically mentions that this grant was not to be used to fund any actual hands-on development of XC—only planning for such development.⁸⁵ This meant that the XC team had to switch gears and

⁸³ Titcomb, “Story of the Washington County Free Library,” 15.

⁸⁴ Bowen, interview.

⁸⁵ Lindahl, interview.

reassess their approach. A large portion of the Phase I grant was then used to convene a conference of thought leaders and potential partners who might be knowledgeable about and interested in the types of problems XC intended to solve. As Lindahl notes, the XC team “ended up being able to hold a conference that really shaped what XC became.”⁸⁶ It was at this conference that attendees offered critical feedback, insights, and suggestions regarding the development potential and directions of XC. For instance, Eric Lease Morgan raised the issue of libraries’ ability to control their own data, while Jeremy Frumkin pointed out concerns of scope management: how, exactly, was XC going to achieve all the myriad goals it claimed to attempt?⁸⁷ Based on the specific comments received from these partners, as well as results from a survey of libraries, by the end of Phase I the scope of XC was refined and reframed to focus more on metadata tools.⁸⁸

The framing of a design problem affects all subsequent solution attempts, and every decision made toward a solution affects the next decision: what Schön calls a “web of moves.”⁸⁹ XC is a prime example of moves affecting other moves because of its commitment to reflecting needs drawn specifically from user research. Findings from user work practice studies informed decisions regarding XC design features. Foster expressed this eloquently in a blog post where she described how user needs influence metadata decisions. She draws on an example of searching for books by size: although traditionally considered an unpopular search strategy, if

⁸⁶ Ibid.

⁸⁷ Lindahl, Bowen and Foster, “eXtensible Catalog Phase 1 Final Report,” 3-4; “XC Phase 1 Partner Activities,” news post from eXtensible Catalog website (October 8, 2007,) accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-phase-1-partner-activities>

⁸⁸ Lindahl, Bowen and Foster, “eXtensible Catalog Phase 1 Final Report,” 13.

⁸⁹ Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York, NY: Basic Books, 1983), 94.

user research indeed uncovered that library users wanted to find books of certain measurements it would imply the need to record those measurements in the metadata.

“If we really wanted to help our patrons find items in our OPAC by size, we would need to include the thickness of each item in our metadata records. Since we don’t currently do this, we would have to go out and start measure [sic] things like crazy and enter the information into hundreds of thousands of records. We’re not going to do that, but we could if we were convinced that it would be worth it.

We may face a similar challenge, depending on what our XC user research discovers, and what features we think we might want to add to the system. In making our decision, we will have to consider the costs not just of programming but of adding or massaging metadata when we decide which of several possible features to build.⁹⁰

Foster clearly illustrates the web of moves for XC, showing that user research not only affected decisions about interfaces and presentation (which in turn affect the programming and coding of those interfaces) but also decisions about metadata. The web of moves of XC, as with most designs, was far-reaching.

4.2.4 Service orientation

Design differs from other traditions of inquiry because of its inclusion of service as a defining element.⁹¹ The idea of design as improving the state of the world through problem-solving is interconnected with design’s focus on service. Throughout its history, librarianship has often been considered a service profession, and so it should come as no surprise that this element of

⁹⁰ “Size Matters,” news post from the eXtensible Catalog website (January 16, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/size-matters>

⁹¹ Harold G. Nelson and Erik Stolterman, *The Design Way: Intentional Change in an Unpredictable World*, 2nd ed. (Cambridge, MA: MIT Press, 2012), 41.

design epistemology is so clearly evident in library artifacts and design processes. Poole's Index clearly demonstrates a service orientation from its first printed edition to all the additional tools and services created around it. As discussed in an earlier section, Poole's Index was created under the guise of service to information seekers, to unite them with the content contained within periodicals. However, the dedication to service in this case goes far beyond the tool itself. Throughout the history of Poole's Index, there is an attitude and established precedent of sacrifice for the purpose of service: the belief that the service provided by this tool was so valuable to users that the creators and contributors would give freely of their time, labor and expertise to manifest such an important instrument.

The creation of each iteration of the Index required a great deal of work, most of which was done in librarians' free time with no financial compensation. Poole frequently speaks—nay, boasts—about his work on the Index being a “labor of love,” completed entirely off the clock and without financial compensation.⁹² Remembrances of Poole mention that during the preparation of the 1848 edition, he worked in the library after hours until early morning, sleeping in his clothes on the table.⁹³ Poole claimed to have devoted all of his spare time outside of his duties as Assistant Librarian at the Boston Athenaeum to the 1853 edition,⁹⁴ and he himself similarly described his work on the 1882 edition:

“Not one of the 634 [volumes] credited to the Chicago Public Library was done in the library working hours. I indexed every one of them myself in my own home twelve miles

⁹² Poole to Guernsey (March 12, 1869), W.L. Williamson - William F. Poole Research Papers; “Universal Index of Subjects,” *Transactions of the Conference of Librarians* (1878), 163.

⁹³ Daniel L. Shorey and others, *In Memoriam: William Frederick Poole* (Chicago, IL: Chicago Literary Club, 1894), 8.

⁹⁴ Poole to Herrick (February 16, 1852), W.L. Williamson - William F. Poole Research Papers.

from the city after 9 o'clock at night. I carried these vols out in my hands and returned them in the same way to the library."⁹⁵

So devoted was Poole that he dedicated his own personal time in service of the Index, and, in turn, its users. Although some, like Robert Harrison, thought the proposal for the 1882 edition might fail due to the lack of follow-through from gratuitous labor,⁹⁶ more than 50 librarians—the majority of whom worked on the Index without pay in off-hours—demonstrated an incredible commitment to service. “This labor, which has been credited to his library, has usually been done in hours of his own, taken from rest and recreation. The librarian will have his pay in the consciousness that what he has done will benefit his library and his readers...”⁹⁷ Even the reviews of the Index that included criticisms of the tool itself remarked at and admired the immense amount of dedication and service that went into it, the “gratuitous and self-sacrificing labors.”⁹⁸ J. Ashton Cross noted that “Nobody wanted librarians to work for nothing, but co-operative labor was not unpaid labor.”⁹⁹ Time and money would be saved through the division of labor, and all participating librarians would benefit from the service they contributed when they could make use of the Index as a bibliographical reference tool in their day-to-day work.

Mary Titcomb also felt strongly drawn to the service aspect of librarianship. She herself stated that “the functions of a library are manifold, but still may all be summed up in one word,—service.”¹⁰⁰ Wiegand notes that Titcomb consistently saw the library as an opportunity to

⁹⁵ Letter, W.F. Poole to N.H. Morrison, (December 30, 1882), Box 4, Folder 20, W.L. Williamson - William F. Poole Research Papers.

⁹⁶ “Universal Index of Subjects,” *Transactions of the Conference of Librarians* (1878), 163.

⁹⁷ Poole, *Index to Periodical Literature* (1882), xi.

⁹⁸ “Poole’s Index,” *Norton Literary Gazette and Publishers’ Circular* 3, no. 3 (March 15, 1853), 40; Review of *An Index to Periodical Literature* (1853), *Graham’s Magazine* 44, no. 3 (March 1854), 345; Boardman, review of *Index*, 318-320.

⁹⁹ “Universal Index of Subjects,” *Transactions of the Conference of Librarians* (1878), 163.

¹⁰⁰ Washington County Free Library, Fourth Annual Report 1904-1905, 13.

accomplish social good.¹⁰¹ But as with all service enterprises, the question arises: who is being served, how, and why? When design is not only about what could be, but also what should be, who decides the “should”? As was common in librarianship of the time, Titcomb evangelically believed that the less fortunate citizens, the illiterate rural residents, should have access to books and should improve their literacy, education, and knowledge. Her belief was actually in direct contrast to the articulated desires of the residents she aimed to improve. Rural residents were more interested in starting a hospital or a mill than a library.¹⁰²

But in a designerly fashion, Titcomb is not satisfied to simply give the users what they want. She sought to give them what they didn’t even know they needed.

“Furthermore, the work of a Library in a community, is never solely to supply known wants but ever and always to be on the alert to create a demand ... The Librarian has learned that as far as lies within his resources, it is his business to see that the right book reaches the right person, even if it involves convincing that person that he wants the book.”¹⁰³

The book wagon was Mary Titcomb’s method of not only getting the right book to the right person, but it was used to draw attention to the library and its services, convincing users that a need existed within them for books that they hadn’t previously realized until the book wagon came.

XC expresses a service orientation in a different way, through the focus on and advocacy for open source tools that afford control back to libraries. In addition to the goal of creating a catalog

¹⁰¹ “Mary Lemist Titcomb: Blazing Trails to Reading,” *The Herald-Mail*, Hagerstown, MD (March 26, 2000), E1.

¹⁰² Farrington, “A Public Library on Wheels,” 299-300.

¹⁰³ Washington County Free Library, *Seventh Annual Report 1907-1908*, 6-7.

user interface that they felt would better serve library patrons, the discourse around the project indicates that XC was also intended to be created in service of libraries. For instance, several of the articulated goals of XC specifically refer to benefits to be gleaned by libraries, such as “giv[ing] academic libraries more control over how best to help people gather information” and offering “inexpensive, flexible alternatives to using off-the-shelf software to provide access to library collections.”¹⁰⁴ Although the early goals of XC were clearly framed in service to both library patrons and staff, the final deliverables shifted to emphasize service to libraries and related organizations. XC was explicitly developed in the service of libraries and clearly reflects a service orientation.

4.3 Generation of knowledge through making

4.3.1 Iteration

The evidence of iteration in all three cases is clear. In Poole’s index, each edition was an iterative improvement on the one before. Even during the development of his very first index, Poole says “for a year or more I plodded on, feeling my way in the dark, frequently throwing aside all I had done and beginning again.”¹⁰⁵ The printing of the 1848 edition was an iterative improvement in the durability, and therefore the usability, of Poole’s original, now no longer existent, manuscript Index at the Society library. After the printing of the 1848 Index, Poole “again remodeled the scheme,” implying iterative development.¹⁰⁶ The 1853 iteration increased the scope and coverage of the 1848 Index. It contained all the entries in the 1848 edition plus “six times as much matter in addition”¹⁰⁷: 38 more periodical titles, additional volumes from the extant titles, and entries for

¹⁰⁴ “Mellon Grant Funds Planning,” University of Rochester press release.

¹⁰⁵ William Frederick Poole, “The Index Symposium and Its Moral,” *Library Journal* 3, no. 5 (July 1878), 179-180.

¹⁰⁶ Poole, “Index Symposium,” 180.

¹⁰⁷ William Frederick Poole, *An Index to Periodical Literature*, (New York: Charles B. Norton, 1853): vi.

articles published subsequent to the printing of the 1848 edition. Additional improvements included the attempt to ascertain authorship information for anonymously written articles,¹⁰⁸ as well as altering the localized citations to something more universally applicable.¹⁰⁹ The 1882 iteration not only increased the scope and coverage again, but also implemented the cooperative indexing plan, an improvement in workflow without which the edition would likely not exist. Iteration is also evident in the 1893 reprint of the 1882 Index: while the intellectual content of the work remained the same, the use of heavier paper in the 1893 reprint was a iterative response to the material character of the earlier printing, since many users noted the paper in the 1882 Index quickly became ragged and torn, making it difficult, if not impossible, to use.¹¹⁰ Because the 1893 reprint used thicker paper, it could not be bound as one single volume, and so in this iteration the work was divided into two volumes neatly between J and K.¹¹¹ It is this specific iteration of Poole's Index along with its subsequent supplements, that comprise what we commonly think of when we think of "Poole's Index" today. We don't typically think of the 1848 or 1853 editions, leaving them to function more as early prototypes and multiple design iterations that led to the Index as we now know it.

Like the editions of Poole's Index, the WCFL book wagon also went through multiple iterations. The first book wagon started in 1904 as a simple rented Concord wagon, used by Joshua Thomas to convey books back and forth to the deposit stations.¹¹² By 1907, the rented wagon was replaced by a custom creation—the aforementioned "Library Wagon" envisioned by Titcomb to

¹⁰⁸ "Just Published: A General Index to Periodical Literature," *Norton's Literary and Educational Register* (New York, NY: Charles B. Norton, 1854), 176.

¹⁰⁹ Poole, *Index to Periodical Literature* (1853), vii.

¹¹⁰ Poole, *Poole's Index, Revised Edition* (1893), [i].

¹¹¹ Letter, Houghton, Mifflin and Co. to W.F. Poole (September 30, 1890), Box 11, Folder 826, Newberry Library Archives.

¹¹² Moser, "Mary Lemist Titcomb," 378; Titcomb, "Story of the Washington County Free Library," 13.

be the herald of library services. The custom-built carriage had shelves along both sides and a space in the center for storage and transport of book boxes to deposit stations along the route. Titcomb herself described it as “a cross between a grocer’s delivery wagon and the tin pedlers [sic] cart of by gone New England days.”¹¹³ It held 200 books and five or six boxes and was pulled by two mules along the county roads.¹¹⁴ But even her first idea quickly revealed the need for iteration: because the wagon was originally painted black, some rural residents mistook it for a hearse. In response, Titcomb had the wheels and door panels painted red, demonstrating an early user-responsive iteration on her original design.¹¹⁵ In 1909, Farrington described it thus: “Drawn by a pair of sleek horses, it rumbles to the farmer’s gate and the driver throws open a door on each side, revealing rows of the latest and most desirable books arranged on shelves just as though they were housed in an alcove of an ordinary library.”¹¹⁶

¹¹³ Titcomb, “Story of the Washington County Free Library,” 14.

¹¹⁴ Farrington, “A Public Library on Wheels,” 300; Moser, “Mary Lemist Titcomb,” 379.

¹¹⁵ “Mary Lemist Titcomb: Blazing Trails,” *The Herald-Mail*, E2.

¹¹⁶ Farrington, “A Public Library on Wheels,” 299.



Figure 4-4. Photograph of the first Washington County (MD) Free Library book wagon, ca. 1905. Image courtesy Washington County Free Library Administrative Archives, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

Titcomb's idea of using a wagon for rural book delivery was self-admittedly not original.¹¹⁷

However, as previously noted, Titcomb's design aimed to solve a much more complex problem than just book delivery. What made Titcomb's solution different was the interpersonal interactions with the rural residents. Unlike other existing book wagon services, the WCFL stopped at more than just deposit stations. It stopped at houses and farms, interacting directly with residents, offering reading suggestions and advice and taking requests for books to be brought on the next trip.¹¹⁸ Thus the driver of the wagon has a significant role in the service.

Joshua Thomas, the library's janitor, had previously been a produce buyer throughout the region, and so was very familiar with both the roads and the people, opening up avenues of trust in

¹¹⁷ Washington County Free Library, Third Annual Report 1903-1904, 7.

¹¹⁸ Julie E. Greene, "The First Bookmobile," *The Herald-Mail*, Hagerstown, MD (March 26, 2000), E2.

reluctant rural patrons.¹¹⁹ Since many of the rural citizens were unfamiliar with specific books or titles, the driver quickly emerged as recommender and reader's advisor.¹²⁰

By December 1909, there were 16 routes, some taking as long as 4 days to travel. "On his long trips, the driver spends the nights at farmhouses or at little country hotels."¹²¹ Unfortunately, in August 1910, the book wagon was completely destroyed in a railroad accident. Titcomb wrote in that year's annual report:

"The loss to readers in the County can scarcely be estimated. Families had grown to depend on its periodical visits and the scope of its work was continually being extended. To equip as soon as possible another wagon and continue this method of reaching the rural districts is the most immediate need of the Library."¹²²

From the time of its destruction, county extension serves were essentially frozen. Deposit stations were abandoned, and circulation dropped fifty percent.¹²³ Financial constraints prevented the replacement of the book wagon until William Kealhofer, the treasurer for the Board of Trustees, generously donated \$2500 to the library for the explicit purpose of replacing the book wagon.¹²⁴

But rather than procuring another horse-drawn wagon of the same specifications, the library purchased an International Harvester car with a 22-horsepower engine and solid tires in March 1912.¹²⁵ The Autobuggy had a custom top with shelves for 300 books and storage for four

¹¹⁹ Farrington, "A Public Library on Wheels," 299.

¹²⁰ Ibid, 299.

¹²¹ Ibid, 300.

¹²² Washington County Free Library, Ninth Annual Report 1909-1910, 5.

¹²³ Washington County Free Library, Tenth Annual Report 1910-1911, 10.

¹²⁴ Titcomb, "Story of the Washington County Free Library," 14.

¹²⁵ Washington County Free Library, Eleventh Annual Report 1911-1912, 7; "Auto Delivery," The Morning Herald, Hagerstown, MD (March 8, 1912), 3D.

deposit cases.¹²⁶ Although this iteration carried 100 more individual books, it had space for 1-2 fewer cases—clearly a reaction to the increased interest in direct delivery service and reduction in deposit stations. In addition to servicing deposit stations and delivering books directly to families, in 1913 the bookmobile also began to be used to transport the school librarian to classrooms around the county.¹²⁷ However, it was not without issues. The presence of a librarian on the traveling routes was key to interpersonal service. “The advantage of sending a trained library worker out with the wagon is seen in the fact that she is increasingly depended upon to select the books, and meeting people in their own homes, can study conditions and suit the book to the individual.”¹²⁸ But because the car was so heavy, the female library staff could not drive it themselves, and so a chauffeur was necessary.¹²⁹

¹²⁶ Sandra J. King, “Birth of the Bookmobile,” *Antique Automobile* (May/June 1994), 14-15.

¹²⁷ Washington County Free Library, Twelfth Annual Report 1912-1913, 6.

¹²⁸ Washington County Free Library, Eleventh Annual Report 1911-1912, 8.

¹²⁹ Titcomb, “Story of the Washington County Free Library,” 15.



Figure 4-5. Photograph of the International Harvester Autobuggy, ca. 1912 or 1913. Image courtesy Washington County Free Library Administrative Archives, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland. Note the chauffeur at the wheel while the librarian rides as a passenger.

In addition to the need for a chauffeur, this second book wagon (and first book automobile) suffered other problems. First, a series of accidents in 1913 affected its performance.¹³⁰ In 1915, car troubles and cold weather made it necessary to send books across the county by parcel post instead of by automobile:

“Wet days, wet roads and repairs shorten the time of operation... After the second trip in the Spring, the wagon was in the shop for one month for repairs. Again this Fall—just at the beginning of our most profitable seasons—two more months were lost for the same reason, and we were obliged to discontinue the work a month earlier than usual for lack of a chauffeur. Consequently we were able to cover but one third of the county a second time, making four trips less than last year.”¹³¹

The need for a more durable vehicle that could successfully traverse the rough, mountainous roads as well as the ever-increasing growth of county services motivated a new iteration on the WCFL book wagon.¹³² In 1917, the library purchased a specially equipped Koehler truck, with a limousine that could accommodate two passengers in addition to the chauffeur. It held 500 books and six deposit station cases.¹³³ The Koehler provided service for five years, when it began to show signs of wear.

Around 1921, after considering both the constraints of the county terrain as well as the needs and convenience of the librarians who traveled with the book wagon, the Koehler was replaced with

¹³⁰ Washington County Free Library, Twelfth Annual Report 1912-1913, 7.

¹³¹ Washington County Free Library, Fourteenth Annual Report 1914-1915, 6-10.

¹³² *Ibid.*, 10.

¹³³ “The 1916 Bookmobile,” The Bookmobile Collection, WHILBR: Western Maryland’s Historical Library, accessed June 3, 2016, <http://www.whilbr.org/itemdetail.aspx?idEntry=129&dtPointer=3>; see also King, “Birth of the Bookmobile,” 10.

a Dodge Business Car.¹³⁴ This particular iteration was found to be so satisfactory that when it began to show signs of wear after five years, it was replaced by another of the same make.¹³⁵



Figure 4-6. Photograph of the Koehler, ca. 1919 or 1920. Image courtesy Washington County Free Library Administrative Archives, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

As book wagon service increased, deposit station service lessened. In 1909, two deposit stations closed because those areas could be better served by the book wagon.¹³⁶ In 1915, five deposit stations were abandoned during the year “as it was found that these neighborhoods could be

¹³⁴ King, “Birth of the Bookmobile,” 16.

¹³⁵ Titcomb, “Story of the Washington County Free Library,” 15.

¹³⁶ Washington County Free Library, Eighth Annual Report 1908-1909, 5.

better served by the automobile.”¹³⁷ By 1931, deposit station service had been discontinued altogether.¹³⁸

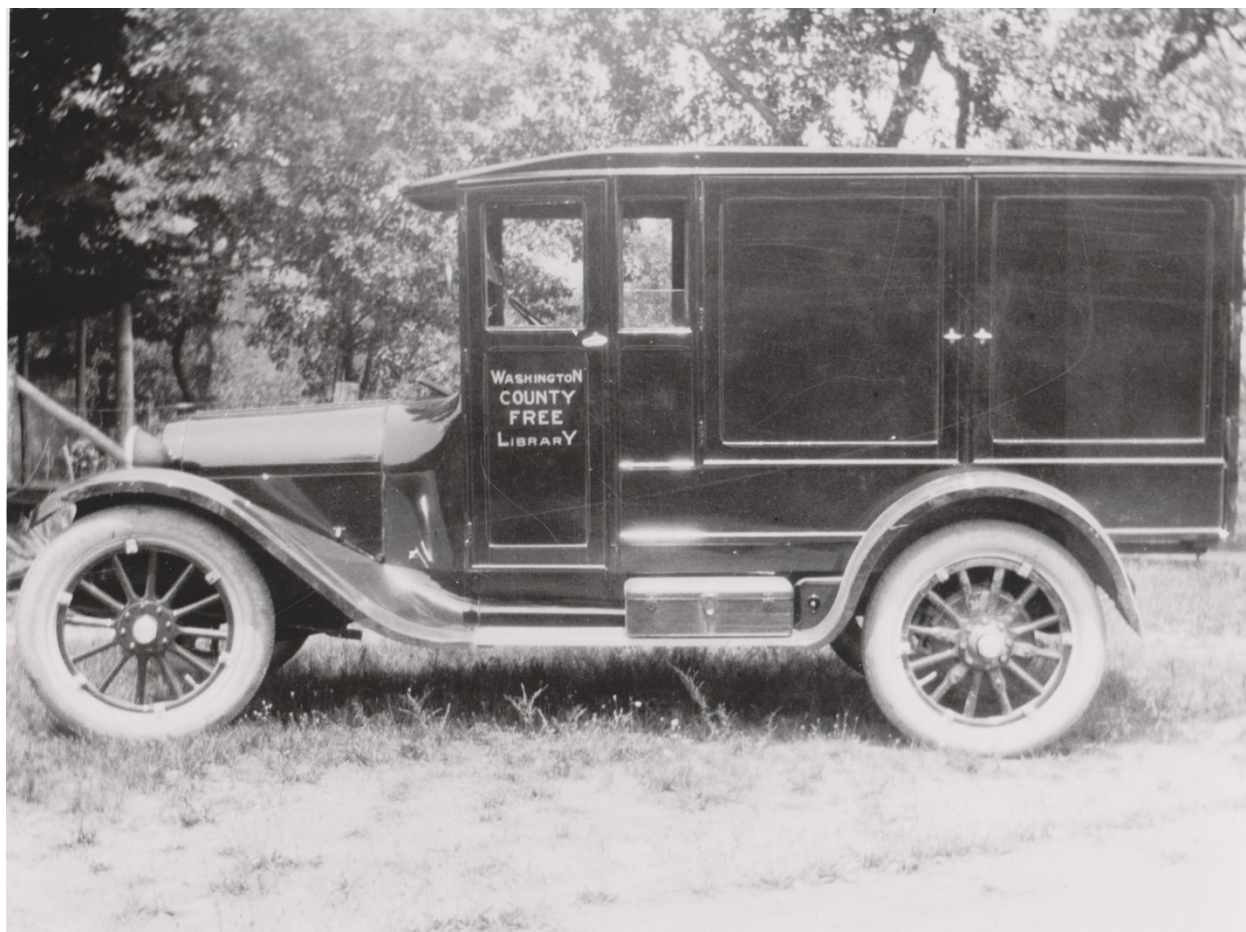


Figure 4-7. Photograph of one of the Dodge Business Cars used as a bookmobile between 1921 and 1940. Image courtesy Washington County Free Library Administrative Archives, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

Between the stock market crash of 1929, the death of Titcomb in 1932, and the deepening economic depression in the United States in the 1930s, many WCFL services were reduced or eliminated—the book wagon among them.¹³⁹ Book wagon service was reduced starting in 1932

¹³⁷ Washington County Free Library, Fourteenth Annual Report 1914-1915, 10-11.

¹³⁸ Titcomb, “Story of the Washington County Free Library,” 18.

¹³⁹ Mary Louise Holzapfel, “The Following Twenty Years of the Washington County Free Library, 1931-1951.” In *The Washington County Free Library 1901-1951* (Hagerstown, MD: Washington County Free Library, October 4, 1951), 33.

and curtailed entirely in 1940, when the current Dodge Business Car book wagon was sold.¹⁴⁰ Funding requests for a new bookmobile were submitted in 1947, 1948 and 1949, but no funds were allotted for the service.¹⁴¹ Finally, in November 1949, the Board of Trustees decided to use money from library investments to buy a Studebaker truck.¹⁴² Affectionately nicknamed “Delilah,” this bookmobile was manned by a driver, a librarian, and a library assistant. By 1957, Delilah made 166 stops per week and had circulated 1,316,594 books (almost one-third of WCFL’s total circulation).¹⁴³

New versions of the bookmobile appeared in 1957, 1969, 1985, and 2004, each demonstrating iterative improvement on the previous model (see Table 4-1). Today, WCFL still relies on bookmobiles to serve patrons throughout the county.

¹⁴⁰ Ibid, 43.

¹⁴¹ Ibid, 43.

¹⁴² Ibid, 44.

¹⁴³ Nellie Lee Powell, “A History of the Washington County, Maryland Free Library, 1952-1965,” (doctoral dissertation, Catholic University of America, 1966), 43.

| Version | Years | Description |
|----------------|--------------|---|
| [0] | 1904-1905 | Rented Concord wagon; used to ferry deposit stations |
| 1 | 1905-1910 | Custom-built horse-drawn wagon |
| 2 | 1912-1917 | International Harvester Autobuggy |
| 3 | 1917-1922 | Koehler truck |
| 4 | 1927-1931; | Dodge Business Car |
| 5 | 1931-1940 | |
| 6 | 1950-1957 | Studebaker truck (nicknamed “Delilah”) |
| 7 | 1957-1969 | GMC built on a 1947 chassis with automatic transmission |
| 8 | 1969-1985 | International Harvester chassis with custom body |
| 9 | 1985-2004 | 2 Thomas-built buses |
| 10 | 2004-present | OBS/Bluebird body |

Table 4-1. Iterations of the Washington County (MD) Free Library bookmobiles, 1904-present.

It also bears noting that the book wagon—and therefore its iterations—are not limited to the physical material artifact itself. For instance, the routes of the book wagon changed in an iterative manner throughout the course of book wagon work. Figures 4-8 through 4-10 illustrate a significant iteration in routes between 1908 and 1910. Sometimes routes were added to reach new territory; other times routes were changed or consolidated for efficiency: “it has been found advisable to change or consolidate some of the routes laid out and to increase the territory covered by others.”¹⁴⁴

¹⁴⁴ Washington County Free Library, Sixth Annual Report 1906-1907, 6-7.

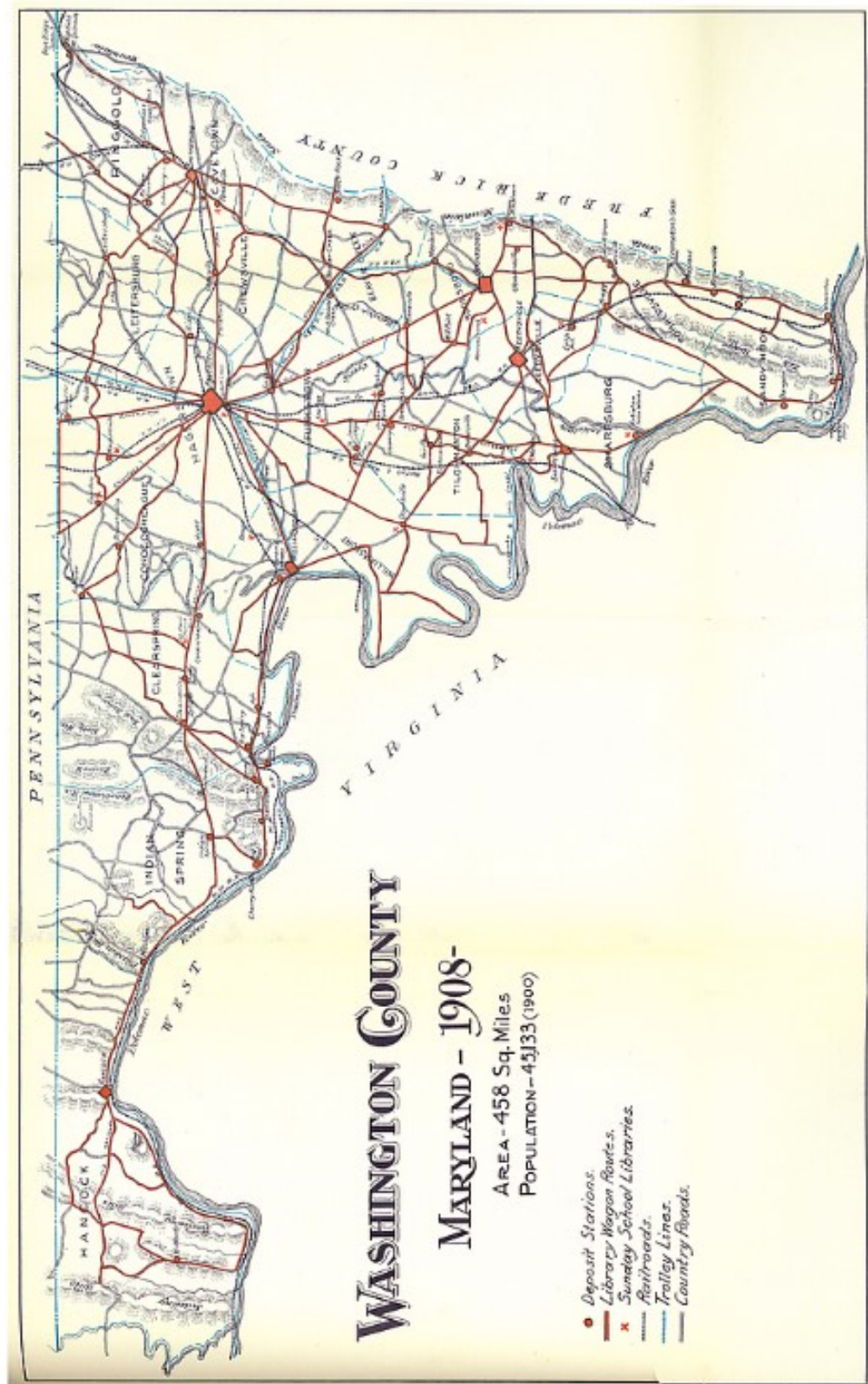


Figure 4-8. Map illustrating book wagon routes, 1908. Inset in the Washington County Free Library Seventh Annual Report, 1907-1908.

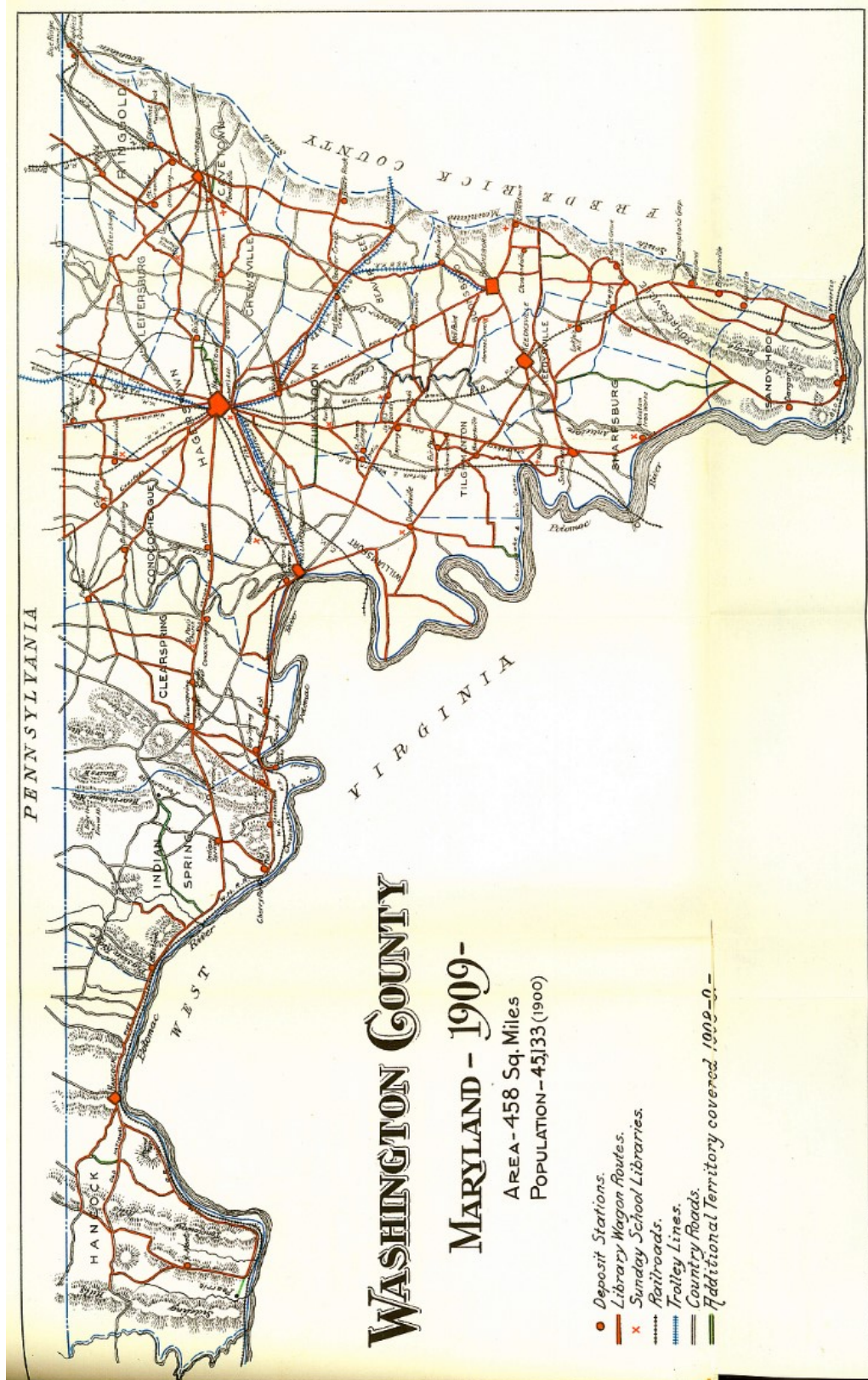


Figure 4-9. Map illustrating book wagon routes, 1909. Inset in the Washington County Free Library Eighth Annual Report, 1908-1909.

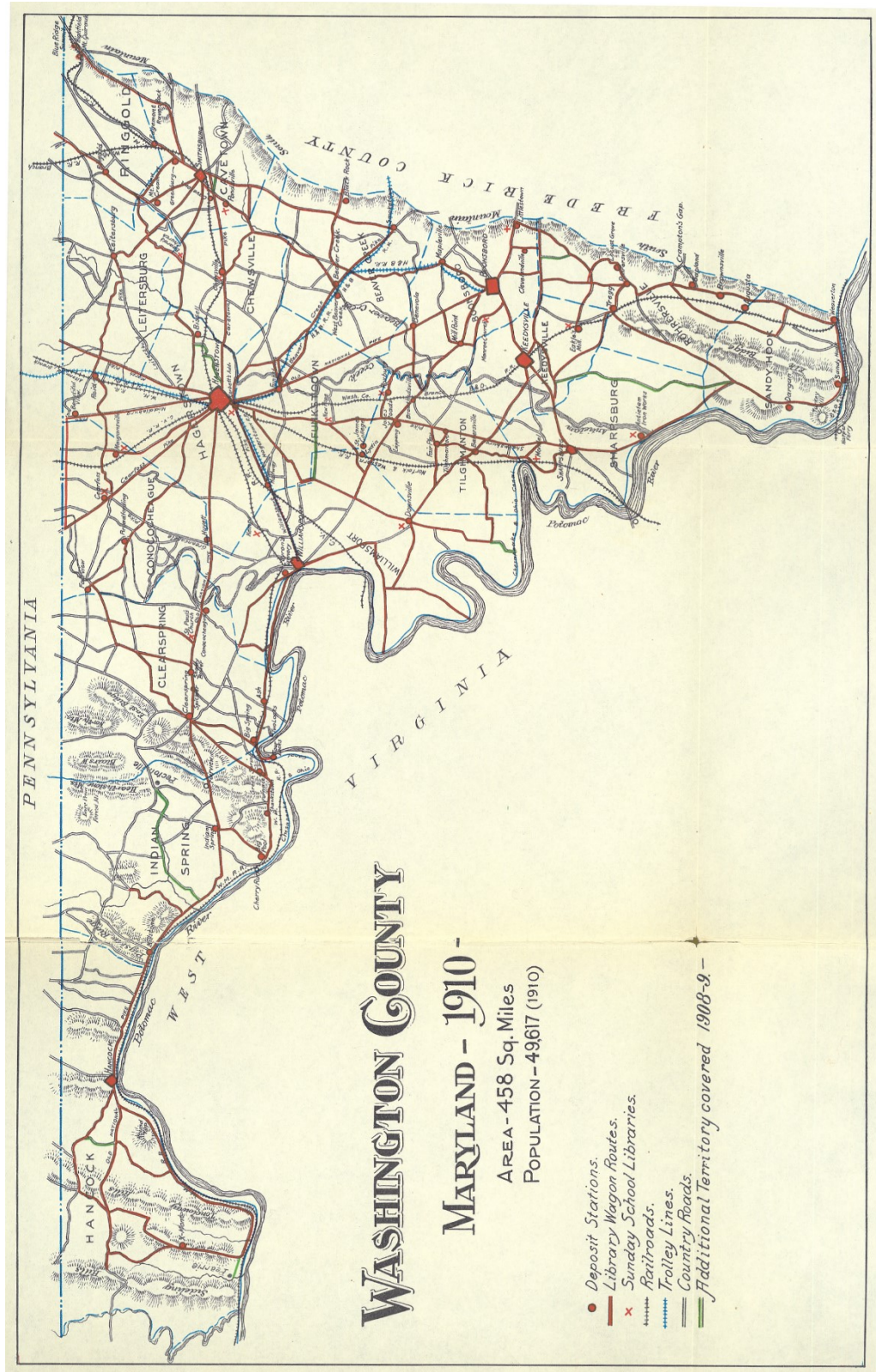


Figure 4-10. Map illustrating book wagon routes, 1910. Inset in the Washington County Free Library Ninth Annual Report, 1909-1910.

Iterations in staffing have also been noted, and certainly collections and materials carried by the book wagon have iteratively been redesigned throughout the years. Although Titcomb might not have called the practice iteration in so many words, she clearly believed in constant improvement. She says:

“...let us not forget that only never ceasing activity and watchfulness can make our institution the library of our dreams ‘Like a circle in the water/Which never ceaseth to enlarge itself’-until it has reached with its beneficent influence every man, woman and child in Washington County.”¹⁴⁵

Likewise, her position on the library as a living entity means not only constant vigilance, marketing, and advocacy of the library’s usefulness and benefits to society, but a clear acknowledgement that any given project is never simply completed and done. She notes that “to follow a well blazed trail from year to year, may not be reckoned as satisfactory progress,”¹⁴⁶ thus indicating the necessary role of iteration in the continuous improvement of library services and increased reach.

Like Poole’s Index and the WCFL book wagon, XC did not emerge from a vacuum, but rather was an iteration on projects that came before. Even before the first NSF grant application for XC, Lindahl and web developer Jeff Suszczynski were working on a prototype user interface called CUIPID 4 (later abbreviated to C4) that included features like faceted browsing and metasearch.¹⁴⁷ This prototype was later used as proof-of concept for the types of functionality the

¹⁴⁵ Washington County Free Library, Second Annual Report, 1902-1903, 10.

¹⁴⁶ Washington County Free Library, Eighth Annual Report 1908-1909, 10.

¹⁴⁷ David Lindahl and Jeff Suszczynski, “CUIPID 4: How to build a faceted searching and browsing interface for your library catalog,” LITA National Forum, Nashville, Tennessee, October 26-29, 2006. Slides, notes, and CUIPID demo accessed February 16, 2016, from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/View/Collection-3492>

XC user interface would provide.¹⁴⁸ Iteration also occurred during the development of the XC schema, the metadata standard created by the team to aggregate, normalize, and transform metadata among other schemas currently used to describe and represent library collections. As the XC team attempted to represent Resource Description and Access (RDA) concepts in the XC schema, they first used Dublin Core (DC) elements directly. But they soon found that some RDA concepts that needed to be represented in the XC schema had no equivalent terms in DC. Therefore, in the subsequent XC schema, new, non-DC elements such as “thesisAdvisor” were added.¹⁴⁹ Other iterations occurred based on similar rationale, and the Pre-Release Version of the XC Schema was published on January 7, 2009. Anything prior to Version 1.0 was considered “pre-release,” implying that some form of iteration was likely to occur between this and subsequent released versions.¹⁵⁰

Additional iteration in XC was observed as part of the typical software development process. Iterative versions of the Metadata Services Toolkit, the OAI toolkit, the NCIP toolkit, and the Drupal user interface are all easily identifiable based on typical software version numbering. For example, version 1.5.2 of the MST was released in January 2014; 1.5.3 in April 2014; 1.5.4 in October 2014, and the current version, 1.5.5, in July 2015.¹⁵¹ Where still available, release notes indicate what changes were made in each new iteration. For instance, version 7.x-1.2 of the Drupal toolkit fixed a security issue that previously allowed malicious users to access the NCIP module.¹⁵²

¹⁴⁸ Lindahl, Bowen and Foster, “eXtensible Catalog Phase 1 Final Report,” 5.

¹⁴⁹ Bowen, “Supporting the eXtensible Catalog,” 10.

¹⁵⁰ eXtensible Catalog Project XC Schema Definition, Pre-Release Version (January 7, 2009), accessed February 11, 2016, <http://www.extensiblecatalog.org/learnmore/publications/xc-schema-definition>

¹⁵¹ eXtensible Catalog Metadata Services Toolkit GitHub, accessed June 3, 2016, <https://github.com/eXtensibleCatalog/xcmetadataservicestoolkit>

¹⁵² Drupal Security Team, “The eXtensible Catalog (XC) Drupal Toolkit - Critical - Cross Site Request Forgery (CSRF) - SA-CONTRIB-2015-121,” accessed June 3, 2016, <https://www.drupal.org/node/2507619>

All of these examples speak to iteration. But in addition to these examples of iteration's influence on the process of development and the resulting products, what is interesting about XC is how such iteration was consciously built into the project itself. The vision and plan for XC was purposefully evolutionary from the outset and throughout the course of the project.

“Our vision and plan for XC continues to evolve. What started as a vision for getting around the limitations of our local ILS now looks like a way to bring the potential of ‘Library 2.0’ to any library through open source applications - and makes the vision very exciting - and might I say ‘extensible?’”¹⁵³

A commitment to ongoing revision throughout the software development process demonstrates not just happenstance iteration, but purposeful incorporation:

“Between now [January 2009] and the release of the XC Software in July 2009, we will continue to refine the definitions of the current XC Normalization and Transformation Services, and develop the XC Aggregation and Authority Control services. As this work progresses, we will make additional changes to these services and to the definition of the XC Schema as needed to support the functionality of the XC software.”¹⁵⁴

It was a revamped iteration of the unfunded NSF grant that made the XC project possible.

“Our grant proposals were in [DocuShare], we could look at the versions of the proposals and we would sort of iterate on them with our program officers, they would give us feedback. And it's great to sort of see how you got somewhere.”¹⁵⁵

¹⁵³ “XC in Library Journal, and Visions for Future Catalogs,” news post from eXtensible Catalog website (February 11, 2016), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-library-journal-and-visions-future-catalogs>

¹⁵⁴ Bowen, “Supporting the eXtensible Catalog,” 21.

¹⁵⁵ Lindahl, interview.

Over time, the descriptions of XC slowly changed from an interface to a suite of software tools. The iterations of scope and focus that emerged from the Phase I conference shifted the project from its front-end to back-end focus. The final report from this phase still included discussion of C4 as a proof-of-concept interface, but the proposed architecture to be developed in Phase 2 began to speak to the modular ideas of multiple softwares, most of which dealt with “back-end” issues.¹⁵⁶ The Phase 2 funding press release described the XC as “a platform for local development and experimentation that will ultimately allow libraries to share their collections through a variety of applications, such as Web sites, institutional repositories, and content management systems.”¹⁵⁷ The Phase 2 final report described major achievements in creating tools for ILS interoperability, metadata management, and the creation of a user interface built on existing Drupal modules.¹⁵⁸ The Phase 2 final report also noted achievements beyond software development, including contributions to research findings regarding the work practices of library users, the creation of a non-profit organization to manage future software maintenance and development, communication and dissemination of project results, and provision of training and experience with cutting-edge technologies,¹⁵⁹ thus showing iteration not just of project elements, but the goals, objectives, and outcomes of the entire project itself. Additionally, the open source nature of the project contributed to its iterative character. The Java-based XC tools (the MST, NCIP and OAI toolkits) were made available under the MIT Open Source License and the Drupal-based user interface toolkit was made available under the GNU General Public License.¹⁶⁰ Both licenses allow modification of the software code, therefore making it available

¹⁵⁶ Lindahl, Bowen and Foster, “eXtensible Catalog Phase 1 Final Report,” 5.

¹⁵⁷ “XC Phase 2 Grant Awarded,” news post from eXtensible Catalog website (October 23, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-phase-2-grant-awarded>

¹⁵⁸ “eXtensible Catalog (XC) Project Final Report [Phase 2],” University of Rochester River Campus Libraries, (April 30, 2010): 4-5.

¹⁵⁹ Ibid, 5.

¹⁶⁰ Ibid, 18.

for others to iterate on.¹⁶¹ And iterate they did. Many other institutions and organizations used and iterated on the XC software to create new projects, one of the most notable of these being the English Short Title catalog by Carl Stahmer at University of California, Davis.

The idea of iteration as a key part of XC was spearheaded by Lindahl, who believed strongly in the need for a shift in academic libraries from thinking about design as just a single end product to thinking about design as an iterative, ongoing process:

“I also find that people forget really easily. Especially when you think about library interfaces... at Rochester we spent years iterating on and improving the website. We had a great website. But if you looked at it on an absolute basis it still had a lot of flaws. And sometimes I think people, some of the librarians at Rochester would say, ‘oh this website is still terrible, look at all the problems.’ And then when you go back and look at where we were and how we got to where we got to, and recognize that some of the flaws are just flaws because you know it doesn’t work as easy as Google. Because you still have to go to all those databases. Like we still have to get people to these other resources. Because it’s not all, it’s not as simple. I think people seeing the history, having it all documented, the pictures of the old interfaces, the written results from doing heuristics testing and assessment usability tests and the ways that we made changes and the ways that we came to the language that we were using, people easily forget that it’s not about the absolute quality of the current interface, it’s about the quality of the process, the design process you go through to get from somewhere to some place better.”¹⁶²

¹⁶¹ See <https://opensource.org/licenses/MIT> and <http://www.gnu.org/licenses/gpl-3.0.en.html>

¹⁶² Lindahl, interview.

4.3.2 Repertoire

It should not come as a surprise that any project headed by William Frederick Poole would display evidence of repertoire, a key aspect of design where reliance on personal knowledge and experience from all contexts, including former design projects, is a legitimate source of knowledge. Poole's beliefs that superior library education and understanding came from hands on experience are well documented in the memoirs of those who worked closely with Poole.¹⁶³ "Experience in a large library is the best preparation for library work," he used to say."¹⁶⁴

Poole's Index also bears many hallmarks of professional repertoire. For instance, although the 1848 edition was by all reports well-received, Poole's exposure to other library tools—consciously or not—certainly influenced its design. When he began working at the Society library in 1847, Poole worked as assistant librarian to John Edmands, who in that same year compiled a small subject guide to assist library users entitled *Subjects for Debate, with Reference to Authorities*.¹⁶⁵ This handy guide offered references to books and specific periodical articles in the Brothers library collection on common debate themes, such as "Capital Punishment" and "Is War Ever Justifiable?" Although this "prehistoric Poole"¹⁶⁶ was not an index by any stretch of the imagination, but rather something akin to a subject bibliography,¹⁶⁷ it certainly laid the groundwork for a periodical index.

Additionally, as others begged for Poole to publish a new edition of the Index in the years leading up to 1876, Poole knew from his own previous experience that such an undertaking was

¹⁶³ William Stetson Merrill, "Early Days at the Newberry Library: Reminiscences of Persons and Events, 1889 to 1894," (unpublished manuscript, Newberry Library, March 15, 1954), 36.

¹⁶⁴ Merrill, "Early Days," 8.

¹⁶⁵ John Edmands, *Subjects for Debate, with References to Authorities* (New Haven, CT: Society of Brothers in Unity, 1847).

¹⁶⁶ J.C. Rowell, "Prehistoric Poole," *Library Journal* 16, no. 11 (November 1891), 109.

¹⁶⁷ Joan M. Reitz, "subject bibliography," *Online Dictionary of Library and Information Science* (Santa Barbara, CA: ABC-CLIO, 2015), accessed September 23, 2015, http://www.abc-clio.com/ODLIS/odlis_s.aspx#subjectbib

simply “too large for one man to achieve.”¹⁶⁸ He may have also drawn on repertoire when he suggested, instead of one man taking on the work, a cooperative approach to periodical indexing could be employed instead. Although uncredited in the work itself, Poole actually received indexing assistance from at least one other person during the creation of the 1853 edition. D.C. Gilman, a Yale student at the time (who would subsequently go on to be President of Johns Hopkins University), indexed at least 5 periodical titles for this edition.¹⁶⁹ So the idea of sharing work among more than one indexer was an experience Poole had dealt with in the past and could now bring to bear on the current situation. If the problem was too much work for one man, then why not spread the work among many? This previous collaboration also offered additional repertory knowledge: that index entries from multiple indexers could vary widely. From his work with Gilman, Poole knew that although indexers needed a certain amount of leeway to use their judgement, they also needed guidelines.¹⁷⁰ Therefore, as part of a committee along with Charles A. Cutter and Justin Winsor, Poole devised rules and guidelines for the cooperative indexing project.¹⁷¹ From his work with Gilman he also know that oversight would be necessary.¹⁷² A “central bureau”¹⁷³ would review the index entries and make the proper alterations to ensure conformity. Poole nominated himself in the role of central bureau, and selected William I.

¹⁶⁸ “Universal Index of Subjects,” *Transactions of the Conference of Librarians* (1878), 163.

¹⁶⁹ Letter, W.F. Poole to D.C. Gilman (December 10, 1852), Box 1, Folder 2, W.L. Williamson - William F. Poole Research Papers.

¹⁷⁰ Transcript of letter, W.F. Poole to D.C. Gilman (December 22, 1852), Box 1, Folder 6, W.L. Williamson - William F. Poole Research Papers.

¹⁷¹ Justin Winsor, William F. Poole and Charles A. Cutter, “Poole’s Index Committee—Second Report,” *American Library Journal* 1, no. 8 (April 30, 1877), 286-287; Justin Winsor, William F. Poole and Charles A. Cutter, “Poole’s Index Committee—Third Report,” *American Library Journal* 1 no. 9 (May 31, 1877), 324.

¹⁷² Poole to Gilman (December 22, 1852), W.L. Williamson - William F. Poole Research Papers.

¹⁷³ “Proceedings: Co-operative Indexing,” (November 30, 1876), 117.

Fletcher, then librarian at the Silas Bronson Library in Waterbury, Connecticut, as his assistant.¹⁷⁴

Repertory knowledge in design is not limited to that gained through iteration on a single project, but through every experience and exposure. Poole worked on a number of other library projects, from Finding Lists of the Chicago Public Library to architectural plans for the Newberry Library, all of which surely must have influenced his approach to librarianship and, in turn, his indexing designs. Although it is difficult to provide concrete evidence of such broad influences, one can actually be seen in the opposite direction—Poole exhibits use of repertory knowledge gained from the creation of the 1848 and 1853 indexes in his 1854 *Catalogue of the Mercantile Library of Boston*.¹⁷⁵ This work demonstrates many principles gleaned from the creation of the 1853 Index, such as the “title-a-line” principle, inversion of titles to bring out subject terms, and the particular arrangement of author, title, and subject in a single alphabetical sequence.¹⁷⁶ Repertory knowledge gained from work on the Index also came in handy for reference service, as Poole found the bibliographical information he obtained during its preparation very valuable for working in libraries overall.¹⁷⁷

Like Poole, Mary Titcomb was also an active librarian who traveled in professional circles and drew on a large repertoire of knowledge, both library-related and from other experiences, to inform her work across the board. Titcomb was already 44 years old when she arrived in Hagerstown to assume the position of WCFL Librarian, with extensive library experience under

¹⁷⁴ “Report of the Committee on a New Edition of Poole’s Index,” *American Library Journal* 1, nos.4-5 (January 31, 1877), 181.

¹⁷⁵ William Landram Williamson, *William Frederick Poole and the Modern Library Movement* (New York, NY: Columbia University Press, 1963), 20.

¹⁷⁶ Carl B. Roden, unpublished draft of Poole biography (n.d.), Box 2, Folder 20, Carl B. Roden - William F. Poole Papers, The Newberry Library, Chicago, 8.

¹⁷⁷ Transcript of letter, W.F. Poole to Edward C. Herrick, (n.d.), Box 1, Folder 2, Carl B. Roden - William F. Poole Papers.

her belt: she apprenticed at the Concord (Mass.) Public Library before serving as librarian at the Rutland (VT) Public Library.¹⁷⁸ She was also secretary of the first Vermont Library Commission and spent twelve years what we might now call consulting—organizing or reorganizing libraries throughout Vermont that needed attention and assistance.¹⁷⁹ This extensive experience was a major reason for her selection for the WCFL position. Many citizens thought that a local Washington County resident should have been selected for the post,¹⁸⁰ but the minutes of the WCFL Board of Trustees cite her “wide experience in Library work” as reason for her selection.¹⁸¹ Titcomb’s experience—her repertory knowledge—was a major factor in her recruitment.

Titcomb put this repertory knowledge to good use in many areas of WCFL, from children’s librarianship to school outreach, and even a training program for education in librarianship.¹⁸² In the case of the book wagon, she herself acknowledges drawing on several specific ideas to which she had been exposed in her past. First was Dr. Thomas Bray’s 1697 idea about lending libraries in Maryland which advocated for taking books to people in the countryside, rather than requiring those people to travel miles for access to intellectual resources.¹⁸³

“Standing Libraries will signifie little in the Country, where Persons must ride some miles to look into a Book; such Journeys being too expensive of Time and Money: But

¹⁷⁸ “Miss Titcomb Dies After a Long Illness,” *The Morning Herald*, Hagerstown, MD, 1.

¹⁷⁹ Moser, “Mary Lemist Titcomb,” 378.

¹⁸⁰ Judith Braunagel, “Mary Lemist Titcomb, 1857-1932,” (1976), Mary Lemist Titcomb Vertical File, Western Maryland Room, Washington County Free Library.

¹⁸¹ Minutes of the Board of Trustees (December 8, 1900), Washington County Free Library, 44.

¹⁸² Marcum, “The Rural Public Library.”

¹⁸³ Titcomb, “Story of the Washington County Free Library,” 10.

Lending Libraries, which come home to ‘em without Charge, may tolerably well supply the Vacancies...”¹⁸⁴

Titcomb was directly inspired by Bray’s idea to create the early deposit stations, the precursors that directly led to the book wagon service. Here she describes exactly the connection between Bray and the work at WCFL:

“Quite the modern library idea of carrying the war into the enemy’s country in the guise of rural delivery, deposit stations and traveling libraries. Identical also were his notions as to the management of these early deposit stations with the branches sent out today from our library, for he plans to provide for them ‘book presses made on purpose to keep them in’ and to deposit them with ‘the minister or schoolmaster in some market town if near the center of the Deanery, that so they may with very little trouble be sent for on any market day and returned within a limited time.’ He also opines that ‘any minister or schoolmaster for the use of such a library under his key will be willing to undertake the trouble to lend out the books and receive them in upon occasion.’ Precisely what 38 merchants, postmasters and others are doing today with the cases of books sent out from the central library at Hagerstown.”¹⁸⁵

Titcomb was also influenced by Melvil Dewey’s “traveling libraries.”¹⁸⁶ Launched in New York State in 1893, Dewey’s traveling library program consisted of ten locking oak bookcases filled with 100 books each which were sent to small public libraries around the state for six-month loan

¹⁸⁴ Thomas Bray, “An Essay Towards Promoting all Necessary and Useful Knowledge, both Divine and Human, in all the Parts of His Majesty’s Do-minions, Both at Home and Abroad,” Printed in *Rev. Thomas Bray, His Life and Select Works Relating to Maryland*, ed. Bernard C. Steiner, (Maryland Historical Society Publication No. 37, Baltimore, 1901), 64-65, and quoted in Samuel Clyde McCulloch, “Dr. Thomas Bray’s Commissary Work in London, 1696-1699,” *The William and Mary Quarterly* 2, no. 4 (October 1945), 337.

¹⁸⁵ Washington County Free Library, Second Annual Report, 1902-1903, 7-8.

¹⁸⁶ Marcum, *Good Books in a Country Home*, 99-100.

periods.¹⁸⁷ By 1900, the number of cases had risen to 1,000, and circulated 360 times.¹⁸⁸ As an active librarian in New England during this time (Titcomb’s participation in the American Library Association, of which Dewey played a significant role, is well-established¹⁸⁹), Dewey’s traveling libraries cannot have escaped her. Indeed, Titcomb and Dewey even corresponded in later years, with him expressing admiration for her work.¹⁹⁰

In XC, repertoire is not as explicitly evident as in Poole’s Index and the WCFL book wagon, but suggestions of repertoire are still present. The most notable examples come from interviews with Lindahl and Foster, who described the relationships between their previous projects and the work on XC. Lindahl drew on knowledge gleaned during his time at Xerox. He described how one project in which he participated—the digitization of 70,000 35mm art history slides and development of a Java-based software tool that integrated with the library’s ILS to mimic a light table—built up his knowledge of library related work practices and technologies.

“I’m kind of telling you a lot of history, but basically I learned the MARC format, I learned Z39.50, I learned how to integrate software between the web and Innovative system, which was, little did I know, probably one of the hardest ILSes to integrate with.”¹⁹¹

He spoke about what he learned on this project, and while that knowledge may seem like “history,” it is clear that his knowledge of MARC, Z39.50, and the Innovative Interfaces

¹⁸⁷ Wayne A. Wiegand, *Irrepressible Reformer: A Biography of Melvil Dewey* (Chicago, IL: American Library Association, 1996), 198-199.

¹⁸⁸ *Ibid.*, 199, 203.

¹⁸⁹ Minutes of the Board of Trustees (June 19, 1912), Washington County Free Library, 120; Minutes of the Board of Trustees (March 19, 1914), Washington County Free Library, 132.

¹⁹⁰ Postcard from Melvil Dewey to Mary Lemist Titcomb, (February 28, 1910), Washington County Free Library Administrative Archives.

¹⁹¹ Lindahl, interview.

integrated library system and other library-related topics offered a foundation of knowledge that not only assisted his work on XC, but without which XC would not have been possible.

Foster also drew on her repertoire of knowledge. But unlike Lindahl, who drew on previous knowledge about libraries, Foster demonstrated knowledge by drawing a parallel between her previous anthropological studies in the Amazon communities of South American and her work at the University of Rochester and XC.

“I had the theoretical background and I had a lot of research experience that on the surface seemed like it would be very different because it was like in the Amazon basin, but actually in terms of the issues I was dealing with, had a lot of similarities. And also methodologically there were similarities, because I had spent a lot of time looking at how people worked, and then developing, you know, interpretations of culture and society. So it was really a pretty short step to the participatory design stuff.”¹⁹²

Foster deftly took repertory knowledge from a previous situation—her work in the Amazon—and transferred it to her work on XC based on connections between the previous and current situations.

4.3.3 Reflection

Although evidence of reflection was sought in existing materials, no evidence of this element of design epistemology was observed in Poole’s Index or the WCFL book wagon cases. It is unclear whether reflection was not legitimately present in the course of the work; present but not recorded in the artifacts or documents surrounding the design; or recorded but records of its presence were subsequently lost. Given that the answer to this conundrum is unknown, I cannot

¹⁹² Foster, interview.

rule out the existence of these elements; however, neither can I sufficiently argue for their presence. Since interviews were not possible in these historical cases, the only other way such evidence might be recorded would be if Poole or Titcomb somehow communicated about their reflection process to another person who recorded it, or if they recorded it themselves in a diary or memoir, neither of which are known to exist.

There are a few instances in XC where reflection can be observed. These examples appear to demonstrate reflection-on-action (i.e., reflecting on a design decision after it has been made). For example, the XC Phase 2 final report includes a concluding section that indicates some reflection on the overall project, including challenges and lessons learned.¹⁹³ Additionally, the XC interviewees all noted that the interview process itself served as a kind of reflection-on-action, such as Foster, who said “It was fun to reflect back on it [XC].”¹⁹⁴ All of the interviewees indicated that, at the very least, the interviews for this study offered them a useful and enjoyable opportunity to reflect on XC.¹⁹⁵ It is also clear that they each had reflective evaluatory contributions prior to the interviews. Bowen mentioned an unfinished book manuscript that detailed reflections on the project:

“You know at one point we were thinking, we had actually started writing a book about our experiences developing XC. And we were not, that did not continue. So we never published it. But there was a lot that we wanted to say about what worked and what didn’t work, about the project and to be able to share that and we’ve never really done that.”¹⁹⁶

¹⁹³ eXtensible Catalog (XC) Project Final Report [Phase 2], 19-20.

¹⁹⁴ Foster, interview.

¹⁹⁵ Foster, interview; Bowen, interview; Lindahl, interview.

¹⁹⁶ Bowen, interview.

Although the discussion did not articulate specific details, it was clear that active thought had been put in to reflecting on the project and sharing those reflections with a wider community. She also mentioned how reflection fostered knowledge through change of perspectives: “the longer we go out from finishing it or not working on it anymore, perspectives change a bit. And Nancy and Dave may have very different ideas about what we should have done differently.”¹⁹⁷ In contrast, Lindahl expressed more personal reflections about himself, his motivations and passions:

“I think that what I also learned that is sort of frustrating, I’m not frustrated by it because I’m proud of it, but I mean, I don’t want to be a salesperson. And I don’t want to be an open source community builder. Like, that’s not interesting to me... I want to do interesting projects that are in the space of applied research. I want to build, I want to do research that’s applied. You know, I don’t want to do basic research. I’m not interested in that. And I don’t want to build a non-profit or open source software company. We did that. But it wasn’t that interesting. I don’t want to do it. So, that’s not my role. And we probably, you know, if we had a fourth XC leader beyond Nancy, myself and Jennifer, it would have been the business person. The person who was passionate about building that entity and reaching out and building all those bridges and we didn’t have that.”¹⁹⁸

But even though his current reflective position came from a personal place, it offers insight at more than just a personal level. First, it speaks to what might have happened differently to make XC even more successful—specifically a full-time position in a business management role, which is useful evaluative feedback. Second, his personal connection also seems to advocate for

¹⁹⁷ Ibid.

¹⁹⁸ Lindahl, interview.

deeper reflective and evaluative connections beyond individual projects: looking at ourselves and our own roles, and the ways in which they align and diverge with design projects can also offer useful evaluation.

Although evaluation is connoted with success, failure—especially reflection on failure—can also offer useful evaluation. Both Bowen and Lindahl mentioned that one unsuccessful aspect of XC was its inability to rapidly process large quantities of metadata records. Bowen noted that learning what doesn't work can be just as useful as learning what does:

“We thought this was going to work but when we try to run a million records through it, it won't, you know, there's no way. I mean, I guess that was really the outcome of the project, we learned that it really isn't robust enough. We learned that that's something that's not going to work.”¹⁹⁹

Lindahl discusses using this seeming failure to actively iterate improvements:

“[The metadata services toolkit] worked really slowly at first. And one of the steps in our process was to hire a software engineer. I think there were well over 20 software developers that worked on eXtensible Catalog over the many years. But one of those developers was hired specifically to make the metadata toolkit run faster... And he did it. He made it run faster. We hired him based on his expertise and he found the bottlenecks in the processing. And it really came down to, you know, we're processing millions of records so milliseconds count. So he would find where the biggest milliseconds were coming from and squash 'em.”²⁰⁰

¹⁹⁹ Bowen, interview.

²⁰⁰ Lindahl, interview.

Foster had alternative perspectives about project evaluation and success. She noted that regardless of functionality, XC was successful because it was able to gather specific knowledge about user needs and use that knowledge in the design process. For instance, she talked about how XC was not just about achieving the functionality of faceting, but also learning about information behavior:

“So just as one example, Jennifer created the metadata standard in a way where later on you could facet for non-microform formats. ‘Cause we just got back so many people saying that they **hated** microform. They really didn’t want to see that stuff. But there was a lot of other stuff that we got that was to do with faceting and how people browse and what kind of information they want. You could say that it influenced the interface, and it did, but what it really influenced was what had to happen under the hood so that the interface could be workable for people.”²⁰¹

Additional evaluative reflection reveals that failure and success are not always diametrically opposed. Bowen astutely observed that what might be perceived as certain failures on the part of XC really have more to do with context and placement in time.

“[XC] didn’t succeed in the way we originally intended it to. Some parts of the software, I think, were really successful. And in fact I think that they still, I think that they were ahead of their time, actually. And I think that there will be more call for them perhaps as we move away from a MARC-based environment. Unfortunately I think we were developing that part of the software in a period of great flux. RDA was being developed actually at the same time as XC and we were trying to implement the RDA linked data

²⁰¹ Foster, interview.

properties, but they hadn't been fully defined yet, so that made it very difficult. [laughs] And BIBFRAME hadn't even been conceived of yet, but we knew there was going to be something that would come after MARC, so this particular part of the software, the metadata platform was really designed to transform MARC metadata into something else. And what else? It could be any number of things, but what people inevitably will want it to become, which will be perhaps BIBFRAME, but it hadn't even been conceived of yet. So I still think that there's a use that hasn't even been, I think that people will find uses for it in the future with some additional development that there's a platform that we created that could be used, say, to transform MARC data to BIBFRAME data. So that part of the project, yes, I think it's a success and I think it will become more of a success. That's what's being used by the digital humanities community right now."²⁰²

Although portions of XC software might have been less functional, XC pushed other entities, like the Library of Congress, to step up their game, to push for and improve new developments and standards, and create what could be perceived as a success, albeit for an entirely different project.

The length of time between the end of the XC project in 2011 and the research of this study in 2015-2016 meant that these descriptions and observations of reflection are limited to reflection-on-action. No evidence of reflection-in-action (i.e., reflection during the course of making design decisions) was seen in any of the three cases. While this is unfortunate, it is not surprising, because by its very nature, reflection-in-action must occur during the design process, and these cases were analyzed *ex post facto*.

²⁰² Bowen, interview.

4.3.4 Use of representations

Evidence of the use of representations in the design process is also tenuous in all three cases. Although Poole's indexing process is described,²⁰³ none of the actual slips representing the indexing entries in Poole's Index appear to still exist. Without these documents, it is impossible to tell if they were used in a manner consistent with ideating and communicating, as they are in design, and if so, in what way. There are a few marked page proofs from the 1882 edition that have survived which could arguably constitute evidence of design representation. However, these examples are limited to a few pages from the prefatory materials (none of the index entry pages) and the corrections are mostly typographical. Regarding the book wagon, Titcomb makes reference to interviewing wagon makers prior to the design and construction of the first iteration, trying "to elucidate her ideas with pen and pencil,"²⁰⁴ which may be the closest allusion to sketched representation across all three cases. However, like the slips from Poole's Index, none of these ideation drawings are known to have survived. Regarding XC, much of the documentation and several interviewees referred to notes and prototypes, but none of these materials were currently available.

4.3.5 Abductive reasoning

Similar to reflection-in-action, abductive reasoning is an internal thought process that takes place during design work. Therefore, it is difficult to observe even under ideal circumstances. Between the after-the-fact nature of this inquiry and the lack of ability to observe thought processes, no evidence of abductive reasoning could be gleaned in the early historical cases. Although attempts were made to elicit information about abductive reasoning during interviews with XC

²⁰³ Winsor, Poole and Cutter, "Index Committee—Second Report," (April 30, 1877): 286-287; Winsor, Poole and Cutter, "Index Committee—Third Report," (May 31, 1877): 324.

²⁰⁴ Titcomb, "Story of the Washington County Free Library," 14.

participants, the time removed from their work and the lack of an easy, common language to describe design and abductive reasoning without asking leading questions made engagement of this topic nearly impossible. Thus no conclusions can be drawn as to the presence or absence of abductive reasoning itself in each of the three cases, only that evidence of it could not be observed for a variety of reasons.

4.4 Design Evaluation Methods

If design problems have no right or wrong solutions, only better or worse ones, how do we know what constitutes better or worse? Criteria for assessment in design epistemology also differ from those in the sciences and humanities. Each of the cases in this study drew on elements of assessment in design, specifically critique, rationale, and adoption to demonstrate validity and success.

4.4.1 Critique

Often, design critique occurs at the end of a project as part of a final assessment. But in an ideal situation, critique of a design happens throughout the design process, not just after its completion and/or deployment.

Poole's Index clearly demonstrates the use of critique through the solicitation of feedback during the design process. Although the 1848 and 1853 editions of Poole's Index do not evince much in the way of feedback, the 1882 edition offers a few examples of Poole asking for input from other experienced librarians, such as this letter to Justin Winsor:

“I enclose a rough list of periodicals I have made with the reference to including them in the new edition of my Index. I submit it for your inspection and revision. I shall be very glad to receive your thoughts on the subject. Shall the list be larger or smaller? Shall

some here included be left out and others added? Please show it to Mr Cutter. By putting our heads together and [collating] our ideas we may be able to strike the happy mean. We cannot index everything.”²⁰⁵

Poole also solicited feedback on the scope and coverage of the Index, such as the question of whether to include Saturday newspapers, or specialty topics like science, medicine, and law. He says: “Please think about it, and talk it over with your associate professionals, and give me the results of your deliberations.”²⁰⁶ While Poole directly sought feedback from well-known librarians of proven experience, others too had feedback and suggestions. *Library Journal* printed a four-page table of proposed periodicals to be indexed, noting that it was “strictly provisional, and librarians or others interested should at once express their criticisms or suggestions to Mr. Poole.”²⁰⁷ Based on the response of the committee in a subsequent report, it was clear that the open opportunity for critique surfaced issues of scope, as well as problematic and unclear use of abbreviations.²⁰⁸ In 1877, Walter Biscoe published a thorough critique of the 1853 Index, in the context of the work proceeding on the new edition. He offered a thorough analysis of the ways in which the 1853 Index fails to meet its own goals, as stated in the Preface.²⁰⁹ In June of 1878, “to avoid certain imperfections evident in the old index,” *Library Journal* hosted a symposium (a kind of debate published in print) on the plan and indexing guidelines for the 1882 edition, where librarians could contribute comment or critique.²¹⁰ Seven

²⁰⁵ Letter, W.F. Poole to Justin Winsor (November 2, 1876), Box 4, Folder 19, W.L. Williamson - William F. Poole Research Papers.

²⁰⁶ Ibid.

²⁰⁷ Untitled introductory material, *American Library Journal* 1, no. 10 (June 30, 1877), 364.

²⁰⁸ “Poole’s Index Report [5],” *Library Journal* (September 1877), 17.

²⁰⁹ Walter S. Biscoe, “The Improvement of Poole’s Index,” *American Library Journal* 1, no. 8 (April 30, 1877), 279- 281.

²¹⁰ “Editorial Notes,” *Library Journal* 3 no. 4 (June 1878), 152.

librarians contributed in-depth critique, mostly concerning the lack of classified arrangement, vocabulary control and cross-references.²¹¹

Other critique came after editions of the Index were published, in the form of published reviews.

While nearly every review praised the Index, regardless of edition, several also offered critique.

For example, *The Church Review* was satisfied with the general idea of the 1848 Index, but it criticized the omission of existing indexes as well as the focus on American magazines.²¹²

Norton's Literary Gazette echoed the problematic focus on American periodicals when reviewing the release of the 1853 edition.²¹³ *The New-England Historical and Genealogical Register* criticized the abbreviation of their own title in the preparation of the 1882 edition:

“...we cannot understand upon what principle the committee in charge of this matter propose to omit the word ‘Historical’ in the title of this periodical, and adopt as an abbreviation of its title, ‘N.E. Gen. Reg.’ If ‘N.E. Hist. & Gen. Reg.’ is too long to print, ‘Hist. & Gen. Reg.’ certainly is not. We hope they have been more careful with other titles.”²¹⁴

Yet a review of the same edition from *The Nation* asserts that the abbreviations are easily understood.²¹⁵ This is a useful example of critique, since critique need not be negative: pointing out concrete successes (not just general praise as most of the reviews in this example provide) is

²¹¹ S.B. Noyes and others, “The Plan of the New ‘Poole’s Index’: A Library Symposium,” *Library Journal* 3, no. 4 (June 1878), 141-151.

²¹² Review of *An Index to Subjects treated in the Reviews and Other Periodicals*, *The Church Review* 3 (October 1848), 462-463.

²¹³ “Poole’s Index,” *Norton Literary Gazette* (March 15, 1853).

²¹⁴ Review of *The American Library Journal*, *The New-England Historical and Genealogical Register* 32, no. 125 (Boston: The Society’s House, January 1878), 112. Note that the abbreviation ended up as “N.E. Reg.” in the 1882 edition of the Index.

²¹⁵ “Poole’s Index,” *The Nation*, no. 916 (January 18, 1883), 63-64.

also valid assessment of a design. In fact, the review in *The Nation* runs just over 2,000 words, offering an in-depth, expert critique that eminently characterizes design assessment.

The WCFL book wagon does not offer evidence of critique in the same manner. Direct critique does not appear to have been purposefully sought from peers and experts. However, the book wagon idea from WCFL was copied by many other libraries throughout the country. Such adoption and emulation may also be considered as indirect critique of a design, in that how much or little a design is used or copied can provide a kind of feedback on that design. However, the concrete connection to explicit critique is tenuous, and adoption and emulation of the WCFL book wagon will therefore be covered in greater detail under the more appropriate section discussing criteria-based evaluation.

XC, on the other hand, does explicitly display evidence of purposefully seeking critique throughout the project, rather than leaving it until the end. This tactic was explicitly intended to ensure a better design outcome. One example of early solicitation of critique was a direct outcome of receiving funding specifically for planning rather than system building, because that funding enabled the partners conference in February 2006.²¹⁶ Lindahl had written a software architecture for XC prior to this meeting, and based on this preliminary design, experts and thought leaders offered ideas and feedback. He emphasized the impact of this platform for critique: “We ended up being able to hold a conference that really shaped what XC became.”²¹⁷

In addition to the conference, other avenues were used to solicit critique throughout the planning phase. A survey was distributed to representatives of partner institutions and potential users of

²¹⁶ “XC Phase I Partner Activities,” news post from eXtensible Catalog website (October 8, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-phase-1-partner-activities>

²¹⁷ Lindahl, interview.

XC in an attempt to glean feedback. While much of the survey focused on needs assessment, information was also gathered by asking respondents to critique current library systems.²¹⁸ This critique was then used to prioritize and design different features of XC. Also, a blog was set up as part of the <http://extensiblecatalog.info> website, and many of the posts throughout Phase I specifically ask for input.²¹⁹ It is difficult to ascertain how effective this strategy was at garnering interaction because most of the comments appear to have been lost (presumably due to the port of <http://extensiblecatalog.info> to <http://extensiblecatalog.org>, likely circa 2014 with the transition from the University of Rochester to the new XCO non-profit organization). However, there is trace evidence that some feedback was indeed posted by community members, sparking conversations and influencing design decisions.²²⁰

The incorporation of critique into the planning stages of design, rather than relegating it to the end, ties into the idea of iteration. To ensure useful iteration, evaluation such as critique must happen throughout the design process. This also reflects the idea articulated by Lindahl that success is in the process, rather than a singular end product.

4.4.2 Rationale

Although experts may point what they see as flaws in a given design as part of critique, that does not automatically mean those flaws are legitimate. Much of this assessment hinges on how the

²¹⁸ “XC Survey Results,” news post from eXtensible Catalog website (July 20, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-survey-results>; see also Nancy Fried Foster and others, “eXtensible Catalog Survey Report,” (River Campus Libraries, University of Rochester, July 20, 2007), accessed February 16, 2016, <http://www.extensiblecatalog.org/learnmore/publications/extensible-catalog-survey-report>

²¹⁹ “Check Out Our New Lit Review,” news post from eXtensible Catalog website (September 12, 2006), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/check-out-our-new-lit-review>; “XC in Library Journal, and Visions for Future Catalogs,” news post from eXtensible Catalog website (August 28, 2008), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-library-journal-and-visions-future-catalogs>; “Is There a Need for XC?” news post from eXtensible Catalog website (May 26, 2006), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/there-need-xc>; “What is XC, in a Nutshell?” news post, (May 26, 2006).

²²⁰ “Is XC Addressing Needs for Metadata Control? Yes!” news post from eXtensible Catalog website (October 23, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-addressing-needs-metadata-control-yes>

problem was framed. Although rationale is used throughout the design process to guide decision-making, it can also be used as a legitimate form of assessment. We can better identify which solutions are “better” or “worse” if we understand and communicate why specific elements of that solution were chosen and applied.

For instance, to anyone looking for all the articles within periodicals written by a specific author, Poole’s Index would have been a terrible solution. But Poole did not frame the problem thus; as noted earlier, he specifically framed it as an issue of subject access. Therefore, all the design decisions over the course of the Index should support this framing, and not another. When rationale aligns with design decisions, better solutions emerge. If rationale does not align with the decision—if the choices do not support the goal as framed—the solution may be interpreted as a worse one (or the problem may be revisited and reframed). Many examples of using rationale to justify and assess design decisions appear in the development of Poole’s Index. For example, not only did Poole frame the problem in terms of subject access, but he was also very explicit that such access be quick and convenient.²²¹ To support speed of access, Poole chose to favor brevity, and not to include full, detailed references, which he contended would be overwhelming to library users and slow them down in their work. “The great minuteness of reference in Indexes, is as often an inconvenience, as an aid to the general reader...”²²² Most articles had only a single subject reference, to ensure conciseness.²²³ Although Poole never discussed it explicitly, the implication is clear that the use of abbreviations was also meant to save space on the page as well as a user’s working memory. Poole also returned to the theme of user convenience when responding to critique of the plan for the 1882 Index. He justified the use

²²¹ “Publisher’s Circular,” *Literary World* (April 29, 1848), 250.

²²² Poole, *Alphabetical Index* (1848), iv.

²²³ “Publisher’s Circular,” *Literary World* (April 29, 1848), 250.

of alphabetical arrangement, rather than classified arrangement, by saying that “a simple alphabetical arrangement requires no preliminary study.”²²⁴ Alphabetical order, he argued, is already familiar to all, unlike classified arrangements, which take time to learn—time which Poole believed readers would not take.²²⁵ Poole also explicitly demonstrated rationale in his stipulations for preferred spelling; not so much for user convenience, but for user perceptions and respect:

“Plow is the spelling adopted by every manufacturer of the implement in the United States, and of every agricultural society which does not have its reports printed in Boston and Cambridge. Plough is a bit of provincialism in this day, and I don’t want our book to have the atmosphere of provincialism.”²²⁶

Other examples of rationale are connected to materiality, either decisions about materials or decisions based on material constraints. While Poole wanted rough edges on the first Supplement for aesthetic reasons, saying that cut edges were “Dutchy” and “simply horrid,”²²⁷ the publishers at Houghton Mifflin & Company felt differently:

“As a matter of taste, we agree entirely with Mr. Poole in preferring a half morocco binding with gilt top and rough edges, but unfortunately the popular taste, we have found by experience, does not appreciate this style. We have even known customers to return

²²⁴ Poole, “Index Symposium,” 181.

²²⁵ Ibid.

²²⁶ Letter, W.F. Poole to Ticknor (March 27, 1882), Box 4, Folder 20, W.L. Williamson - William F. Poole Research Papers.

²²⁷ Letter, W.F. Poole to Justin Winsor (April 1, 1886), Box 5, Folder 22, W.L. Williamson - William F. Poole Research Papers.

such volumes, complaining that the binding was left unfinished, because of the rough edges.”²²⁸

In addition to aesthetics and sales potential, the publishers at Houghton, Mifflin, and Co. also pointed out that rough edges pose a usability problem. “A Dictionary or book of reference is far less easily consulted & run over if the leaves are untrimmed...”²²⁹ and “we cannot imagine that those who use the ‘Index’ constantly would like to have an untrimmed copy for daily use any more than they would like to have an untrimmed Webster’s or Worcester’s Dictionary or any of the cyclopaedias.”²³⁰ (See Figures 4-11 and 4-12 for an example of rough/untrimmed vs. cut/trimmed pages).

Other rationale included the continued justification for brevity and narrow focus on subject access. In the Preface to the fourth Supplement, Fletcher and Mary Poole stated that although the inclusion of additional access points, such as authors, in Poole’s Index was desirable, “such entries added to those now included would nearly double the amount of matter and the consequent size and cost of the volumes, which consideration is simply prohibitive from a commercial point of view.”²³¹ The rationale changed with the authorship: instead of user speed and convenience as underlying justification, material costs and return on investment drove design decisions, a choice which ultimately led to Poole’s Index losing favor to other indexes like Wilson’s *Reader’s Guide to Periodical Literature*, which did include those additional desirable access points.

²²⁸ Letter, Houghton, Mifflin and Co. to Justin Winsor (April 6, 1886), Box 5, Folder 22, W.L. Williamson - William F. Poole Research Papers.

²²⁹ Letter, Houghton, Mifflin and Co. to W.F. Poole (September 21, 1888), Box 11, Folder 826, Newberry Library Archives.

²³⁰ Letter, Houghton, Mifflin, and Co. to W.F. Poole (September 28, 1888), Box 11, Folder 826, Newberry Library Archives.

²³¹ Fletcher and Mary Poole, *Fourth Supplement* (1903), iii-iv.

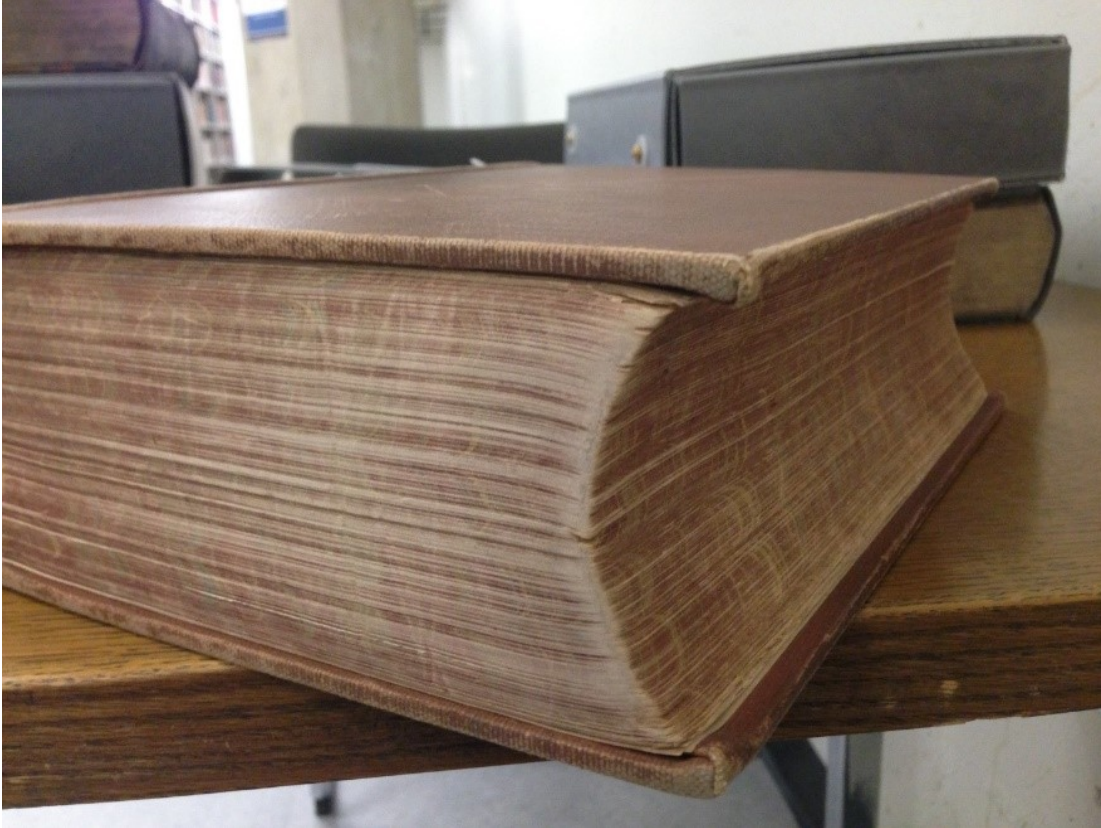


Figure 4-11. Example of trimmed (cut) edges on a copy of the 1882 edition of Poole's Index, Regenstein Library, University of Chicago.



Figure 4-12. Example of untrimmed (rough) edges on a book. From Flickr user cthoyes, used under a Creative Commons BY-NC-ND license.

In the case of the WCFL book wagon, Titcomb did at times offer rationale for book wagon design choices, such as the previously noted example of painting red accents on the wagon to distinguish it from a hearse. She also noted that one of the major reasons for the book wagon's success was the ability to incorporate "the personal element" into library work in the county. "The tastes of the individual can be consulted; if there are children, attention can be called to the books that will please them, if the wagon does not contain what is desired, a memorandum can be taken then and there, and the book mailed to the individual."²³² This illustrates a kind of rationale for the book wagon as a more successful service than could be offered by deposit stations alone.

There were several different techniques used to demonstrate the book wagon's success in reaching the country residents. Some, like traditional circulation statistics, were used to demonstrate success by showing the increasing numbers of books checked out during the periods when the book wagon was actively in use, and declining numbers when it was out of service. Other quantitative data, such as the increase in number of routes, miles traveled, or number of registered patrons, were also frequently given in annual reports to demonstrate the book wagon's success and lobby for increased support.

"A second year's test of the book wagon has demonstrated the fact that as yet, no better way of reaching the remoter portions of the County could be devised. Sixteen routes through various parts of the country have been laid out, and forty trips have been made by the wagon over these routes during the year, so that each section has been visited very nearly three times, or, in other words, the wagon has covered the ground about every four

²³² Washington County Free Library, Seventh Annual Report 1907-1908, 6-7.

months. Once in three months would have been a more desirable average, but the expense has been a consideration, and also the fact that it has been impossible to oftener find a competent understudy to undertake the duties of Mr. Thomas at the central library.”²³³

However, most librarians know that circulation statistics can be misleading. For example, just because a patron checked out a book from the library does not mean he or she has read it.

Numbers of registered users for WCFL was highly problematic, since nearly all registered patrons were residents of Hagerstown, and only a very small proportion of rural residents ever formally registered as library patrons.²³⁴

To combat this, Titcomb explicitly emphasized on numerous occasions that statistics alone are not enough to indicate success.

“After all is said, a report is a vain thing. Figures, comparisons, statistics cannot be made to tell the story of the year’s work; for the vital part, the spiritual essence cannot be put into words. How shall be estimated the effect of some tale of heroism upon the sensitive mind of the child? How [to] tabulate the revivifying, recreative, informing influence of a great book on the heart and mind of an adult? And how shall be chronicled the steps on the pathway towards making the library a community center? A definite goal every librarian must have, but how near one arrives, or how far one falls short, can never be expressed in terms of registration and circulation.”²³⁵

Instead, Titcomb turned to additional alternative forms of evaluation, many of which are reflective of design. One of the most interesting aspects of the WCFL case is the purposeful use

²³³ Washington County Free Library, Fifth Annual Report 1905-1906, 7-8.

²³⁴ Washington County Free Library, Twelfth Annual Report 1912-1913, 4; Washington County Free Library, Thirteenth Annual Report 1913-1914, 5.

²³⁵ Washington County Free Library, Thirteenth Annual Report 1913-1914, 10-11.

of storytelling as an evaluative measure. Rather than relying on statistics alone, Titcomb asserted success by relating stories of positive encounters:

“The interest in the wagon has not waned in any part of the county and by degrees even the more remote places are waking up. Until this year, Pleasant Valley has been to us, one in name only, though it is situated in the rugged but beautiful mountains above Smithsburg. On our first trip there, three years ago, it took much persuasion to lend 47 books to a sluggish and ignorant people. On our visit there last June, every household was won over and 127 books distributed. One or two discouraged truck farmers were at home and seemed glad to get any information that would help them to better methods of raising and disposing of their crops. Families who turned us away before, brought the children out for books. It was a real children’s day, 79 out of the 127 volumes being loaned to them.”²³⁶

In conjunction with stories, Titcomb used the technique of listing the titles of books that patrons selected off the book wagon, such as the following example:

“One farmer asked for, --

- How to grow one hundred bushels of corn to the acre.
- Fertilizers
- Book of Alfalfa
- Soils
- Book of Wheat
- Pruning Book
- Principles of soil Management
- Ginseng culturist’s guide book

²³⁶ Washington County Free Library, Fourteenth Annual Report 1914-1915, 9.

- a winter's reading course in Agriculture all taken from the bulletin.²³⁷

Or this example:

“Not long ago a trip was taken across the mountain from Trego to Samples Manor. It had been rather a discouraging day, for such days do come, when at last the car drove up to a small cottage where a sunny faced lad of fourteen waited with his pile of books. When asked if he was fond of reading he said, “Yes I am, if it is important.” He handled volume after volume with such keen pleasure that it seemed quite worth while the whole trip just to satisfy this one little mountain boy. And these are what he finally decided were important.

- Rhymes of our planet
- Siam and Java
- Hero tales of American history
- Star-land
- Siegfried
- Saints and heroes”²³⁸

Titcomb used the titles themselves to demonstrate the success of the book wagon. Listing titles not only showed that books were being put into hands of potential readers, but which books were theoretically being read. Since a major concern of the time was encouraging people to read “quality” literature, Titcomb used lists like the first one above to show that farmers were not frittering away their days reading trashy novels, but rather interested in bettering themselves in practical and useful arts that would help them improve themselves and their work. The second example shows how higher quality titles of history and classics were selected by youth who

²³⁷ Washington County Free Library, Twelfth Annual Report 1912-1913, 6-7.

²³⁸ Washington County Free Library, Thirteenth Annual Report 1913-1914, 7.

might otherwise succumb to what was considered lesser quality fiction at the time. By listing specific titles, Titcomb demonstrated the success of the wagon in not just reaching country residents, but helping them partake of quality literature.

XC also demonstrates several concrete examples of using rationale as an evaluative measure by offering reasons and justifications for design decisions. For instance, many of the toolkits were built on standards like OAI-PMH because of the benefits standardization offered in terms of the ability to use the tools across collections and organizational settings.²³⁹ Had XC designed its own protocols, it could not have met its goal of reusability by other libraries and institutions.

The decision to create multiple software tools instead of one program was also supported by rationale. In addition to rejecting the “monolithic software architecture” approaches of commercial library systems,²⁴⁰ dividing XC into modular chunks meant that the tools could be used either together or alone.²⁴¹ Beyond the rationale for using existing metadata standards, Bowen discusses rationale based on the XC user research findings that influenced metadata decisions, such as creation of a “thesisAdvisor” role, based on perceived need from the academic user base for which XC was intended.²⁴² In fact, it could be argued that the entire user research arm of the XC project was intended to serve as rationale for the design of XC software and schemas.

Although the alignment of rationale with desired outcomes can be used as a form of assessment in design, it is not without issues. One major concern stems from the information that underlies the rationale: what if the assumptions it was based on are incorrect? Throughout the development

²³⁹ Bowen, interview.

²⁴⁰ eXtensible Catalog (XC) Project Final Report [Phase 2], 4.

²⁴¹ Bowen, interview.

²⁴² Bowen, “Supporting the eXtensible Catalog,” 10.

of Poole's Index, Poole makes assertions about what users want and what would be useful or convenient for them. Partially he draws on repertoire for this—by the time work on the 1882 edition was underway, Poole had more than 30 years of front-line experience working with library patrons in a variety of settings. However, while Poole's repertory knowledge might have been valid for his specific framing of the problem, it may lose legitimacy when extended to broader applications, such as other user demographics or other types of libraries. Rationale in the cases of the WCFL book wagon and XC also sometimes relied on assumptions. In the former case, Titcomb assumed (as did many librarians of the day) that increased exposure to quality books would create opportunities for increased literacy and a more informed and democratic citizenry. The latter case made assumptions about which standards and models should underlie XC's development, for instance, building a catalog that could support the FRBR model of bibliographic description. While this is valid rationale for decision-making regarding the system, what happens if FRBR turns out to be a problematic model, or not in line with the findings based on the user research conducted by the XC team? While rationale is considered a legitimate form of assessment in design, the justification of rationale alone is not sufficient. These examples show that rationale must be closely tied to the way any given wicked problem is framed in order to offer a rigorous evaluation, and that the framing of the problem must be accurately represented through a thorough understanding of the domain.

4.4.3 Criteria-based evaluation

Various criteria may be used as a basis for evaluation in design, including (but not limited to) examples like novelty, adoption, adaptation, and visibility. Examples of these manifest throughout the three cases in this dissertation.

Throughout its development (and even beyond), Poole's Index clearly shows a high rate of acceptance, both through commercial reviews and sales. Reviews across the board, for all editions, were nothing but glowing.²⁴³ For example:

“A copy of a new index to the Periodical Literature of England and America was exhibited to the Convention, and, on motion of Mr. Folsom, it was unanimously resolved, That we have examined the work entitled ‘Index to Periodicals’ by W.F. Poole, Librarian of the Mercantile Library of Boston, and that we approve of its plan and execution, and we recommend that a similar system of indexing be extended to the transactions and memoirs of learned societies.”²⁴⁴

“As to its great value, it cannot be questioned, in the assistance which it proffers, not only to the general reader, but to clergymen, lawyers, librarians, authors, and especially to editors.”²⁴⁵

“This is truly a valuable work. It is a complete key to the periodical literature of the day. Writers, and all who are required to consult the principal reviews and magazines, will find this work quite indispensable.”²⁴⁶

“One of the most important publications of the American press for the year, if not the past decade.”²⁴⁷

²⁴³ Williamson, *Poole*, 111.

²⁴⁴ “Indexes to American Literature II,” *Proceedings of the Librarians’ Convention held in New York City, September 15, 16, and 17 1853* (Cedar Rapids, Iowa: The Torch Press, 1915), 44.

²⁴⁵ “Book Notices: An Index to Periodical Literature,” *The Church Review* 7, no. 1 (January 1854), 135-6.

²⁴⁶ “Editorials, ETC.” *De Bow’s Review and Industrial Resources, Statistics, etc.* 16/new series vol. 2 (New Orleans and Washington City, 1854), 104.

²⁴⁷ Boardman, review of *Index*, 318-320.

The 750 copies of the 1848 edition were in demand before they were even off the printing press, with colleges like Brown, Dartmouth, and Union Hamilton ordering 20-50 copies each.²⁴⁸ Five hundred copies of the 1853 edition were printed in October 1853 and by April 1854 they were nearly gone.²⁴⁹ Although the exact print run for the 1882 edition seems to have been lost to time, by 1890 only about 38 copies remained unsold,²⁵⁰ and the publication was essentially considered out of print, motivating the 1893 reprint.²⁵¹ And although the original number of printed copies of the first Supplement released in October 1888 is also unknown, it had sold almost 700 copies by January 1889 and was nearly out of stock entirely by May of 1891.²⁵² The full set of Poole's Index (the 1893 reprint plus the five Supplements) was reprinted three times: in 1938, 1958, and 1963, by Peter Smith, a publisher known for reprinting works of interest to libraries and scholars.²⁵³ The fact that it was reprinted multiple times in the twentieth century reflects the continued interest in and use of Poole's Index.

Interestingly enough, even as Poole's Index petered out in the wake of other tools, like the Reader's Guide, or new technologies, like periodical databases, Poole's Index continued (and continues) to be used, albeit for somewhat different purposes than it was originally intended. This appears in various ways. For instance, scholars have used Poole's Index as the basis for analysis of periodical trends, such as patterns of titles created and discontinued, dates and

²⁴⁸ Letter, W.F. Poole to Samuel F. Haven (April 10, 1848), Box 1, Folder 6, W.L. Williamson - William F. Poole Research Papers.

²⁴⁹ B.K.P., "Boston Letter," *The National Magazine* 4, no. 4 (April 1854), 380-381.

²⁵⁰ Letter, Houghton, Mifflin and Co. to W.F. Poole (February 19, 1890), Box 11, Folder 826, Newberry Library Archives.

²⁵¹ Williamson, *Poole*, 116.

²⁵² Letter, Houghton, Mifflin and Co. to W.F. Poole (January 9, 1889), Box 11, Folder 826, Newberry Library Archives; Letter, Houghton, Mifflin and Co. to W.F. Poole (May 21, 1891), Box 11, Folder 826, Newberry Library Archives.

²⁵³ New York Times, "Peter Smith," (July 29, 1982).

chronological information, and geographic distribution.²⁵⁴ The ability to analyze Poole's Index along these lines is likely only made easier now that it is available in digital form. Poole's Index was also used as a collection development tool, helping illustrate gaps and offering suggestions on what to acquire:

“The “Index” is the most important aid to good library work which has recently appeared. It is also a keen reminder of numerous deficiencies in our collection. Some notable works which have been carefully indexed have no place in our library. Even the series which hold prominent places in our list of periodicals are incomplete. Under these circumstances, it would be well to provide suitable accommodation, and then purchase for the use of our readers all of the leading magazines and reviews to which reference is made in Poole's Index.”²⁵⁵

In this way, Poole's Index not only guides collection development, but it embodies an authoritative stance that reflects judgement and sets standards regarding which periodicals should be considered worthy for inclusion in a library collection, since, as Cairns notes, there were many periodicals of the time that did not appear in the Index,²⁵⁶ some due to Poole's explicit decision making, others due to tardiness or other flaws of volunteer contributors.²⁵⁷ Poole's Index was also similarly used by booksellers to advertise the sales of periodicals and sets, such as in the following Boston Book Company circular:

²⁵⁴ William B. Cairns, *On the Development of American Literature from 1815 to 1833* (Madison, WI: University of Wisconsin, 1898).

²⁵⁵ *Twenty-second Annual Report of the Trustees of the Public Library of the City of Lynn, including reports of the Librarian and Treasurer, for the year ending Dec. 31, 1884* (Lynn, MA: Woodbury S. Prentiss, 1885), 13.

²⁵⁶ Cairns, *American Literature*.

²⁵⁷ Poole, *Index to Periodical Literature* (1882), vi.

“The publication of Poole’s Index has stimulated the demand for the sets included in that work, and the experience of former years has demonstrated the increasing difficulty of obtaining a sufficient supply of such as have already become scarce; we will therefore, for the sake of fairness, record the orders given us according to the date of receipt, and will ask that lists of wants be forwarded to us as early as possible.”²⁵⁸

Future interpretations might look to the subject terms used in Poole’s Index as a reflection of contemporary thought both in librarianship as well as society at large.

In the case of the WCFL book wagon, there is evidence of direct adoption of the book wagon itself as patrons partook of its service. “Mr. Thomas reports an increase of interest in every section; often when he goes back over a route, he finds that new borrowers have left a message with old ones, asking him to call.”²⁵⁹ However, a more interesting form of adoption occurred in the case of the WCFL book wagon as numerous other libraries and institutions attempted to emulate the service in their own local contexts.

Between 1909 and 1919, Titcomb and WCFL received numerous letters inquiring about details regarding the book wagon, including specifications, costs, and service particulars for the purpose of starting something similar locally. The following letter from a librarian in Connecticut is representative:

“Our library association has under its consideration the question of library book wagon service for the towns in the vicinity, and I am advised to write to you in regard to this matter, as I understand that such service has been successfully conducted in your section

²⁵⁸ Boston Book Company, “Circular Letter to Libraries, Subject: Periodical Sets,” (March 5, 1891), Box 19, Folder 1610, Newberry Library Archives.

²⁵⁹ Washington County Free Library, Fifth Annual Report, 1905-1906, 8.

of the country. I would be pleased to have any information available on the subject—method of conducting the work, means of transportation, compensation of librarians, how the enterprise is regarded by the public, and anything else which ^would^ help me to a knowledge of the undertaking. Printed matter relating to this branch of library service would be much appreciated.²⁶⁰

Librarians from across the United States came to see the WCFL book wagon and participate in trips to serve county routes.²⁶¹

“Our success along this line has made our library a matter of national importance, so much so that when the Librarian of the Yamaguchi Public library of Yamaguchi, Japan, asked our government for the latest information upon the best method of reaching rural communities with library books, the authorities at Washington [D.C.] referred him to the Washington County Free library as an example.”²⁶²

Newspaper and magazine articles profiling similar services enacted at other libraries consistently refer to the inspiration of the WCFL book wagon. Such interest in emulating Titcomb’s design clearly demonstrates that it was held in high regard by others, both within the library profession but also by other organizations such as the YMCA and local clubs and societies.²⁶³ Even booksellers were interested in taking up the traveling book wagon idea to ploy their wares.²⁶⁴

²⁶⁰ Letter, W. E. Grumman to Mary Lemist Titcomb (August 30, 1919), Titcomb scrapbook, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland, 43.

²⁶¹ Washington County Free Library, Twelfth Annual Report 1912-1913, 9.

²⁶² Washington County Free Library, Sixth Annual Report 1906-1907, 3.

²⁶³ Letter, George B. Hodge to Mary Lemist Titcomb (December 24, 1909), Titcomb scrapbook, 6; Letter, Winnie Love Henderson to Mary Lemist Titcomb (n.d.), Titcomb scrapbook, 33.

²⁶⁴ “The Librarian,” (n.d.), newspaper clipping, Titcomb scrapbook, 318.

Although adoption via emulation can serve as design evaluation in that these types of instances are demonstrative of success for the WCFL book wagon specifically, the copy-cat nature of these projects presents issues. Blindly adopting a design without consideration of context may actually run counter to success. For instance, Edna Bullock wrote the following to Titcomb in 1911 to inquire about the possibility of starting a book wagon service in Lincoln, Nebraska:

“I should very much like your opinion on my estimate of the probable expense of maintaining a county library in our county. We have railroads in all directions. There is probably not a village without its railroad. Our county roads are fine. Lincoln is at the center of the county.”²⁶⁵

One of the motivating factors for the WCFL book wagon was the lack of accessibility to deposit stations and rural residences by railroad. However, Bullock notes the prevalence of railroads in Lincoln. Simply adopting a book wagon plan without considering the local context would likely be an ill-fitting solution to the problem of book distribution in Lincoln—if such a problem even existed in the first place.

But others took the inspiration of the WCFL book wagon and iterated on it to better serve their local needs. Shortly after corresponding with Titcomb about the WCFL book wagon, the Berea (KY) College library started their own book wagon service.²⁶⁶ A notable example is that of the St. Louis Public Library. In 1915, Alice Hazeltine, the children’s librarian, wrote to Titcomb asking for details about the book wagon and inquiring about the possibility of using a book wagon to support children’s work.

²⁶⁵ Letter, Edna D. Bullock to Mary Lemist Titcomb (December 13, 1911), Titcomb Scrapbook, 19.

²⁶⁶ Letter, Florence H. Ridgeway to Mary Lemist Titcomb (October 19, 1916), Titcomb scrapbook, 39; Florence H. Ridgeway, “Kentucky’s First Book Wagon,” *The Berea Alumnus* (December 1958), 7-9. Washington County Free Library Administrative Archives.

“We have been thinking of one large enough to be used as a miniature children’s room, with shelves inside, or shelving swung so that the books might be used either inside or out, according to the weather. As I remember the pictures of your wagons the shelves are all outside. Will you tell me how the work is then done on a rainy day?”²⁶⁷

In 1916, the St. Louis Public Library unveiled its “playground wagon,” a truck clearly based on the WCFL book wagon but specifically designed for use at children’s playgrounds.

“On the road it appears as a simple and ordinary motor truck, but once arrived at the playground it ceases to be ordinary, albeit as simple as ever. Within, a bookcase has been concealed, a bookcase on wheels, with a capacity for 380 volumes. This is rolled out on a shelf hooked to the end of the truck and supported by a wooden upright. A small slide is next pulled out, making a desk at which the books are issued. Having loosened the chains which hold the books in place during the journey, having placed an empty box beside his stool to hold the returned books, and having seated himself on the stool before the desk, the driver of the machine is ready for the children, who have been ready for him since the machine first drove on to the grounds.”²⁶⁸

Such emulation is not just a flattering nod, but an evaluative measure helping to demonstrate the success of the WCFL book wagon through influence and impact.

²⁶⁷ Letter, Alice I. Hazeltine to Mary Lemist Titcomb (December 7, 1915), Titcomb scrapbook, 28.

²⁶⁸ Mary Wilkinson, “The St. Louis Playground-wagon,” *Library Journal* vol. 41, no. 9 (September 1916), 654.



Figure 4-13. St. Louis (MO) Public Library “playground wagon,” ca. 1919. From The Public Library of the City of St. Louis Annual Report 1919-1920 (*St. Louis*, 1920), [91].

Like the previous two cases in this study, adoption, adaptation, and reuse is a major evaluative indicator in XC. In addition to the University of Rochester and XC partner institutions, many other libraries used part or all of XC in various projects. Denver Public Library used the XC Drupal user interface toolkit and the XC OAI-PMH toolkit to create its “Creating Communities” website, a 2010 IMLS-funded project to digitize, unite, and deploy a large collection of local neighborhood history resources.²⁶⁹ In 2011, Lehigh University used the XC NCIP toolkit to perform circulation functions between their ILS and a newly released resource sharing system named E-ZBorrow.²⁷⁰ And from 2011 to the present, Kyushu University library in Japan has

²⁶⁹ “Drupal Toolkit modules used in Denver Public Library project,” news post from eXtensible Catalog website (September 17, 2010), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/drupal-toolkit-modules-used-denver-public-library-project>; see also <https://www.drupal.org/node/903926>

²⁷⁰ “Lehigh University goes live with XC NCIP Toolkit functionality,” news post from eXtensible Catalog website (March 31, 2011), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/lehigh-university-goes-live-xc-ncip-toolkit-functionality>

been using the entire XC suite of tools to provide next-generation catalog services to its patrons.²⁷¹ Lindahl explicitly characterized this adoption as a positive evaluation and demonstration of success: “And it was good enough to be put into production in libraries in Japan. I mean, they adopted it as a real interfaces for their live library.”²⁷²

Many more institutions have possibly partaken of XC due to its freely open accessibility. However, detailed names and specific numbers are unknown for the very same reason. It is difficult (not to mention potentially in conflict with library values of privacy) to keep track of who downloads the software and for what purposes they may or may not end up using it. Bowen speaks to this phenomenon:

“You know, that’s the thing with open source software, you never know who’s using it, because anybody can download it and take it. And unless they write to you or post something and say ‘hey, we’re using it,’ you never know. In fact I found out that the digital humanities use, the English Short Title Catalog, I found out purely by accident because I went to a presentation at a conference and they were talking about it. They hadn’t contacted us. We had no idea. So you just don’t know who’s using it.”²⁷³

Interestingly, in addition to the software product itself and the schema incorporated within it, other aspects of XC were also adopted and reused by others. Materials and documentation about the anthropological methods used by Foster for the user research portions of XC development were also provided for others to use via Creative Commons licensing.

²⁷¹ “Kyushu University Library announces discovery pilot,” news post from eXtensible Catalog website (July 7, 2011), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/kyushu-university-library-announces-discovery-pilot>

²⁷² Lindahl, interview.

²⁷³ Bowen, interview.

“But one of the things we always did at Rochester was to share everything completely openly. So, I mean, it doesn’t surprise me. And I mean, you know, it’s nice. That people use your stuff. Attribution would be nice, but you know, it’s just sort of gotten out there now, and everybody uses the methods that we developed...we did want to get it out there for free and we succeeded, so that’s a good thing.”²⁷⁴

Here Foster touches on two types of success: first, that these methods and information were made available, and second, that people actually used them. But like the XC software suite and schema, the Creative Commons licensing and distribution model offered no recordkeeping regarding who might be using these methods and where. In later years, Foster has begun to collect some of this information via AnthroMap, a collaborative Google map identifying institutions and locations that self-identify as using the methods she developed.²⁷⁵

Adoption is often tied up with determining success, and XC was no exception. Although I have previously pointed out that one indicator of evaluative success can be adoption and implementation, and shown examples of this in XC, such indicators are not binary. That is to say, although adoption can be used to evaluate a design, it must be used holistically, and lack of adoption does not inherently indicate poor design. For instance, although modules of XC are still currently in use by many organizations, Bowen indicates that XC is no longer used at all at the University of Rochester itself.²⁷⁶ However, this is likely less an evaluative reflection and more to do with shifting priorities of the institution leading to reduced or eliminated support for the sustainability of the XC implementation at Rochester.

²⁷⁴ Foster, interview.

²⁷⁵ See <http://anthromap.org>

²⁷⁶ Bowen, interview.

Finally, an interesting evaluative element that appears in XC might be seen as related to adoption, although it is not adoption itself: the idea of visibility, and that visible prominence within a community may also function as a form of assessment. For instance, Foster notes that even though the software may have had limited success if evaluated on the premise of adopting the entire system (i.e., all the component parts together), many organizations did incorporate XC tools and components into projects where XC afforded functionality yet remained hidden.

“I think that the software actually has been very successful but not entirely, it’s been successful, it had limited success, it had some success, as a system. It’s not always visible. It’s had much greater success as when parts of eXtensible catalog are incorporated as parts of bigger systems where it’s not so visible.”²⁷⁷

Thus XC may not have been accorded as much success due to its lack of visibility, yet these other successful projects could not have functioned without it. Lindahl also notes how the visibility of XC motivated other organizations and institutions to move forward with future metadata developments:

“We produced something that got the Library of Congress to invite us to come and talk about it. We produced something that got the Library of Congress to, Jennifer and I believe, move forward with RDA.”²⁷⁸

Regardless of whether or not XC was considered a successful project in and of itself, other forms of success, such as its visibility, may be used as additional evaluation criteria for a design.

²⁷⁷ Foster, interview.

²⁷⁸ Lindahl, interview.

4.5 Summary

This chapter discussed observable evidence regarding the ways in which elements of design epistemology manifested in the three cases: Poole's Index to Periodical Literature, the Washington County (MD) Free Library (WCFL) book wagon, and the eXtensible Catalog (XC) project. Many previously defined elements of design epistemology were evident in these cases, specifically wicked problems; problem finding and framing; service-based orientation; iterative processes; drawing on repertoire; and the use of assessment techniques aligned with design epistemology such as critique, rationale, and adoption. Evidence of other aspects of design epistemology, such as the use of representations; abductive reasoning; and reflection (especially during the design process), was not observed in these three cases, and it is not known whether this is because those elements are actually absent from the process, or because they were unrecorded or records of instances involving such elements did not survive.

Chapter 5 Discussion

In the previous chapter, I discussed the ways in which elements of design epistemology manifest in American librarianship based on a critical analysis of three major cases, thus challenging the status quo that librarianship is a social science discipline. This chapter now presents an interpretation and discussion about what these manifestations mean and what is uniquely revealed about librarianship when examining the discipline based on this new understanding. My critical analysis now critiques the role of design in American librarianship by arguing that elements of design epistemology often manifest implicitly and passively throughout American librarianship. That is, artifacts and actors in these cases do illustrate elements of design epistemology—some more visibly and strongly than others—but they often do so unconsciously or without realizing (much less embracing) the epistemological underpinnings of these elements. On the occasions where elements of design epistemology are explicitly present, such as some examples from the eXtensible Catalog where the application of design methods and epistemology are explicitly discussed, they are often relegated to external contexts outside of librarianship, either through source materials, education, or other delineations of professional jurisdictions. Elements of design epistemology also manifest in ways that reveal the user-focused nature of librarianship. Beyond these discussions, this chapter also discusses insights that are revealed when looking at librarianship from a design standpoint. Analyzing these cases from the perspective of design offers insights about knowledge construction, values, and the effects of materiality on librarianship that have gone mostly unaddressed until now.

5.1 The overall role of design in librarianship

In this chapter, I discuss the ways in which elements of design epistemology manifest in American librarianship based on a critical analysis of three major cases. No discussion can cover

every identifiable theme found in the case evidence, so this discussion will focus on topics pertinent to the contemporary field of librarianship as well as interesting insights that potentially offer greater impact on the field. While some points may seem negative or critical, it is not my intention to take away from the many positive contributions these libraries and their designs have made. Rather, this is a product of the critical analysis method that specifically seeks to change the status quo and critique the current existing situation.

5.1.1 Design is implicit and passive

The first interpretation I posit is that overall, design plays an implicit and passive role in American librarianship. That is to say, epistemological underpinnings of design are implied throughout the discipline of American librarianship, yet are not plainly or overtly expressed. Although this idea was hinted at in the literature review, evidence from all three cases confirms that even though design is occurring throughout library work, explicit consideration of that work as underscored by design epistemology is rarely present.

Many identified elements of design epistemology are clearly present in all three examples (see Table 5-1). However, despite the implicit presence of the majority of elements in each of the three cases, they are not explicitly grounded in design epistemology. Lack of explicit conceptualization of librarianship as a field based in part on design epistemology in the historical examples is not surprising. After all, clear understanding and articulation of design as an epistemology did not even begin until the 1960s, so it would be ludicrous to expect these early projects to contain explicit design discourse. But it would also be faulty to assume that situations and contexts of the past did not include a concept simply because the same words were not used to describe it then as are used today. And in fact, we see that this is the case for much of design in librarianship: there is no evidence that Poole referred to his choices and decisions about the

Index as “rationale,” nor that Titcomb called the multiple versions of book wagons “iterations,” yet the actions and concepts of rationale and iteration are clearly present. Regardless of language, the previous chapter has shown that the actions and occurrences throughout each of the three cases can clearly be interpreted in the context of design epistemology: a rose by any other name indeed smells as sweet.

Table 5.1 Evidence indicating the presence of elements of design epistemology present across all three cases.

| | | | Poole’s Index | WCFL book wagon | XC | |
|---------------------------------|--|--------------------------------------|---------------------|--------------------|---------------|--|
| Elements of design epistemology | Creation of problem solutions | Artifacts | ● | ● | ● | |
| | | Wicked problems | ● | ● | ● | |
| | | Problem finding, framing & reframing | ● | ○ | ◐ | |
| | | Emphasis on service | ● | ● | ● | |
| | Generation of knowledge through making | Iteration | ● | ● | ● | |
| | | Repertoire | ● | ● | ● | |
| | | Reflection | ○ | ○ | ◐ | |
| | | Use of representations | ○ | ◐ | ◐ | |
| | | Abductive reasoning | ○ | ○ | ○ | |
| | Design evaluation methods | Rationale | ● | ● | ● | |
| | | Critique | ● | ◐ | ● | |
| | | Criteria-based evaluation | ● | ● | ● | |
| | | | ● Concrete evidence | ◐ Partial evidence | ○ No evidence | |

What is interesting to note is less the language surrounding the elements of design epistemology than the perceived intent. In almost all of the previously described instances of design epistemology, there was no observable evidence that design actions like drawing on repertoire or participating in reflection were actively undertaken. For example, there is strong evidence that John Edmands' pamphlet *Subjects for Debate, with Reference to Authorities*¹ was part of Poole's repertoire and as such, influenced the design of Poole's Index. But Poole denies ever encountering it because it was published six months before he began working at the Society library.² However, books and other bibliographic tools are unlikely to evaporate in such a short time period. Poole's presence in the Society library during the time of the pamphlet's creation and use means that he was likely influenced by it, even if he was himself unaware of such influence. "It seems reasonable to suppose that Dr. Poole did get the suggestion of his Index from this pamphlet, nor is it strange if after forty years he failed to remember it."³ Edmands' *Subjects for Debate* was surely part of Poole's repertoire of knowledge, even if Poole himself did not admit it.

While these elements of design epistemology indeed occurred in each case, I argue that they occurred passively rather than proactively, allowing them to occur rather than purposefully drawing on them, afterthoughts if consciously considered at all. Designers, on the other hand, are trained in these techniques through formal education such as design studios and critique sessions.⁴ To consider an analogy: many people search Google every day without actively

¹ John Edmands, *Subjects for Debate, with References to Authorities* (New Haven, CT: Society of Brothers in Unity, 1847).

² J.C. Rowell, "Prehistoric Poole," *Library Journal* 16, no. 11 (November 1891), 109.

³ William I. Fletcher, "The Original 'Poole's Index,'" *Bulletin of Bibliography* 1, no. 7 (1897), 101-102.

⁴ See for example Ashraf M. Salama and Nicholas Wilkinson (eds.), *Design Studio Pedagogy: Horizons for the Future* (Gateshead, UK: Urban International Press, 2007); Philippa Lyon, *Design Education: Learning, Teaching and Researching Through Design* (Farnham: Ashgate Publishing, 2011).

thinking about what they are doing, while librarians are trained in specific, rigorous searching methods and techniques. The same might be said of librarians drawing on design epistemology: librarians draw on elements of design epistemology like repertory knowledge and reflection every day, but few are trained to actively and explicitly perform such tasks.

Although myriad examples of implicit design epistemology exist in American librarianship, there are occasional examples of explicit references to and incorporation of design epistemology. One of the most interesting aspects of XC is that it is one of few projects in librarianship to explicitly self-identify as a design project. However, it is clear that despite explicit use of the term, the concept of design does not necessarily refer to epistemology. In this case, the concept of design has different interpretations based on context and perspectives. Design is considered, at varying times throughout the XC project, to be a process, a specific type of technique, and an epistemological construct. These different understandings of design serve different purposes and roles, thus communicating varied ideas about exactly what role design played in the project and what it might contribute to librarianship at large.

Interviews with XC personnel revealed two distinct interpretations of design: one focused on a creative process to produce a product and the other on discovering new knowledge. We might think of the former as methods and the latter as epistemology. For instance, Lindahl specifically mentioned a divide between “productizing” and basic research in the context of leaving his previous job:

“So after a while at working at Xerox I got tired of the fact that Xerox had a real tough time turning, productizing things that research did. And that was frustrating because we got to build cool things but they didn’t actually materialize into real products.”⁵

This illustrates the idea of design as the creation of an artifact. But Lindahl is very clear that creating an artifact is not a singular one-time achievement but rather an emergent representation of an ongoing, iterative process, and that academic libraries acknowledge the former but not yet the latter.

“So, I find this in the library I’m in today and I’ll find it in every organization I’ll ever work in, I’m sure, is that people don’t want to understand design as a process. They tend to want to know what the next design’s going to look like. Right? Like if you look at a current design and you’re like well they have a requirement and they want to know, ‘what’s the solution look like?’ The problem is that they’re not only one with a requirement. And what you need is to collect the requirements, then you need to have an iterative process to get from point A to point B. And the designer doesn’t know what the end result looks like. And it’s not very satisfying for the person who has the issue with the current design. Right? So I think libraries have to shift from seeing design as a next step kind of a process to one where the process is the solution...I’ll give you an example. Let’s say you’re looking at someone’s research guide on a website. On a library website. And it has problems. Like maybe it’s really cluttered. And to get from there to something that’s really useable for the end user you might have to change it several times. And then evaluate the changes and change it again. Where the thing that you publish next isn’t the

⁵ David Lindahl, interview with the author (March 2, 2016).

first idea you had to fix it. But it was like you actually created three or four iterations, none of which got published. Right? And then you finally come up with something that you can publish. I think that idea of iterating is a really important concept to get academic libraries to, to get them to see the world that way. To see sort of trying incremental improvements rather than being able to picture the end result. It's like a creative process.”⁶

In this way, design as typically understood in the academic library domain is an iterative process resulting in an artifact—a method for achieving a solution, but not necessarily a foundation for knowledge creation. Specific types of techniques are used to achieve this artifact, including the iteration mentioned above, as well as other user-centered design methods. Lindahl, however, tried to articulate and advocate for something beyond just process or method. He tried to get academic librarians to “see the world in a new way,” that is, to acknowledge and embrace a design epistemology.

5.1.2 Design is relegated to the external

Although XC demonstrates explicit and purposeful consideration and incorporation of some aspects of design, others—especially at a more epistemological level—remain implicit and relegated to jurisdictions external to librarianship. For instance, although design was considered to be an inherently fundamental aspect of the XC project, some of the discourse surrounding XC does not reflect this idea. A literature review conducted during the planning phase covered the categories of usability testing; catalog and related library technology research and development; libraries as physical spaces; conceptual models of searching; authoritative information and peer

⁶ Ibid.

review; qualitative and ethnographic research in higher education; and qualitative and ethnographic research in libraries.⁷ Literature on design was not reviewed, unless it fell into one of the above categories, such as usability testing, which could only offer a very narrow slice of design as an overall epistemological approach. In fact, in this literature review, usability testing and user-centered design seem to be conflated and understood as similar, if not the same.⁸ One might assume that design epistemology is such a high-level, almost “meta” topic that it might not warrant inclusion in such a review—akin to including an epistemological work like Kuhn⁹ in a literature review for a simple biological experiment. However, the fact that so much space in this literature review is dedicated to qualitative and ethnographic research, which seem like parallel topics epistemologically, does seem to suggest that higher level topics were worthy of consideration, and that design was not one of them.

Additionally, in the categories of literature collected on the website for review, there is no category for design. The categories are identified by the following labels: architecture, catalog functionality, developer tools, digital libraries, FRBR, metadata, open source, problems, proprietary, search, seminal reports, standards, user interface, user research, user tools, and web 2.0.¹⁰ Although there may be snippets of design within these categories (such as user interface design), they again offer a limited understanding of design, and there is no overarching category designated for the topic. Oddly enough, there is no mention of “participatory design” despite the emphasis on using participatory design techniques in the user research for XC. Although this

⁷ Nancy Fried Foster and Ryan Randall, “Designing the Academic Library Catalog: A Review of Relevant Literature and Projects,” (September 25, 2007), accessed February 16, 2016, <http://www.extensiblecatalog.org/learnmore/literature/61>

⁸ Ibid, 2.

⁹ Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: University of Chicago Press, 1962).

¹⁰ “Check Out Our New Lit Review,” news post from eXtensible Catalog website (September 12, 2006), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/check-out-our-new-lit-review>; now relocated to <http://www.extensiblecatalog.org/learnmore/literature>

online literature review was at one point open for additional suggestions and feedback in the form of a blog post, any mentions of design resources in the comments have since been lost to time, so there is no way to know if suggestions for additional literature specifically regarding design were made.

Also, although an iterative epistemological approach was spearheaded by Lindahl, some of the evidence of iteration in XC is externalized. For example, the iterative approach evident in software versioning is an established protocol in software development and not necessarily reflective of a design epistemology. Although software versioning may be considered iteration in literal sense, it may not reflect true design iteration if all it does is correct mistakes and fix bugs. While technically such correction improve on the design, do they really change the overall design to something better? Fixing software bugs may be more like tightening a screw on a bicycle—you need that work to make the design functional (and safe!), but it doesn't really create a substantively new design.

Other considerations, like sources of design knowledge, underscore the externalization of design in XC. The expertise of the team leads was incredibly diverse and drew upon the expertise of existing staff in “programming, metadata, anthropology, graphic design, user-centered design, and usability testing.”¹¹ Of the three team leads, Lindahl earned multiple computer science degrees and experience working at Xerox; Foster received a PhD in applied anthropology; and Bowen studied music before pursuing a master's degree in library science. This is not to argue that one needs an MLIS to work in or understand a library, but to show that the people working

¹¹ “Mellon Grant Funds Planning Analysis for Future Online Services.” Press release from University of Rochester (April 14, 2006), accessed February 16, 2016, from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/Get/Document-22096/Mellon%20Phase%201%20press%20release.pdf>

on this project brought in ideas, concepts and methods that they learned from other domains. Although all three participants led areas of design work—Lindahl headed the software architecture and development; Foster developed research methods, protocols, and findings; Bowen created the metadata schema—much of the design in XC was perceived as related to software. Credit for design work was assigned to specific areas of work and the people in those areas. For instance, Bowen says “...it was really Dave Lindahl that designed the system” and “He’s really the designer. It really was his design.”¹² Bowen credits Lindahl as the designer of XC; she does not seem to see herself as a designer, even though she headed the design of the metadata schema and referred to it as such in the title of a white paper about the design of the XC element set.¹³ Lindahl, on the other hand, does describe Bowen’s role as a design role:

“[Jennifer] was designing the foundation of what was essentially a huge metadata software project,”¹⁴ even if Bowen did not describe it that way herself. Foster, too, credits Lindahl for “bringing this kind of design work into libraries,”¹⁵ implying that design work is something external to libraries. She also discusses how her own participatory design work for the user research arm of XC was informed by external sources: “I knew about participatory design and user-centered design just because I knew people from Xerox and I talked to them.”¹⁶

This view of Lindahl as the designer and that design came from external sources contributes to the idea that design is something external to librarianship. Design may have been explicitly present in XC because it was explicitly brought in from an external source—in this case, the design and development work Lindahl experienced and contributed to at Xerox. Lindahl also

¹² Jennifer Bowen, interview with the author (January 29, 2016).

¹³ Jennifer Bowen, “Supporting the eXtensible Catalog through Metadata Design and Services,” University of Rochester Working Paper (January 8, 2009), accessed June 11, 2016, <http://hdl.handle.net/1802/6377>

¹⁴ Lindahl, interview.

¹⁵ Nancy Fried Foster, interview with the author (February 8, 2016).

¹⁶ Ibid.

went looking for design ideas and instruction at IDEO, the famous design firm, again looking externally for approaches, methods and knowledge in places outside of libraries. Hiring an anthropologist was not only “the way they did it at Xerox”¹⁷ but another example of bringing in external elements, and so the participatory design aspects that were Foster’s design purview may still be considered separate from library work.

The externalization of design is not unique to XC. Despite numerous elements of design epistemology identified in Poole’s Index, the majority of work done on the project actually occurred outside the scope and boundaries of official library work, which assists in contributing to the idea that design is external to librarianship. As previously described, almost all of the work for Poole’s Index was completed in librarians’ free time with no financial compensation. When indexing was underway, Poole spent all of his free time outside of library hours devoted to the work. Although such self-sacrifice has been lauded under the banner of service, a closer examination reveals that such an extreme commitment to service may have actually been problematic, not just for the specific case of Poole’s Index, but librarianship as a whole. Although Poole often positions himself as the martyr of the Index, there is evidence to suggest that he did not imagine that the return on its investment would always be so sacrificial. Poole felt that once users (and investors, like library directors and trustees) saw the benefits of the Index, they would understand its value and allot library resources accordingly. Such “self-denying labor” would also help “in raising the profession of the Librarian to its proper dignity,” legitimizing indexing and the creation of such knowledge tools and making them worthy of professional status.¹⁸

¹⁷ Ibid.

¹⁸ Letter, Dr. N.H. Morison to William Frederick Poole (January 15, 1883). Record Group II/A: Office of the Provost, Peabody Institute Archives, Johns Hopkins Peabody Library.

But this was not to be: despite rave reviews of the 1882 Index, which should surely have demonstrated its worth, the subsequent Supplements were not completed on library time or with library funding. Poole once again fronted money for the plates and printing,¹⁹ and once again, voluntarily free labor was solicited from the library community.²⁰ Poole's notion that once proven the Index would acquire recognition and support (and therefore funding) from official channels was incorrect.

This had arguably a greater impact on more than just funding of subsequent indexing projects. In addition to setting a precedent for lack of support for multi-library projects, the creation of the Index outside the boundaries of official library time meant that such design projects instilled themselves as outside the scope of library work. Since the design of these tools were relegated to "off hours," those who had the resources to front them, like publishers, took over jurisdiction of them, helping to set the course for library-vendor relationships throughout the twentieth century. As an example, even though the intellectual content of Poole's Index has become public domain, Paratext LLC, a library vendor now sells that information back to libraries in database form.²¹ The participants in the XC project were explicitly aware from the start of the impact of and desire to regain some of the design power ceded to vendors. Stanley Wilder, Associate Dean of the University of Rochester River Campus Libraries at the time of XC, noted that "The most important aspect of the XC project may be its potential to galvanize libraries to try once more to 'build it ourselves,' this time with networked communities and open source code."²² Bowen also

¹⁹ Memorandum of Agreement between William F. Poole, William I. Fletcher, and Houghton, Mifflin, and Co. (January 28, 1888), Box 11, Folder 826, Newberry Library Archives.

²⁰ Ernest C. Thomas (ed.), "Proposed supplement to Poole's Index to Periodical Literature," *The Library Chronicle: A Journal of Librarianship and Bibliography* 1, (London, UK: Dryden Press, 1884), 69-70.

²¹ Paratext LLC, "About Paratext," accessed September 22, 2015, <http://www.paratext.com/about/>

²² Stanley Wilder, "Baker's Smudges," *Library Journal* 14, no. 131 (September 1, 2006), 32.

noted the rise of interest in open source at the time and how the associated DIY mentality of that community revealed the power struggle between libraries and vendors:

“...the Code4Lib community was really kind of instrumental in kind of developing that kind of community of people who could, ‘well, we’ll just build it ourselves.’ You know, wanting libraries to not be locked in to what commercial vendors were providing. So yeah, we were collaborating with them as far as we could in just communicating with them. I think there was a lot of spirit of ‘well, what are you doing, and what are you guys doing,’ and sharing and comparing notes, which is of course not what you get with vendors.”²³

These examples demonstrate how librarianship has continually conceptualized design as outside the purview of the field—it is something that other people and other disciplines do. And over time, these other people and fields took up the design work needed by and for libraries, shifting the balance of power, and making libraries and librarians depending on other sources, like vendors, to provide much of this type of work. Bowen writes that XC was specifically and explicitly positioned to address this power imbalance:

“While it may be tempting to wait and see what commercial vendors offer as their next generation of commercial discovery products, such a passive approach may jeopardize the future viability of library metadata...projects such as the eXtensible Catalog can serve as a vehicle for moving forward by providing an opportunity for libraries to experiment

²³ Bowen, interview.

and to then take informed action to move the library community toward a next generation of resource discovery systems.”²⁴

But even with that understanding and the successes demonstrated by XC, this idea did not take hold as strongly as perhaps the XC team anticipated, possibly due to the unconscious externalization of many of the aspects of design. Even today, such delineations continue: MacDonald’s 2015 interviews with user experience (UX) librarians found that most of these professionals conceptualized their role specifically as a research role rather than a design one, de-emphasizing design-related tasks and relegating them to other staff and departments.²⁵ As more libraries become increasingly interested in design methods and techniques (including UX), the lack of incorporation of the epistemological foundations that underscore these techniques only widen the theory/practice divide so commonly criticized in the field. Additionally, while framing design work as research is a valid way of creating knowledge (see subsequent discussion on this topic in this chapter), limiting design solely to this perspective threatens to continue the power imbalance. While such research is beneficial to artifact creation, it is the designers creating artifacts—not the researchers—who make the ultimate decisions about how things can, will and should be.

5.1.3 Design offers a user-centered focus

Although contemporary discourse may equate design with a user-based perspective, there are many approaches to design, of which user-centered design is only one. User-centered design (also known as human-centered design) is a design approach that focuses on users, their needs,

²⁴ Jennifer Bowen, “Metadata to Support Next-Generation Library Resource Discovery: Lessons from the eXtensible Catalog, Phase 1.” *Information Technology and Libraries* 52, no. 2 (June 2008), 16.

²⁵ Craig M. MacDonald, “User Experience Librarians: User Advocates, User Researchers, Usability Evaluators, or All of the Above?” In *Proceedings of the 2015 Annual Meeting of the Association for Information Science and Technology (ASIS&T 2015)*, vol. 72 (Silver Spring, MD: ASIS, 2015), [5].

and requirements, to create more useable and useful products and systems.²⁶ This is in contrast to other approaches, such as system-based approaches that consider the needs and requirements for the system. Although many libraries of the distant past may have functioned in a more systems-based environment, such as concentrating on books or collections as the main focus, American librarianship is traditionally considered a user-based service.²⁷ This idea is reinforced and confirmed by the user focus in all three cases in this study.

All artifact deployment in these cases was based on user needs, either perceived or explicitly identified. For instance, Poole consistently referred to his user base of the “very cultured general student,”²⁸ implying a specific set of needs for that user group. His focus on abbreviations and alphabetical order were based on the idea that users needed quick and convenient access to information about periodicals. However, Poole’s examples reflect assumptions made about user needs and what would be convenient for users. Although Poole began the Index when he himself was a student and therefore arguably familiar with students’ information needs and behaviors, there is no evidence that he ever explicitly inquired or otherwise communicated with users about their needs. Some of his conclusions are certainly based on observations and experiences, which can be helpful in this regard, but much of his communication revolves around librarians discussing among themselves what they presume best for users.

Titcomb too was motivated by user convenience. Even in the earliest days of her tenure as WCFL librarian, she emphasized user convenience through the idea that the library service

²⁶ ISO 9241-210, Ergonomics of human-system interaction - Part 210: Human-centred design for interactive systems (2010), accessed June 3, 2016, <https://www.iso.org/obp/ui/#iso:std:iso:9241:-210:ed-1:v1:en>

²⁷ Richard E. Rubin, “From Past to Present: The History and mission of libraries.” In *Foundations of Library and Information Science*, 4th ed. (Chicago: Neal Schulman, 2016), 31-81.

²⁸ Letter, W.F. Poole to Morrison (March 1, 1878), Box 4, Folder 20, W.L. Williamson - William F. Poole Research Papers.

would come to the user, rather than mandating the opposite. The 1904 *Bulletin of the Washington County Free Library* stated that “Those living at a distance that it is not convenient for them to visit the library will be promptly served if they will write the librarian given the subject upon which information is desired.”²⁹ Such early service set the tone of user convenience from the outset. But even as the book wagon developed to continue such convenience, it was also directly guided by user needs. For instance, the preliminary routes of the book wagon were chosen based on responses from users requesting locations for wagon visits:

“Letters were sent to the county residents explaining bookmobile service at community stops together with a post card to be filled in requesting service. On the basis of the excellent response to this letter the bookmobile trips were planned.”³⁰

Although often described in a general way, feedback from library users along the book wagon routes was also clearly solicited, with many users expressing preferences for what kinds of books or reading materials they would like to receive. These concrete and direct connections to users provide an interesting contrast to Poole’s Index where much of the information about user needs was presumed.

While Titcomb and the WCFL clearly solicited information from users about their needs, it was considered part and parcel of the process and not a special approach or technique. In the case of XC, the project was specifically framed around discovering user needs, with an explicit emphasis on research to understand user needs.³¹ From the outset, XC proposed not only to draw on the

²⁹ *Bulletin of the Washington County Free Library at Hagerstown, Maryland* 3, no. 2 (March 1904), 1. Washington County Free Library Administrative Archives.

³⁰ Mary Louise Holzapfel, “The Following Twenty Years of the Washington County Free Library, 1931-1951,” in *The Washington County Free Library 1901-1951* (Hagerstown, MD: Washington County Free Library, October 4, 1951), 44.

³¹ “Size Matters,” news post from eXtensible Catalog website (January 16, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/size-matters>

expertise of computer programming and metadata staff, but also anthropology, user-centered design, and usability testing.³² This idea is carried further in the project through education and training of all project staff about user-centered design techniques and methods.³³ Foster described the tight connections between decisions and user data to ensure that the direction of XC is always connected to user needs: “we always need to go back to our raw data to be sure that we really came up with user-inspired ideas and that we didn’t go off track and lose our connection to the actual data.”³⁴

The attention devoted to understanding user needs throughout the XC project was immense, resulting in multiple publications (including a full book) about the information needs and use behaviors of academic library users.³⁵ But what is interesting about the XC case is that it not only revealed a massive amount of in-depth information about library users, it opened up perspectives on who those users are. As noted previously, XC set out to create a front-end interface for use by library patrons, but evolved into a back-end tool for librarians and library staff. This meant that the librarians and library staff were also users, with their own specific needs and behavior patterns. This did not escape the notice of XC participants, who also spent time investigating the needs of libraries and librarians. For instance, in 2007 XC released results from a survey of librarians as users intended to gauge interest in the burgeoning system and identifying the types

³² “Mellon Grant Funds Planning,” University of Rochester press release.

³³ “What is User Centered Design?” PowerPoint presentation (last edited May 30, 2006), accessed February 16, 2016, from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/View/Collection-3175>

³⁴ “Integrating User Research Findings into XC Design,” news post from eXtensible Catalog website (November 25, 2008), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/integrating-user-research-findings-xc-design>

³⁵ Nancy Fried Foster and Susan Gibbons, *Studying Students: The Undergraduate Research Project at the University of Rochester*, (Chicago: Association of College and Research Libraries, 2007); Nancy Fried Foster, *Scholarly Practice, Participatory Design and the eXtensible Catalog*, (Chicago: Association of College and Research Libraries, 2011).

of functions librarians desired in such a tool.³⁶ Bowen began to delineate between “users” (i.e., librarians) and “end users” (i.e., patrons) in her publications about XC.³⁷ As the project continued to evolve from a patron-facing tool to one for back-end functionality, XC deftly switched from patrons as the users to librarians and other internal library staff as users. With the creation of the eXtensible Catalog Organization (XCO), a non-profit organization devoted to the maintenance and improvement of XC, the shift included not only librarians, but other implementers of XC: tool creators themselves, such as Carl Stahmer from UC Davis, who used XC to create a number of digital humanities projects.³⁸

5.2 Revelations about librarianship from a design perspective

Beyond this demonstration of implicit, passive, and externalization of design in American librarianship, many insights are revealed when looking at librarianship from a design standpoint. Analyzing these cases from the perspective of design offers insights about knowledge construction, values, and the effects of materiality on librarianship that have gone mostly unaddressed in previous applications based in more scientific perspectives.

5.2.1 Knowledge in librarianship

5.2.1.1 *Knowledge from artifact making*

Established forms of knowledge generation in design differ from those recognized by scientific paradigms. Typical paradigms in librarianship conduct scientific research meant to inform design, but often do not result in the creation of an artifact. For instance, Fidel is well-known for offering design suggestions and guidance based on models developed from research. Her 1999

³⁶ “XC Survey Results,” news post from eXtensible Catalog website (July 20, 2007), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/xc-survey-results>

³⁷ Bowen, “Supporting the eXtensible Catalog,” 6.

³⁸ Bowen, interview.

study of web-searching behavior of high school students offered suggestions for system designs based on a model of user seeking and searching behavior.³⁹ Another well-known researcher, Bates examined alternative approaches to subject access in online catalogs to suggest a design model superior to contemporary catalogs of the time.⁴⁰ Rather than simply emulating the same traditional card-catalog structure in electronic form, Bates completely re-envisioned online subject access. She based her new suggested model of an online catalog not on technological advancements alone but on philosophical and theoretical design principles of “uncertainty,” “variety,” and “complexity,” insights gleaned from earlier research projects. She then offered not only design features that should be included but ways to integrate these features into currently existing systems, in order to save time and money by repurposing and reorganizing existing information and structures.

These and other examples from librarianship offer models, suggestions, and implications for design—but no actual creation of artifacts themselves. Whether for targeted, specific user groups or broad, abstract applicability, the suggestions put forth in these articles were not taken up to create functional artifacts, at least not by library scientists. Some of Fidel et al.’s suggestions may have been folded into projects like CD-ROM and online encyclopedias, but not by libraries and certainly not immediately.⁴¹ Bates’ design model still sits unfulfilled nearly 25 years later.

Yet all of the cases in this study demonstrate legitimate forms of knowledge generation in design through artifact creation. That is, unlike the traditional examples of design artifacts being informed by research knowledge, in design epistemology, research knowledge is created through

³⁹ Raya Fidel and others, “A Visit to the Information Mall: Web Searching Behavior of High School Students,” *Journal of the American Society for Information Science* 50, no. 1 (1999), 24-37.

⁴⁰ Marcia Bates, “Subject Access in Online Catalogs: A Design Model,” *Journal of the American Society for Information Science*, 37, no. 6 (1986), 357-376.

⁴¹ Raya Fidel, personal communication (2011).

the actual creation and deployment of an artifact. The existence of a new artifact is, in itself, a form of new knowledge, because something new that did not previously exist has now been created.⁴² Each case in this study clearly demonstrates the creation of a new artifact. In addition to being knowledge themselves, these artifacts create additional knowledge about the problem situation and context. For example, the XC team used prototypes not just to test functionality, but to learn: “By building prototypes, we have learned what really will be required to build functionality such as faceted browsing and cross-schema authority control.”⁴³ As the book wagon evolved into automobile form, the artifact itself was used to determine the need for the service:

“[The trustees] decided in November 1949 to use invested funds to buy a bookmobile and put it in operation to determine the need for the service, and on the use made of it base the request to the County Commissioners for the support of its continuance. The County Commissioners were advised of the Trustee’s decisions and were favorably impressed.”⁴⁴

By building and creating a bookmobile and putting it into service—the actual creation of an artifact—they were able to determine and demonstrate the need for such service in the community. This type of creative design-based approach differs from more typical contemporary techniques of needs assessment or user experience research, such as patron surveys or focus groups, as it purposefully opens up the design space for uncertainty and experimentation rather than narrowing focus.⁴⁵

⁴² John Zimmerman and Jodi Forlizzi, “The Role of Design Artifacts in Design Theory Construction,” *Artifact* 2, no. 1 (2008), 41-45.

⁴³ David Lindahl, Jennifer Bowen and Nancy Fried Foster, “University of Rochester eXtensible Catalog Phase 1 Final Report,” (September 14, 2007), University of Rochester Institutional Repository, 13.

⁴⁴ Holzapfel, “The Following Twenty Years,” 44.

⁴⁵ William Gaver and others, “Cultural Probes and the Value of Uncertainty,” *Interactions* 11, no. 5 (September/October 2004), 53-56.

The typical library user experience assessment techniques reflect the influence of social science on librarianship, while the use of the book wagon to better understand patron experiences and values clearly demonstrates a more design-based approach. It uses the creation of an artifact and its deployment to reveal user needs, rather than a determination of user needs to determine how and in what way an artifact might be created. Additionally, once an artifact is created, it can be used to generate additional knowledge. The case of the WCFL book wagon does provide some evidence that the creation of the book wagon itself generated knowledge about the county patrons in addition to simply providing a service. This is not unlike the idea of design probes, which are artifacts specifically intended to gather data about people's lives, cultures, and values.⁴⁶ For instance, even though Titcomb certainly had ideas about what people should read, interactions between library staff and rural patrons clearly revealed reading desires that were previously unknown.

“The call for books of a practical nature has been constant, and often it has been impossible to supply the demand. Everywhere the people are looking to the library for the best and latest methods of truck gardening, fruit raising, agriculture in all its phases, while the farmer's wife welcomes any new suggestions in dairying, domestic science and poultry culture.”⁴⁷

This shows how the book wagon created an avenue for knowledge generation regarding the previously unknown and not well understood information needs of the rural farmers. Interactions with county patrons during book wagon service also exposed and upturned preexisting assumptions about their reading habits:

⁴⁶ Bill Gaver and others, “Design: Cultural Probes,” *Interactions* vol. 6, no. 1 (January/February 1999), 21-29.

⁴⁷ Washington County Free Library, Eleventh Annual Report 1911-1912, 8.

“At the next house we find a lad of seventeen or eighteen who leaves his loaded wagon to ask if we have anything of Shakespeare’s on our shelves. He says that he read one book of his once, and that he “thinks he is a real good writer,” a tribute to the universality of genius quite delightful to encounter. Happily we find a volume of the Rolfe edition tucked away in one corner, and register again a vow to never forget that the best is none too good for the country.”⁴⁸

Such knowledge generation was not just useful locally. Although Titcomb was often called upon to present at conferences and meetings about the book wagon in general, she also received requests to specifically speak about the habits and preferences of rural readers.⁴⁹

“But what sort of books do my people read? I hear you ask. I can only say that they read, even as you and I, or perhaps more accurately, even as the people in Hagerstown with a balance in favor of the country. The number of classed books [i.e., books that fall in the classes of the Dewey Decimal Classification] borrowed is greater in the country, the percent of fiction being only a trifle over 50. Of the classes, 200 [religion] and 300 [sociology] are especially popular. Colquhoun’s ‘Mastery of the Pacific’ went out with the wagon a year ago, and has since never been returned, but goes from neighbor to neighbor. One cannot always tell why a book is in demand, but it is probable in this case, that it interested some man, who has talked it over with his friends. The taste in religious books is catholic, with a preference for those of a devotional nature. When it comes to poetry, we find much more time for it in the country than in the city. Seldom is a book of

⁴⁸ “Second Session: Work in the field, a series of personal experiences in the east and west,” in *Papers and proceedings of the Thirty-First Annual Meeting of the American Library Association held at Bretton Woods, New Hampshire, June 26-July 3, 1909* (Chicago, IL: American Library Association, 1909), 355.

⁴⁹ Letter, Robert P. Bliss to Mary Lemist Titcomb (July 1, 1911), Titcomb scrapbook, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland, 15.

poems sent out with the wagon, overlooked. American history, biographies of Americans, ‘good Christian biographies,’ and travel of all sorts are read. Of the fiction, fully 75 per cent is juvenile, which means that the books are read by both parents and children.”⁵⁰

The wagon also exposed a new group of people previously unassisted by library services: shut-ins and other invalids who were physically confined to their homes.⁵¹ Such patrons were previously not on the radar of library staff, and so the wagon helped to generate knowledge about this new aspect of clientele. Could this kind of knowledge have been acquired through more scientific means? Surely the patrons of WCFL could have been surveyed, or some other scientific investigation carried out to glean knowledge about their reading habits and needs. The point here is not to demonstrate that this knowledge *could only* be generated through design, but rather than in this case—a notable case in librarianship—it *was* in fact generated using design rather than science.

In XC design was used specifically as a means of generating knowledge. For instance, Lindahl described a participatory design activity, the ultimate goal of which was not to produce a design artifact, but to produce knowledge. Teams of students were asked to design an app that would assist them with group work. But Lindahl and the XC team were not interested in the app itself, but rather knowledge about how students worked in teams and what they needed in terms of support to succeed in teamwork.

“We didn’t want their app design, we wanted to understand the work that they needed to be able to do through the ideas that they came up with in designing their apps. So that’s what we, and that’s you know our anthropologist had a lot, had a big role in that but the

⁵⁰ “Second Session: Work in the field,” 355.

⁵¹ Washington County Free Library, Fifth Annual Report 1905-1906, 8.

idea is all we care about is knowing the work they need to be able to do. And sure, their apps had good ideas in them, but we weren't building an app. We were learning about their work. And we were learning about their work by having them do a creative design activity that would create something to support their work.”⁵²

This example clearly shows how design is used to generate knowledge. Interestingly enough, although XC was often referred to as a participatory design project, the participatory design aspects—that is, involving users in the actual creation of the artifact itself—were almost always spoken about as part of the user research arm of the project. Participatory design techniques were mostly used to understand user needs and gather user requirements, rather than in the actual creation work on the XC schema or the software products. This is not to say that there is a distinct segregation of these two contexts. After a trip to the design firm IDEO in 2006, Lindahl notes that there are more similarities than differences:

“I was gratified to learn that much of what we do here at the University of Rochester is similar to what they do at IDEO. We put more emphasis on work-practice study. They put more emphasis on prototyping. Many of our methods are similar.”⁵³

This also demonstrates the use of design as knowledge generation in XC due to the emphasis on understanding users' work practices over creating artifact prototypes, reinforcing the idea design as knowledge generation even more than artifact creation.

Because knowledge in design is inseparable from creation, knowledge is also generated in the process of creation. Processes of artifact creation such as iteration, design experimentation, the

⁵² Lindahl, interview.

⁵³ “Looking for Studies in the Bay Area,” news post from eXtensible Catalog website (August 17, 2006), accessed February 11, 2016, <http://www.extensiblecatalog.org/news/looking-studies-bay-area>

development of repertoire, and active reflection also constitute legitimate design knowledge in addition to artifactual outcomes. Although as previously noted, minimal reflection was observable in the selected cases, all three of the other forms of knowledge generation were present.

Because wicked problems have no stopping rule, and approaches to them are constantly being reframed, it makes sense that iteration plays a significant role in design. Although iteration is commonly viewed as a method or a technique (i.e., a practical approach), it can be argued that iteration is actually epistemological in design; that is, it serves to create knowledge, or at least contribute to how knowledge is created. For instance, the knowledge that creating a periodical index would take more than the work of a single person came from Poole's iterations of the first and second editions of the Index. Likewise, knowledge that standardization among indexers would be necessary came through iteration and Poole's previous work with Gilman. The WCFL book wagon created knowledge regarding which routes best served the county book distribution by constantly iterating on them. And XC learned through iteration not only that the massive number of bibliographic records needed to achieve a goal of incorporating resources from multiple sources caused immense slowdowns in processing time, but iterative, incremental ways in which the processing might be sped up. Additionally, although all the cases in this study demonstrate evidence of iterative processes, evidence from XC clearly shows how iteration was viewed as an essential knowledge construct by at least one of the team leads. Lindahl specifically speaks to the role of iteration in the process of design:

“I think people seeing the history, having it all documented, the pictures of the old interfaces, the written results from doing heuristics testing and assessment usability tests and the ways that we made changes and the ways that we came to the language that we

were using, people easily forget that it's not about the absolute quality of the current interface, it's about the quality of the process, the design process you go through to get from somewhere to some place better."⁵⁴

5.2.1.2 *Experimentation other than scientific*

In addition to repertory knowledge, Titcomb demonstrates other additional characteristics of what today would be identified as designerly ways of thinking and knowing. For instance, on numerous occasions, she refers to the book wagon as an "experiment":

"Is not Washington County with its good roads especially well adapted for testing an experiment of this kind, for the geography of the County is such that it could be comfortably covered by well planned routes."⁵⁵

"Though we have had but six months in which to test this experiment, and three of those embraced the time of greatest industrial activity in a rural community there can be no hesitation as to pronouncing the wagon a successful venture."⁵⁶

"Some experimenting had to be done before the type of car could be found best suited to the roads and to the convenience of those in charge. The first two, were too heavy, requiring a chauffeur. The third a Dodge Business Car proved so satisfactory that when it began to show signs of wear after five years continuous service, it was thought best to replace it with another of the same make."⁵⁷

⁵⁴ Lindahl, interview.

⁵⁵ Mary Lemist Titcomb, "Story of the Washington County Free Library," in *The Washington County Free Library 1901-1951* (Hagerstown, MD: Washington County Free Library, October 4, 1951), 14.

⁵⁶ Washington County Free Library, Fourth Annual Report 1904-1905, 8.

⁵⁷ Titcomb, "Story of the Washington County Free Library," 15.

Although the connotation of the word “experiment” is typically associated with scientific hypothesis testing, such as a controlled laboratory experiment, the word is also used by design theorists like Schön to describe what designers do. Rather than leaving the definition limited to the scientific meaning, Schön distinguishes among multiple types of experimentation, of which hypothesis-testing (the kind of experimentation used in traditional scientific experimentation) is only one.⁵⁸ He also identifies the “exploratory experiment” (i.e., when action is taken only to see what follows, without any predictions or hypotheses),⁵⁹ and “move-testing experiments,” where action is taken to produce an intended change.⁶⁰ Schön argues that the practice of design includes all three of these types of experiments, with move-testing being especially significant because design practice is explicitly interested in change.

The same can be said of Titcomb and the book wagon. There is clear evidence that she was interested in changing the situation: from illiterate farmers to literate citizens, from library agnostics to educated lovers of reading. Titcomb did not conduct an experiment solely for the discovery of knowledge, to see what would happen. She explicitly sought change.

“Miss Titcomb believed that giving out books to those who came for them was but a small part of a library’s purpose. The important part was to popularize its wares and to create a demand for them within the community.”⁶¹

She desired to create a new demand for books and reading in a community that did not previously value literacy at the same level she did. The idea of seeking purposeful change is an

⁵⁸ Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (New York, NY: Basic Books, 1983), 144-147.

⁵⁹ *Ibid*, 145.

⁶⁰ *Ibid*, 146.

⁶¹ Jean R. Moser, “Mary Lemist Titcomb, 1857-1932, Creator of the Bookmobile,” in *Notable Maryland Women*, ed. Winifred G. Helmes (Cambridge, MD: Tidewater Publishers, 1977), 378.

inherent characteristic of design epistemology, which rests in the idea of problem solving and changing from current states to preferred ones.

5.2.2 Material constraints

Unlike some other approaches, looking at librarianship from a design perspective offers the opportunity to consider materiality in very specific ways. All technological artifacts—physical, digital, or even conceptual—contain embedded material properties that afford or constrain the interpretation of that artifact. Inherent, essential properties of artifacts—material or intangible—shape how they are used: this is the idea that function follows form.⁶² However, material properties do not guarantee that artifacts will be interpreted in a single, predetermined way—demonstrations of interpretive flexibility show us that properties of artifacts do not determine use. Instead, these properties affect how artifacts *can* be interpreted, not how they *will* be interpreted. Properties reflect affordances, or the possibilities that an object offers for action.⁶³ Affordances are any and all of the possible ways an artifact might be interpreted or used. Affordances do not prescribe or predetermine use, they simply offer possibilities. Affordances are a suggestion rather than a command.

While Gibson's definition of affordances is situated in the natural environment, Hutchby argues that affordances can exist in other forms: artifacts, other humans, other species, etc.⁶⁴ He further fleshes out the definition of affordances as “functional and relational aspects which frame, while not determining, the possibilities for agentic action in relation to an object.”⁶⁵ Affordances are relative to all manner of contexts, including social, cultural, political and economic contexts.

⁶² Neil Postman, *Technopoly: The Surrender of Culture to Technology* (New York, NY: Vintage Books: 1993).

⁶³ J.J. Gibson, *The Ecological Approach to Visual Perception* (Boston, MA: Houghton Mifflin: 1979).

⁶⁴ Ian Hutchby, “Technologies, Texts, and Affordances,” *Sociology*, 35 no. 2 (2001), 441-456.

⁶⁵ *Ibid*, 444.

While Gibson's original concept of affordances reflected the natural world, the idea is clearly extendable to design artifacts, including physical devices, such as axes, shoes, or telephones, or more complex creations, such as a network of telephone infrastructure or a bibliographic classification system. Affordances are not limited to the physical materiality of objects, although those are often the most easily illustratable examples. Just as an axe's sharp metal blade affords cutting and the long handle affords leverage, when those two properties are combined, they offer a new, intangible affordance of splitting logs. It is not one single physical property that affords this possibility, but the combination of factors that makes splitting logs possible. Similarly for a telephone network: a telephone may afford the possibility of calling another person, but it is the underlying infrastructure—not just the physical poles and wires but the structure of the telephone companies, the standardization of circuits and switches and the number of other people connected to the network that afford the possibility of global communication. Such complex constructed concepts are still properties that afford possibilities despite their lack of physical structure or tangible existence. Even digital media have materialities.⁶⁶ While we may not commonly think of digital documents, like web pages, as having materiality, they are certainly shaped by material infrastructure—maybe fiber optic cable, or wireless routers—but also infrastructures of standards like the `http://` protocol and subscriptions to internet service providers. It is in this sense that “materiality” refers to more than just physical materials with embedded properties, but the properties of any artifacts.

In addition to materiality, all technological artifacts—tangible or not—share a common origin: they were created by humans as opposed to naturally occurring phenomena.⁶⁷ Therefore, the fact

⁶⁶ Paul Dourish and Melissa Mazmanian, “Media as Material: Information Representations as Material Foundations for Organizational Practice,” *Third International Symposium on Process Organization Studies* (Corfu, Greece: 2011).

⁶⁷ Herbert Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: MIT Press, 1996).

that we create artifacts also means we can create their affordances. In addition to any naturally occurring material affordances, affordances may also be instilled or ‘designed in’ to artifacts.⁶⁸

Hutchby classifies affordances into two major types: functional (possible functions an artifact allows) and relative (possible functions enabled by particular contexts).⁶⁹ Overhill categorizes affordances into seven loose and admittedly overlapping clusters: physical affordances (comparable to Hutchby’s functional affordances), perceived affordances (physical affordances visible to users), hidden affordances (physical affordances not visible to users), cascading affordances (combinations of affordances that offer new possibilities), social affordances (affordances that enable or thwart social interactions), designed affordances (affordances created by humans rather than nature) and intellectual affordances (affordances for intellectual rather than physical possibilities).⁷⁰ These material and non-material affordances are constraints that affect the outcome of artifact designs. Whether or not a particular material can be used or a particular affordance is present ultimately shapes a design.

While affordances do not determine what actors *will* do with an artifact, they do set limits on *what is possible* to do with an artifact. Because affordances are about actions and interactions—about what we do with artifacts—an analysis of an artifact’s affordances offers better understanding of social interactions: “they show old behaviors in a new light and illustrate how new behaviors emerge.”⁷¹ Hutchby calls us to pay more attention to materiality and the

⁶⁸ Hutchby, “Technologies, Texts, and Affordances,” 449.

⁶⁹ Ibid.

⁷⁰ Heidi Overhill, “J.J. Gibson and Marshall McLuhan: A Survey of Terminology and a Proposed Extension of the Theory of Affordances,” In *Proceedings of the 2012 Annual Meeting of the Association for Information Science and Technology* (Silver Spring, MD: ASIS, 2012), accessed June 3, 2016, <http://doi:10.1002/meet.14504901340>

⁷¹ William Gaver, “Situating Action II: Affordances for Interaction: The Social is Material for Design,” *Ecological Psychology* 8 no. 2 (1996), 115.

affordances that underlie and influence the many different possible courses of action related to an artifact.⁷²

Examining the material affordances of the artifacts in the three cases in this study reveals not only a reinforcement of the presence of some of the elements of design epistemology, but also additional interesting insights regarding innovation and values in librarianship. Although indexes are intellectual constructs, they must somehow be materially embedded if they are to be communicated and used. Evidence of materiality manifest in a variety of ways in the case of Poole's Index. For instance, the interleaving in the Newberry Library's copy of the 1848 Index (Figure 4-1; shown earlier) demonstrates that its material format—printed text on paper, single spaced—did not leave room for additions or future information. Unlike the materiality of contemporary periodical index tools, which utilize digital formats, printed text in a bound volume could not be reordered or afford insertion of new entries. Although the interconnectedness of materiality was present throughout all editions of Poole's Index, it became especially evident in the third edition. Letters between Poole, his colleagues, and publishers demonstrate material concerns such as quality and durability of paper stock, effects of printing, and size of the work.⁷³ Still, despite such proactive consideration, the thin paper used in the first printing of the 1882 index quickly wore out from use.⁷⁴ The front matter, which included a “Chronological Conspectus” of titles, volumes, and date ranges of periodicals indexed, was especially prone to wear, prompting some users to contact Poole with suggestions for improvement, like printing the front matter on thicker paper or vellum.⁷⁵ Some suggestions were

⁷² Hutchby, “Technologies, Texts, and Affordances.”

⁷³ Letters, W.F. Poole to Justin Winsor (December 28, 1876), Box 4, Folder 19; W.F. Poole to Ticknor (August 9, 1882), Box 4, Folder 20, W.L. Williamson - William F. Poole Research Papers.

⁷⁴ William Frederick Poole, *Poole's Index to Periodical Literature, Revised Edition* (Boston, MA: Houghton, Mifflin and Co., 1893), [i].

⁷⁵ Letter, H.A. Webster to W. F. Poole (November 20, 1888), Box 30, Folder 2071, Newberry Library Archives.

implemented: the 1893 reissue was printed on heavier stock.⁷⁶ However, the thickness of the new paper across the entire work would make the book so large it would be difficult to bind, much less use, due to its width (for reference, the 1882 edition on thinner paper measured 3 5/8" wide). Therefore, the work was divided into two parts and reprinted as a set.⁷⁷ The suggestions to print the front matter of sturdier materials were prevented by materiality issues of publishing—it was too difficult (and too expensive) for the printers to incorporate two different types of paper.⁷⁸ In fact, printing the front matter on thicker paper might have been a useful solution indeed, as many copies from this printing suffered damage from use specifically in this area, prompting libraries to undertake solutions in this matter for themselves, such as reproducing these pages on heavier paper and inserting them in during rebinding (see Figures 5-1 and 5-2).

⁷⁶ Poole, *Poole's Index, Revised Edition* (1893), [i].

⁷⁷ Letter, Houghton, Mifflin & Company to W.F. Poole (October 9, 1890), Box 11, Folder 826, Newberry Library Archives.

⁷⁸ Houghton, Mifflin & Company to W.F. Poole (September 21, 1888), Box 11, Folder 826, Newberry Library Archives.

LIST OF CO-OPERATING LIBRARIES.

| LIBRARY | LIBRARIAN | No. Vols. |
|---------------------------|------------------------|-----------|
| NEW YORK STATE LIBRARY | Henry A. Brown | 74 |
| ALBANY LIBRARY | William S. Brown | 120 |
| ALBANY HISTORICAL SOCIETY | John W. M. Lee | 30 |
| ALBANY PUBLIC LIBRARY | F. B. Utter | 30 |
| ALBANY UNIVERSITY | Joseph C. Rowell | 117 |
| ALBANY UNIVERSITY | Charles A. Cutter | 175 |
| ALBANY UNIVERSITY | John Ward Dean | 100 |
| ALBANY UNIVERSITY | William T. Chamberlain | 33 |
| ALBANY UNIVERSITY | Mary A. Bean | 400 |
| ALBANY UNIVERSITY | Stephen A. Mayes | 75 |
| ALBANY UNIVERSITY | Thomas F. W. Rogers | 117 |
| ALBANY UNIVERSITY | John E. Goodrich | 94 |
| ALBANY UNIVERSITY | Justin Winsor | 31 |
| ALBANY UNIVERSITY | William F. Poole | 108 |
| ALBANY UNIVERSITY | Ellen F. Whitney | 134 |
| ALBANY UNIVERSITY | James T. Clark | 30 |
| ALBANY UNIVERSITY | Coraelia B. Olmsted | 52 |
| ALBANY UNIVERSITY | Charles A. Hay | 20 |
| ALBANY UNIVERSITY | John H. Barbour | 22 |
| ALBANY UNIVERSITY | William I. Fletcher | 111 |
| ALBANY UNIVERSITY | Willard Fiske | 31 |
| ALBANY UNIVERSITY | Frederick H. Hedge | 516 |
| ALBANY UNIVERSITY | Peter Cowell | 80 |
| ALBANY UNIVERSITY | William Brace | 23 |
| ALBANY UNIVERSITY | Robert Harrison | 14 |
| ALBANY UNIVERSITY | Talbot B. Reed | 6 |
| ALBANY UNIVERSITY | Thomas Hunter | 2 |
| ALBANY UNIVERSITY | Alpheus Smith | 23 |
| ALBANY UNIVERSITY | Daniel S. Durrie | 4 |
| ALBANY UNIVERSITY | George F. Winchester | 3 |
| ALBANY UNIVERSITY | Charles T. Winchester | 104 |
| ALBANY UNIVERSITY | Robert C. Ingraham | 13 |
| ALBANY UNIVERSITY | Addison Van Name | 61 |
| ALBANY UNIVERSITY | J. Schwartz | 26 |
| ALBANY UNIVERSITY | Frederick Saunders | 75 |
| ALBANY UNIVERSITY | William T. Peoples | 74 |
| ALBANY UNIVERSITY | Reuben B. Pool | 199 |
| ALBANY UNIVERSITY | James B. Bailey | 24 |
| ALBANY UNIVERSITY | Thomas M. Osborne | 53 |
| ALBANY UNIVERSITY | Lloyd P. Smith | 45 |
| ALBANY UNIVERSITY | John Edmands | 34 |
| ALBANY UNIVERSITY | Frederic Vinton | 10 |
| ALBANY UNIVERSITY | William P. Goodrich | 34 |
| ALBANY UNIVERSITY | William P. Upham | 115 |
| ALBANY UNIVERSITY | John N. Dyer | 21 |
| ALBANY UNIVERSITY | Frederick M. Crunden | 35 |
| ALBANY UNIVERSITY | Alfred E. Whitaker | 97 |
| ALBANY UNIVERSITY | Ainsworth R. Spofford | 8 |
| ALBANY UNIVERSITY | Homer F. Bassett | 157 |
| ALBANY UNIVERSITY | Samuel S. Green | 162 |
| ALBANY UNIVERSITY | William F. Poole | 50 |
| ALBANY UNIVERSITY | | 108 |
| ALBANY UNIVERSITY | | 1468 |
| ALBANY UNIVERSITY | | 6205 |

Figure 5-2. Example of reprinted and inserted front matter in the 1882 edition of Poole's Index, Regenstein Library, University of Chicago.

Evidence of materiality's inseparable connection to access also appears in the fourth Supplement, which did not acquiesce to popular demands for including author access points

because it would take far too much room, therefore increasing the bulk of the tome and, correspondingly, the cost.⁷⁹ Ultimately, material formats affected the publication of the Index altogether: the final printing of Poole's Index was in 1963, during an era spurring advances in digital technologies. This shift in material focus presumably rendered further physical printing of the Index on paper moot; and indeed when the Index was re-released in 1998 by Paratext LLC, it was in a digital format.

The material construction of the WCFL book wagon inherently allowed for distribution of library materials more directly to patrons in the rural outskirts of Washington County. However, there are several specific examples that show how materiality specifically affected this book distribution service, most notably in the destruction of the first book wagon. The material construction of the wagon and its driving over rocky, rough roads meant that it made quite a loud noise as it traveled. Many farm families knew of the book wagon's approach because of the sound, and would come out to meet it.⁸⁰ But this same noise that worked to elicit interest and attention from rural residents contributed to the wagon's demise. On August 25, 1910, Joshua Thomas left Hagerstown to deliver books when the wagon was struck by a southbound freight train on the N. & W. railroad crossing at St. James.

“The accident occurred at the crossing, near the residence of Samuel Wroe. Mr. Thomas left Hagerstown this morning with the team to deliver books in that section of the county and was driving across the railroad tracks when the accident occurred. He could not see

⁷⁹ William I. Fletcher and Mary Poole, *Poole's Index to Periodical Literature: Fourth Supplement* (Boston, MA: Houghton, Mifflin and Co., 1903), iii-iv.

⁸⁰ American Library Association, *Book Wagons: The County Library with the Rural Delivery* (Chicago, IL: American Library Association, 1922), 2.

the train approaching owing to trees along the track and the rumble of the train was drowned by the noise made by the wagon.”⁸¹

According to the Daily Mail, he could not see the train due to trees along the track, nor could he hear the approaching train over the immense noise of the wagon.⁸² Thomas suffered a broken rib and slight abrasions.⁸³ The book wagon was completely destroyed.

Subsequent iterations of the book wagon had material affordances and constraints that both broadened and reduced service. For example, the adoption of automobiles as the vehicles for book distribution allowed increased service. Automobiles reduced the time it took to traverse the county: routes that had previously taken days in earlier iterations of the book wagon could now be completed in a single day.⁸⁴ However, the mechanical nature of automobiles—a reflection of their material construction—led to accidents, breakdowns, and the inability to travel in bad weather.

“Unfortunately the wagon is a victim of circumstances over which we have no control. Even at best, but eight or nine months can be counted on, and wet days, wet roads and repairs shorten the time of operation still more. This year has been no exception. After the second trip in the Spring, the wagon was in the shop for one month for repairs. Again this Fall—just at the beginning of our most profitable seasons—two more months were lost for the same reason, and we were obliged to discontinue the work a month earlier than usual for lack of a chauffeur.”⁸⁵

⁸¹ “Library Book Van Smashed in a Railroad Wreck—Mr. Thomas Escapes Serious Injury,” The Daily Mail, Hagerstown, MD (August 25, 1910).

⁸² Ibid.

⁸³ “Hab [sic] a rib broken,” The Daily Mail, Hagerstown, MD (August 26, 1910).

⁸⁴ Ralph Stautter, “The Washington County Free Library, Hagerstown, Maryland,” 4. Washington County Free Library Administrative Archives.

⁸⁵ Washington County Free Library, Fourteenth Annual Report 1914-1915, 7-8.



Figure 5-3. Photographs of the International Harvester under repair, ca.1915. Library Administrative Archives, Western Maryland Room, Washington County (MD) Free Library.

The material nature and construction of the first two automobile versions of the book wagon made them too “heavy and unwieldy” for the female librarians to drive themselves, and so required a chauffeur. The material nature of the early automobiles meant that the library had to hire more staff (and thus spend more money) to continue the book wagon service. But the third automobile, the Dodge Business Car, did not require a chauffeur. It was light enough to be driven by the female librarians themselves—as long as one stood on the running board to keep the car from tipping over while the other drove⁸⁶—another indication of how materiality shaped the design of the book wagon service.

Materiality in XC manifested very differently than Poole’s Index or the WCFL book wagon. The previous two cases dealt primarily with physical materiality, either in the artifact itself or surrounding material conditions that affected the artifact. But with XC, both physical and digital materialities affected the design outcomes.

To begin with, the primary goal of XC was originally motivated by a significant issue of materiality: how to create a catalog interface that could search, browse, and display library collections of diverse material formats. Previously, most library collections were described differently based on material format. Even when the same content standards were used for resource description, additions and alterations had to be supplied to address multiple material and media formats. For example, even though the *Anglo-American Cataloging Rules, 2nd edition* (AACR2) ostensibly provided standardized rules for describing all library materials, it contained separate chapters for describing books, maps, archival manuscript collections, music, sound recordings, movies and video recordings, images, electronic resources, microforms, three-

⁸⁶ Sandra J. King, “Birth of the Bookmobile,” *Antique Automobile* (May/June 1994), 16-17.

dimensional objects, and so on.⁸⁷ Thus resources of different physical formats are represented by different metadata, both in terms of content standards but also by different schemas designed to represent and transmit information. The purpose and function of the XC Schema and the Metadata Services Toolkit was specifically to transform and standardize metadata from these multiple disparate sources into a format that could represent all of these materials.

Like an index, a metadata schema is an intellectual product that must be somehow instantiated in order to be used. Although the XC schema exists as a textual document with identified and defined elements,⁸⁸ each of these elements is also instantiated in digital form as a uniform resource identifier (URI). A URI is a unique character string used to “distinguish one resource from all other resources.”⁸⁹ A URI may also specify the location of a resource, especially a digital resource. This is often done in the form of a uniform resource locator, or URL, such as typical web address.⁹⁰ While the concept of URI is not inherently digital—for example, an ISBN on a printed book may be considered a form of URI—it emerged in the context of digital resources and thus is often discussed in that context. The URIs in the XC schema are digital, and, as they take the form of URLs, are also intended as digital locators, either to a referenceable element resource or to a conceptual XML namespace. However, because these element URIs are digital, they are subject to the affordances and constraints of digital materiality. Materiality of digital objects is well-established, both in terms of constraints specific to digital media as well as

⁸⁷ Joint Steering Committee for Revision of AACR and American Library Association, *Anglo-American Cataloguing Rules, 2nd ed.* (Chicago, IL: American Library Association, 2002).

⁸⁸ eXtensible Catalog Project XC Schema Definition, Pre-Release Version (January 7, 2009), accessed February 11, 2016, <http://www.extensiblecatalog.org/learnmore/publications/xc-schema-definition>

⁸⁹ Tim Berners-Lee, Roy Fielding, and Larry Masinter, “Uniform Resource Identifier (URI): Generic Syntax. Request for Comments 3986,” Section 1.1, accessed November 20, 2013 at <http://tools.ietf.org/html/rfc3986>

⁹⁰ *Ibid.*

being affected by physical infrastructure to support digital products.⁹¹ In addition to physical limitations on digital materiality, like inability to access or use the schema without a computer, electricity, and internet infrastructure, specific characteristics of digital material, like ephemerality, come into play. Although it should be noted that according to the definition document, the URIs for these XC properties are provisional, many of the schema element URIs—specifically those located in the <http://extensiblecatalog.info> space—no longer resolve. That is to say, the actual, digital, element reference no longer exists. This is presumably due to the change in the top level domain from extensiblectalog.info to the current domain of xoproject.org, possibly in conjunction with the hand-off of the project from the University of Rochester to the Consortium of Academic and Research Libraries in Illinois (CARLI). Attempts to locate the elements by substituting the new top-level domain in the URI were unsuccessful—the references did not resolve.

5.2.2.1 *Lack of material innovation*

It's true that all design artifacts, in some form or fashion, are limited by material properties, be they physical or digital. But one notable difference between other design domains and librarianship is the innovation that emerges from pushing material boundaries based on problem framing. By that I mean if the goal is truly problem solving, then sometimes the best way to solve a problem is to develop or invent a new material that achieves your goals, rather than building a solution limited by the constraints of existing materials. For instance, a fashion designer charged with designing new police uniforms may create new bullet-proof textiles in the course of his work. Even when materials do not yet exist, designers do not let themselves be

⁹¹ Dourish and Mazmanian. "Media as Material"; Alexander R. Galloway, *Protocol: How Control Exists After Decentralization* (Cambridge, MA: MIT Press: 2004).

stifled. Techniques like mock-ups or “Wizard of Oz” prototypes help envision possible directions for new material innovations.⁹² To offer a library-related example, the idea for what eventually became the Google Books project fostered the development of new scanning materials and technologies that significantly reduced the time necessary to digitize library materials.⁹³

In contrast, libraries seem resigned to work with existing materials rather than inventing new materials or drawing from innovative sources. Poole took the physical book form for granted, never questioning that it was the appropriate way to solve the problem. The XC team found themselves constrained by MARC and other existing bibliographic standards that held them back, and rather than develop new standards (which they discovered was ultimately key to actually solving the problem), they worked within these material constraints, limiting their ability to solve the original problem from the outset. The one contrast may be the book-wagon, as it explicitly viewed the situation in terms of how to solve the problem of reaching rural citizens, rather than “how to reach rural citizens with deposit stations” or any other pre-conceived materials. Mary Titcomb wanted to get books into the hands of rural readers, and she examined numerous possibilities for doing so, from deposit boxes to mail order and finally the book wagon. The material was selected because it solved the problem, rather than the other way around.

⁹² Pelle Ehn and Morten Kyng, “Cardboard Computers: Mocking-it-up or Hands-on the future,” in *Design at Work: Cooperative Design of Computer Systems*, Joan M. Greenbaum and Morten and Kyng, ed. (Hillsdale, NJ: L. Erlbaum Associates, 1991), 169-196; Bill Buxton, *Sketching User Experiences: Getting the Design Right and the Right Design* (New York, NY: Morgan Kaufmann Publishers, 2007), 239-243.

⁹³ “Google Books History,” accessed June 3, 2016, <https://www.google.com/googlebooks/about/history.html>

5.2.3 Embedded values

5.2.3.1 *Divergence from stated values of librarianship*

Unlike natural objects, design artifacts are not neutral, but rife with politics and values. By offering some possibilities but not others, affordances enact values. Possibly the most notable example of this is the bridge system designed by Robert Moses in New York. Overpasses were designed at a height to prevent buses—the typical form of transportation for people of lower socioeconomic classes—from traveling underneath en route to Long Island.⁹⁴ Thus an inanimate object (in this case, a bridge) enacted specific political and value perspectives (the idea that lower classes were not welcome in the wealthy neighborhoods). This artifact ended up controlling which people were allowed to travel where as well as determining that the current system of social class was reinforced.

Although Moses' values were purposefully embedded in his bridge design, artifacts always reflect and enact values, regardless of whether or not the designers intended them to do so. We can see this in tangible artifacts like Pinch and Bijker's analysis of bicycles, where designs reflected values like personal safety and femininity.⁹⁵ But various analyses of software and information systems have shown that these artifacts also contain biases, assumptions, and or worldviews that reflect specific value perspectives.⁹⁶ Galloway goes so far as to argue that such

⁹⁴ Langdon Winner, "Do Artifacts Have Politics?" *Daedalus* 109, no. 1 (1986).

⁹⁵ Trevor J. Pinch and Wiebe E. Bijker, "The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other," *Social Studies of Science* 14 (1984), 399-441.

⁹⁶ See for example Batya Friedman and Helen Nissenbaum, "Bias in Computer Systems," *ACM Transactions on Information Systems* 14 no. 3 (1996), 330-347; Batya Friedman, ed. *Human Values and the Design of Computer Technology* (Stanford, CA: Center for the Study of Language and Information, 1998); Helen Nissenbaum and Lucas D. Inrona. "Shaping the Web: Why the Politics of Search Engines Matters," *The Information Society* 16, no. 3 (1999), 169-185; and Ben Shneiderman. *Leonardo's Laptop: Human Needs and the New Computing Technologies* (Cambridge, MA, MIT Press: 2002).

embedded determinations are inescapable and all objects are imbued with social power to the extent that society cannot break free.⁹⁷

The creation of artifacts is a central component of design, and one of the things that separates design from nature. Every artifact has inherent properties and characteristics that inescapably affect how that artifact can be designed, considered and used. Thus design is a uniquely positioned lens that allows examination of values in ways that other approaches cannot. Critical analysis of artifact affordances in each of the three cases reveals insights about library values regarding where they align with or diverge from established traditional values of librarianship as well as additional new values not yet formally articulated.

Many values visible in these artifacts align with established values of librarianship. Although the American Library Association's statement of core values of librarianship was formally adopted in 2004, the organization specifically notes that this set of stated values reflects both the history and the ongoing development of librarianship.⁹⁸ The stated values include the following:

- Access
- Confidentiality/Privacy
- Democracy
- Diversity
- Education and Lifelong Learning
- Intellectual Freedom
- Preservation
- The Public Good
- Professionalism
- Service
- Social Responsibility

⁹⁷ Galloway, *Protocol*.

⁹⁸ American Library Association, "Core Values of Librarianship," (June 29, 2004), accessed June 3, 2016, <http://www.ala.org/advocacy/intfreedom/statementspols/corevalues>

Each of the artifacts considered in this study reflect some portion of the values of librarianship as stated above. For instance, the first value on the list, access, is defined by ALA as follows:

“All information resources that are provided directly or indirectly by the library, regardless of technology, format, or methods of delivery, should be readily, equally, and equitably accessible to all library users.”⁹⁹

Evidence of this value is present in all three cases. Poole’s Index enabled ready access to library periodical materials by compiling bibliographic information in one single artifact. Patrons no longer had to wade through multiple periodical indexes, nor did they need to consult the librarian. Anyone who came into the library could use the Index, making it equally accessible to all library patrons. Whether or not this was also equitable access is arguably colored by historical context. Today we know that literacy levels, library anxiety, and other challenges mean that access to an index does not necessarily equal access to the information within it; however, given the zeitgeist of the era in which Poole’s Index was created, the value of access as perceived by those of the time can be seen. The WCFL book wagon is a more progressive example, as it explicitly undertook to create equitable access to library materials between urban citizens and rural residents as one of its major tenets. Without the wagon, library materials would have been inaccessible by most of the county residents. And through de-siloing of various material formats, XC enabled more direct access to library materials from multiple sources and of various types. XC also represents access on a deeper level by establishing the toolkits as open source software products. This goes beyond equitable access to library materials and offers equitable access of library tools to other librarians and library staff, which in turn could enable them to offer direct

⁹⁹ American Library Association, “Core Values of Librarianship: Access,” (June 29, 2004), accessed June 3, 2016, <http://www.ala.org/advocacy/intfreedom/statementspols/corevalues#access>

access to materials in multiple formats. The open source nature of the artifact could also be considered to reflect social responsibility in a way as open source software arguably ameliorates societal issues surrounding copyright, licensing, and ownership of intellectual property regarding software. Other examples of cases in this study aligning with ALA values include education and lifelong learning, which is clearly evinced by Titcomb's motivations for the book wagon service, and the ALA value of service, which dovetails with the service orientation of design described in previous chapters.

Other ALA values are not so clearly represented in the artifacts of this study. There are some ways in which values may be reflected at an abstract level, such as democracy, which is stated as a corollary to access in ALA's code.¹⁰⁰ However, the widely-held belief that an informed citizenry is necessary for a dynamic democracy lends support to cases like Poole's Index and the WCFL book wagon. The former offered citizens increased access to periodical content, which was increasingly the home for political and social writing.¹⁰¹ The latter increased both access to and interest in information resources from the library. Even the XC may arguably support informing citizenry through increased support for access to a greater variety of materials. However, these connections are indirect. The same might be said for values like preservation and intellectual freedom. There is neither evidence for nor against any strong positions regarding these values in these artifacts.

A few examples from the artifacts in the three cases demonstrate contradictory values to those stated by ALA. The most noticeable is the value of privacy/confidentiality, and it arises in the

¹⁰⁰ American Library Association, "Code of Ethics of the American Library Association," (last amended January 22, 2008), accessed June 3, 2016, <http://www.ala.org/advocacy/proethics/codeofethics/codeethics>

¹⁰¹ Frank Luther Mott, *A History of American Magazines, 1741-1930* (Cambridge, MA: Belknap Press of Harvard University Press, 1958), 337-379.

case of the book wagon. A key aspect of the design of the book wagon service is that it visits patrons' houses directly. Although the library coming to the user certainly demonstrates a value of convenience, it also does not afford the same levels of privacy or confidentiality that a patron might experience when coming to a library space. Library staff working the book wagon routes sometimes made comments regarding patrons, their residences, and their book choices.

“But as a rule a return trip to certain families is anticipated with much pleasure. One of these lives near Garrett’s mill and consists of father, mother, a son, and two grown daughters. They live on a small farm and raise poultry and market produce. Though they subscribe to only one weekly newspaper they are deeply interested in the big world outside. This fall they were found cutting corn, shelling beans and baking for a festival to be held in the neighborhood that evening. Seated on the back porch steps, domestic problems, the war, and the books they had so thoroughly enjoyed were discussed. Then all went out to the car for more. Here is what they selected for their winter’s reading:

- About Paris
- Java
- Life of Napoleon
- Through darkest Africa
- Tenants of an old farm
- In Vanity Fair
- Sky pilot
- In old school days
- David Harum
- Broadway
- Battle of the strong
- A Roman holiday

- Italian life in town and country
- When America was new”¹⁰²

Other examples of diverging from the value of privacy and confidentiality include observations and sometimes even intrusions by librarians into patrons’ health and medical situations.

“Many a mother has the wagon woman to thank for bringing her to the ministrations of the public health nurse. Many a child has been saved from adenoids, weak eyes or other ailments because of the observing eye and practical helpfulness of the county worker. Confidence once established not only books for the children and adult education progress, but in countless ways, the visit of the wagon becomes a blessing.”¹⁰³

Clearly Titcomb felt that the action we would now construe as intrusive and in violation of privacy were justified because of the benefit to patrons. There seems to be little recorded as to patrons’ perceptions of these behaviors, only the opinions of the library staff. Not only did library staff themselves observe private spaces and behaviors, and take actions based on what they saw, but they apparently felt no qualms about publishing this information—including entire lists of titles circulated to patrons—in the library’s annual reports, a violation of privacy that would be considered anathema by today’s ALA code. But though these actions may be considered intrusive and in violation of privacy according to the contemporary list of librarianship’s core values, it should be noted that values are not static. They change over time and in response to social, political, and other contexts. Viewing Titcomb’s marketing and communications strategies through contemporary eyes overlooks the evolution of the value of privacy in librarianship. Privacy was not articulated as a core value until 1939, twenty years after

¹⁰² Washington County Free Library, Thirteenth Annual Report 1913-1914, 7-8.

¹⁰³ Titcomb, “Story of the Washington County Free Library,” 16.

the book wagon service began.¹⁰⁴ When the lack of privacy became dangerous to users, privacy became increasingly valued, such as in the mid-20th century in the context of the Red Scare, and again in more recent years with the instigation of the Patriot Act.¹⁰⁵ Although Titcomb's strategies may not have conflicted with the values of librarianship at the time—in fact, they emphatically supported the contemporary values of education and literacy—examining the value of privacy in this case offers an increased awareness of how values can change over time and ideally lets us acknowledge that the values espoused by ALA today may also be different in the future.

For instance, new values may be incorporated. Beyond the values currently stated by ALA, all three cases in this study reveal additional values beyond the ones formally stated in librarianship: notably a commitment to cooperation—a value that has served the field well in many instances of diminishing resources and other constraints over the course of its history. The cooperative plan for indexing that emerged from the third edition of Poole's Index demonstrates the value of cooperation—without it, the Index would likely have ceased to exist. Poole certainly would not create another edition on his own; he explicitly stated as much.¹⁰⁶ Titcomb notes in meeting minutes and annual reports that much of the success in achieving the library's mission is due to the cooperation of the staff. Certainly the book wagon would not have prospered without the cooperation of Joshua Thomas, who was officially on the payroll as the janitor and not as book wagon driver or librarian despite performing tasks accorded to both of those positions. But cooperation is probably most evident not within WCFL internally, but in Titcomb's constant

¹⁰⁴ American Library Association, "1939 Code of Ethics for Librarians," Article II, number 11, in "Midwinter Council Minutes," *American Library Association Bulletin* 33 no. 2 (1939), 128–129.

¹⁰⁵ Christopher M. Finian, *From the Palmer Raids to the Patriot Act: A History of Free Speech in America* (Boston, MA: Beacon Press, 2007).

¹⁰⁶ "The Proceedings [of the conference of librarians at Philadelphia]: Co-operative Indexing," *The American Library Journal* 1, nos. 2-3 (November 30, 1876), 116-117.

dedication to sharing information about the project with other libraries and institutions wishing to implement similar services. Regarding XC, cooperation was explicitly built in to the project from the outset:

“Part of this project plan is to be technological, but an important component identifies similar projects and then creates a framework for broad-based cooperation and community-based code development.”¹⁰⁷

Cooperation was actively solicited in a variety of areas, including user studies, development of various toolkit components, implementation, and even in an advisory capacity.¹⁰⁸ In addition to institutional partners, XC also reflects cooperation through the long-established precedent in libraries of working with students. Five undergraduates at the Rochester Institute of Technology worked together with librarians at the University of Rochester to create a Name Access Tool which was subsequently incorporated into the Metadata Services Toolkit.¹⁰⁹ Cooperation in libraries has been the norm since the beginnings of American librarianship. It is arguably one of the strongest and longest held values in the field. However, despite its prevalence, it does not appear in ALA’s list of core values. Cooperation should be officially added to the core values of librarianship to reflect its well-established existence in the field and to support it as an overall value in society, akin to the other stated values.

Cooperation in XC existed for many of the same reasons as the other cases, such as reduction and deduplication of labor, standardization, and support for sharing information. However,

¹⁰⁷ Stanley Wilder, “Baker’s Smudges,” *Library Journal* 14 no. 131 (September 1, 2006): 31-32.

¹⁰⁸ “XC Letterhead,” blank form letter inviting partners to participate (last edited April 27, 2007), accessed June 3, 2016 from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/View/Collection-4051>

¹⁰⁹ Matthew Horoszowski, Rob Busack, Anthony Lyo, Ben Greenwood and Dean Rzonca, “Name Access Control Module Final Report,” accessed February 16, 2016, from Xerox DocuShare, <http://docushare.lib.rochester.edu/docushare/dsweb/Get/Document-27362>

cooperation in XC notably demonstrates an additional aspect: a high level of value placed on freedom and control. XC sought to empower libraries through the use of the DIY and open source paradigms of the time. Demonstrating that such a powerful product could be developed by a library (as opposed to a commercial vendor) was one way of asserting power and control. Another was to accord power and control to other libraries that did not have their own product development resources by offering XC as open source. Out of all the goals put forth over the course of the XC project, the commitment to releasing any products as open source was the most consistent and unwavering aim, as evidenced by the goals stated in various documents over the course of the project timeline:

- develop an open-source online system¹¹⁰
- “XC is envisioned as an open-source system that libraries can download and install as an alternative way for users to access their resources”¹¹¹
- design and develop a set of open-source applications that will provide libraries with an alternative way to reveal their collections to library users¹¹²
- “XC is envisioned as an open-source system that libraries can download and install as an alternative way for users to access their resources”¹¹³
- experimenting with contemporary open source code¹¹⁴

¹¹⁰ “Mellon Grant Funds Planning,” University of Rochester press release.

¹¹¹ “What is XC, in a Nutshell?” news post from eXtensible Catalog website (May 26, 2006), accessed June 3, 2016 at <http://www.extensiblecatalog.org/news/what-xc-nutshell>

¹¹² Nancy Fried Foster and others, “eXtensible Catalog Survey Report,” (River Campus Libraries, University of Rochester, July 20, 2007), 1, accessed February 16, 2016, <http://www.extensiblecatalog.org/learnmore/publications/extensible-catalog-survey-report>

¹¹³ “What is XC, in a Nutshell?” news post (May 26, 2006).

¹¹⁴ Lindahl, Bowen and Foster, “eXtensible Catalog Phase 1 Final Report,” 4-6.

- Publish the XC code as open source, to be sustained by a community of contributors bound by a funded governance structure¹¹⁵
- Make it possible for libraries to implement an entirely open-source approach to the discovery of library resources¹¹⁶
- publish the XC code as open-source software¹¹⁷
- provide libraries with open-source tools and software that will allow libraries to expand their current roles¹¹⁸

The consistent and unwavering commitment to making XC open source, as well as the articulated motivations for this move, including “providing libraries with alternative ways to reveal their collections” and “making it possible to libraries to go entirely open source” and “expanding library roles,” all speak to a greater aim of releasing libraries from their historical dependence on commercial software products as well as empowering librarians to invent new and innovative projects that would reshape the role of libraries.

Much of this was made possible through cooperation, by engendering a feeling of empowerment in the community and by explicitly differentiating XC work from the work of commercial entities, as Bowen describes:

“...the Code4Lib community was really kind of instrumental in kind of developing that kind of community of people who could, “well, we’ll just build it ourselves.” You know, wanting libraries to not be locked in to what commercial vendors were providing. So

¹¹⁵ “The University of Rochester’s eXtensible Catalog Project,” information sheet, (last edited January 25, 2008), accessed February 16, 2016, <https://docushare.lib.rochester.edu/docushare/dsweb/View/Collection-3175>

¹¹⁶ Ibid.

¹¹⁷ Bowen, “Metadata to Support Next-Generation Library Resource Discovery,” 7.

¹¹⁸ “Serials Solutions Joins eXtensible Catalog Project,” news post from eXtensible Catalog website (July 3, 2009), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/serials-solutions-joins-extensible-catalog-project>

yeah, we were collaborating with them as far as we could in just sort of communicating with them. I think there was a lot of spirit of, well, what are you doing, and what are you guys doing, and you know, kind of sharing and comparing notes, which is of course not what you get with vendors.”¹¹⁹

Unlike many other library projects, XC explicitly demonstrated value of power and control regarding library designs, and along with it, a form of empowerment.

A strong aspect of librarianship that has enabled cooperation over the course of the field’s history is standardization. Standardization affords easier sharing of data and resources among different groups or organizations,¹²⁰ and even though it has not been formally stated as a professional value, has been highly valued in librarianship. Poole led the “central bureau” for the cooperative indexing work on the 1882 edition, a position that included collating, alphabetizing, and thoroughly revising all the submitted entries to bring them into a consistent, standardized form.¹²¹ He furnished a “code of rules” for indexing periodicals to each cooperating library so that all indexing slips arriving to the central bureau would be consistent and therefore easier to organize and compile.¹²² The trajectory of XC clearly demonstrates that accomplishing the lofty goal of bringing together and displaying resources from diverse collections and formats hinged on standardization of metadata among said resources. XC toolkits were built on standards like OAI-PMH because of the benefits standardization offered in terms of the ability to use the tools across collections and organizational settings.¹²³

¹¹⁹ Bowen, interview.

¹²⁰ Paul Miller, “Interoperability: What is it and why should I want it?” *Ariadne* 24 (2000), accessed June 3, 2016, <http://www.ariadne.ac.uk/issue24/interoperability>

¹²¹ “The Proceedings: Co-operative Indexing,” *American Library Journal* (November 30, 1876), 117.

¹²² William Frederick Poole, *Poole’s Index to Periodical Literature* (Boston, J.R. Osgood & Co., 1882): iv.

¹²³ Bowen, interview.

But in addition to standardized metadata, XC embraced other forms of standardization to support collaboration among multiple contributors, such as the document repository described by Lindahl that afforded standardized forms of documentation and version control. Additionally, standards in software development and open source licensing allowed XC to be shared and used by any interested party. It is no surprise that Poole's Index and XC both valued standardization highly, since they are both projects related to information organization and access, for which standardization has long been a central tenet. As a counterpoint, the WCFL book wagon offers little evidence of explicitly valuing standardization; on the contrary, the wagon itself, as well as its routes and collections varied depending on material availability and influences, community needs, and other external circumstances.

Although the preceding discussion of values is framed in terms of concurrence or contrast from the currently stated core values of ALA, it should be noted that values are never that clear cut. Values—even those articulated together in a set, such as ALA's list—are always in tension. For instance, privacy and confidentiality may often come into conflict with other values like access (such as demonstrated in the case of the WCFL book wagon), diversity (such as demonstrated in recent cases of recording gender identity information in authority records¹²⁴), and preservation (such as preserving private or confidential information in archival collections¹²⁵). These tensions are not inherently problematic; however, identifying and acknowledging such tensions is critical to understanding the discipline of librarianship as well as providing quality tools and services. Additionally, this review of values also reveals that librarianship has traditionally framed its core values in terms of services to patrons. This demonstrates the service focus of librarianship and a

¹²⁴ Amber Billey, Emily Drabinski, and K. R. Roberto, "What's Gender Got to Do with It? A Critique of RDA 9.7," *Cataloging & Classification Quarterly* 52, no. 4 (2014), 412-21.

¹²⁵ See for example Alice Robbin, "State Archives and Issues of Personal Privacy: Policies and Practices," *The American Archivist* 49 no. 2 (Spring 1986), 163-175.

focus on users. However, the cases in this study demonstrate values relevant to the practice of librarianship itself, such as cooperation and standardization. Although these do subsequently affect library patrons, they perhaps more strongly affect librarians and other practitioners of American librarianship. This reinforces the idea that librarianship is comprised of two user groups: patrons and librarians. These groups may or may not have overlapping sets of core values, and possible value tensions may emerge between these two sets of users.

5.2.3.2 Disconnect between the universal and the ultimate particular

The disproportionate focus on standardization in librarianship may contribute to an ongoing disconnect between what is referred to in design as the “universal” vs. the “ultimate particular.” According to Nelson and Stolterman, the “universal” describes abstract ideas, absolute truths, and overarching theories, while the “ultimate particular” refers to specific, concrete, highly contextual instantiations. Specific artifacts (tangible or intangible), like a chair, a curriculum, or a policy, are each an example of an ultimate particular. They are each unique—not the universal chair, the universal curriculum, or the universal policy. They posit that unlike science, which begins with ultimate particulars and extrapolates universal knowledge about the world, design is the process of moving from the universal to specific artifacts (see Figure 5-4).¹²⁶

¹²⁶ Harold G. Nelson and Erik Stolterman. *The Design Way: Intentional Change in an Unpredictable World*, 2nd ed. (Cambridge, MA: MIT Press, 2012), 30-32.

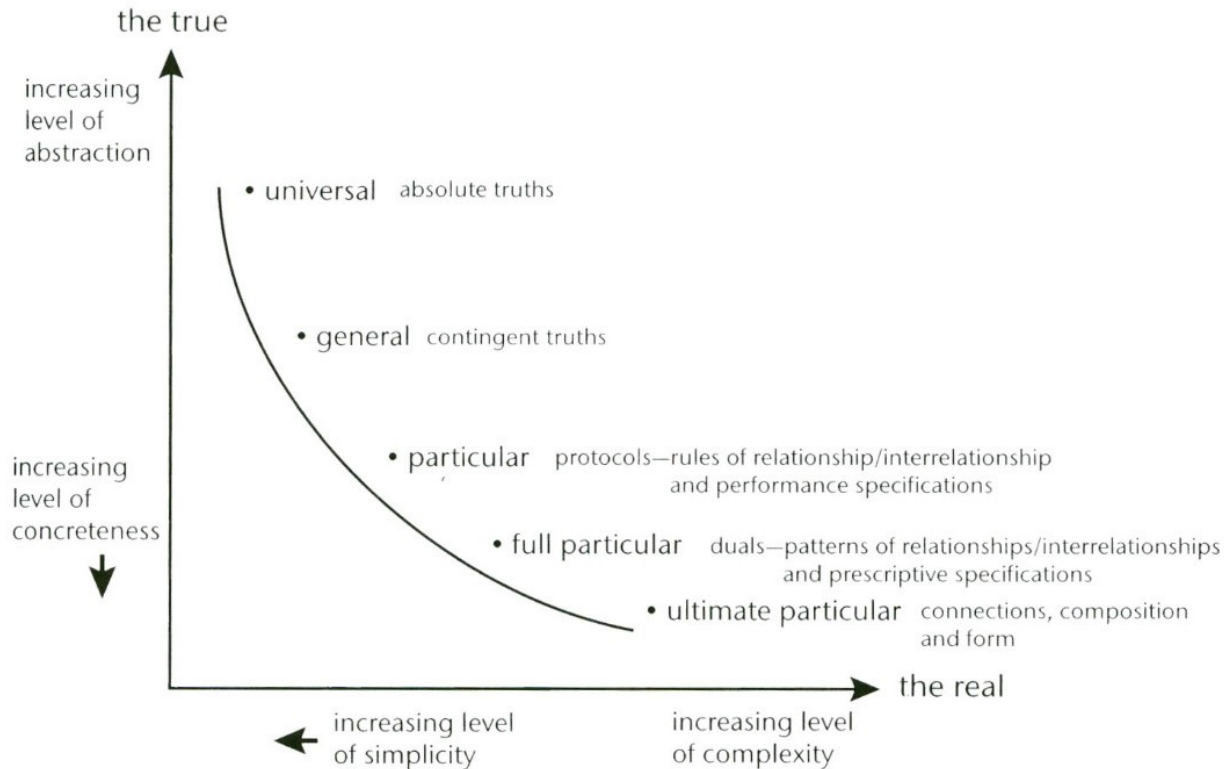


Figure 5-4. Universal to ultimate particular. From Harold G. Nelson and Erik Stolterman, *The Design Way*, Figure 1.2, page 31.

Each of the cases in this study are, by their very nature, analyses of examples of particulars.

Poole's Index was shaped by the specific affordances and constraints that arose from its context of creation—it would not be the same if it had been, say, Dewey's or Cutter's Index, or if it had continually been written by Poole alone as opposed to the cooperative plan. The book wagon would be a different design if it had been created in California rather than Maryland, due to differences in terrain and the diversity and spread of the population. Likewise it would be a different particular had Joshua Thomas not been the original wagon driver, as his familiarity with the territory allowed him to traverse the roads, and his rapport with the rural residents went a long way in building trust and interest in the book wagon. XC might have stayed the course as a user interface if different people with different knowledge and backgrounds and different resources had been part of the team.

Yet rather than acknowledging the design perspective that particulars derive from universals, American librarianship seems to have perpetuated the opposite idea. While the emphasis on standardization and cooperation in librarianship has provided benefits in terms of sharing data, workload, and resources, it has also left librarianship in a position of attempting to derive universal particulars—artifacts that work across all contexts. But since design problems have already been established as wicked problems, inherently affected by diverse contexts and framings, creating any sort of universal artifact that works for all libraries is a quixotic task. The focus on the universal level extends throughout the discourse of librarianship: the field often talks and teaches about libraries in an abstract sense (what I call the “capital-L library”), or even “public libraries” or “academic libraries” as broad units, even though those libraries may vary vastly depending on size, geographic locations, and demographics of the clientele, among other factors. Library tools are often referred to in a similar manner, talking about “library catalogs” or “storytime” rather than specific instantiations of systems or events. To use a classification analogy, one might say that librarianship mostly represents a “lumper” point of view, where the tendency to see similarity puts everything into the same category. But design artifacts (ultimate particulars) represent the “splitter” perspective, emphasizing differences unique to local and individual contexts. Although identifying similarity can support cooperation among many institutions, it may result in less successful design artifacts, as there is no one, universal index or catalog, no single book wagon or storytime that can serve libraries at the “capital-L” level.

5.3 Summary

In this chapter, I discussed the ways in which elements of design epistemology manifest in American librarianship based on a critical analysis of three major cases. No discussion can cover every identifiable theme found in the case evidence, so this discussion has focused on interesting

topics pertinent to current topics in the field that emerged from my interpretation of the evidence. While some points may seem negative or critical, it is not my intention to take away from the many positive contributions these libraries and their designs have made. Rather, this is a product of the critical analysis method that specifically seeks to change the status quo and critique the current existing situation.

Discussion of elements of design epistemology from each of the three cases reveal that design epistemology is often present, but implicit, in American librarianship. When design epistemology is present, it may be relegated to external contexts, like other professions or fields, and not considered part of librarianship. Elements of design epistemology present in librarianship also help to concretely support the idea of librarianship's focus on users. Beyond these discussions, this chapter also reveals about knowledge construction, values, and the effects of materiality on librarianship that have gone mostly unaddressed in previous applications of more scientific perspectives.

Chapter 6 Reflection and Recommendations

I have previously shown that elements of design epistemology manifest in various ways in librarianship, and that because of this manifestation, librarianship can validly be considered a design discipline. However, the design epistemology that underlies these manifestations is implicit throughout the field and/or externalized as the work of other fields and disciplines. In this chapter, I turn to critical reflection to discuss some possible reasons for this implicit externalization as well as implications for the field. Based on previous discussion and these reflections, I then recommend ways that design epistemology might be more explicitly manifested and embedded in research, education, and practice the field in the future.

6.1 Reflections

6.1.1 Why is design implicit and external?

If we acknowledge the potential power inherent in embracing design epistemology in American librarianship, then why does design epistemology remain implicit and external? Some of it may be due to the conceptual framing of librarianship: if the field has not been explicitly understood as a design field, then there is no reason to believe that design elements and concepts would be considered in any formal or explicit way. The historical evolution of the field, as discussed in Chapter 2, certainly had a significant influence. The lack of available language may also be a reason: since librarianship predates the formal articulation of design as epistemology, librarians may not be familiar with this discourse with regard to discussing their actions.

In addition to these explanations, the evidence in this study reveals that lack of resource support for design—both in terms of concrete resources as well as intangible resources like leadership and intellectual grounding—may also contribute to the externalization of design in librarianship.

Poole's Index clearly demonstrates a lack of support for design work through the absence of funding for the project and the shifting of the work to outside of library time. Titcomb had moderate success convincing the WCFL board of trustees to support the book wagon, but support for the project varied over the years, leaving large blocks of time when no book wagon existed. When the board did support the book wagon in terms of financial support, they were supporting the idea of the existing service, rather than supporting a holistic approach to design in librarianship.

Several examples from XC directly speak to a lack of support for design in libraries overall. For instance, Lindahl mentioned wanting to incorporate elements of design epistemology from his time at Xerox into his library work at University of Rochester. He made requests to the Dean to hire an anthropologist full-time, and was denied because funding was unavailable. The Dean suggested, however, that Lindahl secure grant funding to hire an anthropologist for a one-off library project as a proof-of-concept, that might (and eventually did) help support his case for hiring Foster full-time.¹ Without that initial grant funding, many of the design elements in the work of XC and other projects at the UR libraries would never have been supported. Thankfully UR's academic library setting supported the grant application process—a luxury that not all libraries have, as many libraries, especially public libraries, face constraints like a lack of time to devote to grant writing or lack of experienced mentors to guide a successful application. But even grant-funded support is not enough in the long run, as Bowen notes:

“...at some point the sustainability becomes the issue, you know, because we were trying to sustain things through grants, and eventually the grant money dries up. And if there

¹ David Lindahl, interview with the author (March 2, 2016); Nancy Fried Foster, interview with the author (February 8, 2016).

isn't a large community that can support it—and you need a pretty large community of users to be able to support something—you know, it's just not a model that's as sustainable as we thought it was.”²

Foster also mentions the lack of sustainable financial support for innovative design projects in libraries and contexts that support design epistemology:

“In the meantime, however, the library funding situation has deteriorated so badly. Whereas at the time we started eXtensible Catalog, we had a software shop in our library and a lot of other libraries did too. And now that's rare. It's disappeared from the University of Rochester. It's gone. So that project could never be done now. It's unthinkable. That's over. And also at many of the other places that contributed programming time and money, that's dried up. And I think that it's really, I mean this is not what you're asking me about, but it's a really terrible backward step in academic libraries because it makes academic libraries even more dependent on vendor products, you know, commercial products. And there are a few of these projects that are just doing really cool stuff that can amount to something, but you really, at some point you really need a big investment to make a big system. And that's just not available now. Nobody's making that kind of investment.”³

Support is often financial, but not always. Lindahl discusses additional infrastructure at Rochester that allowed for design support, such as the use of a document repository to support iteration:

² Jennifer Bowen, interview with the author (January 29, 2016).

³ Foster, interview.

“And you know, one of the challenges of academic libraries is there’s bigger, more-resource-rich ones, and there’s smaller ones, and most academic libraries don’t have a lot of resources. So they’re challenged on what they spend their money on. But I think academic libraries that want to do projects and don’t have a repository to manage their documents are missing out a lot. So I would say that XC couldn’t have happened without some way of having a robust management of documents. So we had version control, we had the ability to share documents, collaboratively author them, to keep track of requirements, to iterate on things. You know, iterate, iterate, iterate. To do usability testing, to see the results, to write the results down, to be able to go back and see how we progressed through versions of things. All of that is just basic and foundational. But I think there’s a lot of libraries that don’t have any experience with having tools like that. So they don’t know what they’re missing.”⁴

Foster and Lindahl both discuss more than just a lack of funding. Foster clearly alludes to the power struggle that libraries still find themselves in because design is controlled by external players (in this case, commercial software vendors). While Foster Spoke specifically in the context of technology, beneath the surface her words allude to aspects of design epistemology that underscore that software production, such as anthropological studies of work practices that guide software design. What we see here is a lament about an increasing lack of fostering space for forward-thinking, innovative design potential. Lindahl expresses frustration not just with a lack of financial resources, but libraries’ lack of experience. Why would any library advocate for

⁴ Lindahl, interview.

funding for design resources or support if they've never experienced the benefits of such approaches?

Yet libraries have been advocating for design resources and support—for patrons. For example, a number of contemporary American libraries have successfully gleaned resources to create “makerspaces” or “innovation labs” for patrons. But what Foster and Lindahl describe at Rochester was an innovation lab for the library itself. Taking away this kind of makerspace intended to serve the library (as opposed to one intended to serve library patrons) takes away support for design in libraries and continues the externalization of design. Libraries are then left to support the innovation of others without being able to support, understand, integrate and design for themselves.

Like other forms of support, leadership can also play a make-or-break role. There is no doubt that each of the cases in this study demonstrate strong leadership. Many well-known library projects were only made possible by the existence of a strong figurehead ignited by passion.⁵ The same can be demonstrated in these cases regarding Poole, Titcomb, and the combined leadership of Bowen, Foster and Lindahl. Each had passion that drove their respective projects forward. However, it is possible that in addition to mere passion, the “designerly way of knowing” espoused by Cross and others also contributed to leadership support. For instance, Lindahl clearly demonstrated a designerly way of knowing through his comments about many of the elements of design epistemology, such as iteration. Is this because he is an innately creative person? Or is it because he was trained in designerly ways of knowing during his time at Xerox and subsequently sought to further his own education in this area through visits to places like the

⁵ Elisabeth Jones, “Constructing the Universal Library,” (doctoral dissertation, University of Washington, 2014), 345-347.

IDEO design firm? We may never know,⁶ and these may not be separable binary concepts. But whatever the reason, XC had at least one leader who explicitly espoused a designerly way of knowing.

Evidence also reveals that Mary Titcomb may have also had a similar mentality. Although there is no way to know for sure whether Titcomb explicitly considered herself a designer, she certainly demonstrates many of the traits associated with what we identify as designers today. Marcum comments on Titcomb's user-centered attitude,⁷ and newspaper articles consistently refer to her as "an innovator."⁸ Beyond the many WCFL programs and services she created, she was noted for designing and making all her own "wearables"⁹ and even designing "Library House," the building in which she lived at 634 Summit Avenue: "It was built and given to the Library by Mr. E. W. Mealey following Miss Titcomb's plans."¹⁰ Titcomb may or may not have known that these traits were "designerly" ones, but by doing them she demonstrated how this type of overall holistic designerly mindset that pervaded her whole life also influenced her library work. To others, it may have been special or different, but perhaps Titcomb was not acting as a designer, she was just acting as who she was, which happened to be designerly, thus leaving design as an implicit component of her leadership.

⁶ Author's note: a follow-up inquiry was made to Lindahl regarding this question, but at the time of submission of this document there was no response.

⁷ Deanna Marcum, "The Rural Public Library: Hagerstown, Maryland, 1878-1920," (doctoral dissertation, University of Maryland, 1991), 195-238.

⁸ "Mary Lemist Titcomb: Blazing Trails to Reading," *The Herald-Mail*, Hagerstown, MD (March 26, 2000), E2.

⁹ Judith Braunagel, "Mary Lemist Titcomb, 1857-1932," (1976), Mary Lemist Titcomb Vertical File, Western Maryland Room, Washington County Free Library.

¹⁰ Draft of speech, Simms Jamieson (1965), Mary Lemist Titcomb Vertical File, Western Maryland Room, Washington County Free Library, 3-4.

6.1.2 Who are the users in librarianship?

Regardless of the varying epistemological influences over the course of its history, American librarianship has traditionally considered itself to be a user-centered field. The user focus in all three of the cases in this study is clear. Poole sought to connect library users to information within periodicals, both through efficient collocation of information previously spread across multiple sources as well as offering users direct access to the information, enabling them to find resources themselves, without needing intermediary help from a librarian. Titcomb's goals for the book wagon were heavily rooted in reaching users who previously did not have access to or knowledge of the benefits of the public library. Her user-centered focus can also be seen in her desire to improve the rural citizenry through literacy and access to reading materials and educative information. XC began with the intended goals of offering library users a new catalog experience, one that presented bibliographic information for a variety of resource formats in a single, unified presentation. Yet as the project progressed, the idea of the user also evolved, and ultimately XC offered tools for a user group comprised of library staff and other related metadata professionals.

This illustrates an interesting pervasive tension regarding user-centeredness in librarianship: the idea that for any given library artifact there may be two general sets of users—patrons and librarians.¹¹ While the goals of these two groups often overlap, their frames and contexts of needs and experiences will naturally mean that an artifact created to serve one group may not fully fulfill the needs of the other.

¹¹ Author's note: Debate around the terminology used to describe library users has been contentious in recent years, with advocates and opponents for terms like "library users," "patrons," and "customers." In this section I use the term "patrons" to describe non-library staff people who partake of a library's goods and services. I use the term "librarians" loosely to represent those employed by or otherwise trained in libraries and library services.

An artifact designed to serve two masters may end up serving neither. Although social science approaches to librarianship have offered user-centered focus through methods such as needs assessment and community analysis, design can offer a more nuanced understanding of the tension among multiple user groups. Although design is often thought to be in service to users (and indeed it is), design is also governed by the notion of a client. Nelson and Stolterman delineate that a design client is not the same as a design user or consumer; rather, the client is part of a balanced, symbiotic relationship with the designer.¹² They emphasize the difference in the two roles by saying that design is done *with* clients while design is something done *to* users.¹³ Drawing on the idea of the client inherent in design lets us look at the user focus of librarianship from a new perspective. In the cases in this study, the intended users are often clear: all of the artifacts were originally intended as tools or services of benefit to library patrons. In reviewing each of these cases, however, identifying the client is murkier. In the ideal client-designer relationship, the client and designer are separate entities, with the client offering desiderata to be teased out and iteratively innovated on by a designer with alternative repertory experiences and framing perspectives, ultimately resulting in an outcome that delightfully surprises both.¹⁴ In both the cases of Poole's Index and the WCFL book wagon, the designer and the client appear to be one and the same. Poole observes his perceived problem of access to periodicals and proposes and enacts a solution. Titcomb seeks to address her own agenda of educating the populace. This reduces the potential for the "surprise of self-recognition," or the provision of a solution to the client that fulfills needs they could not articulate because they did not know they had them.¹⁵ I

¹² Harold G. Nelson and Erik Stolterman, *The Design Way: Intentional Change in an Unpredictable World*, 2nd ed. (Cambridge, MA: MIT Press, 2012), 41-56.

¹³ *Ibid*, 42.

¹⁴ *Ibid*, 46-49.

¹⁵ *Ibid*, 42.

suspect in both cases, and possibly many others in librarianship, the designers presumed that library users were the clients. But clients are active participants in the design process, and these examples of Poole's Index and the WCFL book wagon are clearly situations of designs being done *to* patrons, rather than *with* them.

If patrons are not the clients in librarianship, then who is? Librarians may assume they are clients in the context of vendor-supplied services, perhaps because the word "client" is commonly used to describe such a purchasing or licensing relationship. Yet here too I would argue that librarians are actually users, having design done *to* them rather than *with* them. This lack of symbiotic relationship in the design process was a large part of the underlying motivation for XC's commitment to open source principles. XC also demonstrates a more balanced designer-client-user relationship through its evolution from patron tool to librarian tool, and the accordant shifting of priorities. Being a client and thus having the ability to participate in the design process is a more empowering role than that of the passive, receptive user. Empowerment of libraries and catalogers is mentioned throughout the lifespan of the XC project.¹⁶

In addition to librarians shifting from users to clients, other perspectives on the idea of clients may come into play. Simon suggests that as problems become increasingly wicked, especially in terms of complexity and interconnected social factors, society itself may serve in the role of client.¹⁷ This perspective was added to the third and final edition of his seminal text after many years of reflection and observation. He suggests that the power of the client in a client-designer

¹⁶ Jennifer Bowen, "eXtensible" Cataloging: Opportunities presented by the eXtensible Catalog (XC) Project," part of the ALCTS program "Creating the Future of the Catalog and Cataloging," American Library Association Annual Conference, Anaheim, California (June 29, 2008), PowerPoint slides accessed June 3, 2016, <http://www.extensiblecatalog.org/learnmore/publications/extensible-cataloging>; "Andrew W. Mellon grant awarded to CARLI for MST development," news post from eXtensible Catalog website (April 11, 2011), accessed June 3, 2016, <http://www.extensiblecatalog.org/news/andrew-w-mellon-grant-awarded-carli-mst-development>

¹⁷ Herbert Simon, *The Sciences of the Artificial*, 3rd ed. (Cambridge, MA: MIT Press, 1996), 150-154.

relationship rests not only in helping to shape the goals of the design, but also in reacting to proposed and enacted designs. Since libraries face wicked problems are embedded in societal contexts, it may be useful for libraries to consider the ways in which society might act as client.

6.1.3 Which values “should” be embedded?

The externalization and implicit treatment of design in American librarianship also reveals a significant disconnect between the creation of library tools and services and the values those tools and services embody and reflect. The idea of seeking purposeful change is an inherent characteristic of design epistemology, which rests in the idea of problem solving and changing from current states to preferred ones. While design is about solving problems, it offers two differing yet complementary perspectives on problem solving: creating a solution based on what *could* exist, or creating one that *should*.¹⁸ The former identifies possibilities while the latter makes a judgment about the world. Although librarianship has a tradition of offering a neutral and objective standpoint,¹⁹ values and perspectives about how the world “should” be are embodied in library artifacts regardless of neutral intentions. Each of the three cases in this study clearly show evidence that the designs were motivated not just by how the world could be, but how the designers thought it should be. This demonstrates not only that particular values are put forth over others, but also that librarianship is a design field because it adheres to this notion of “should be.”

The case of Poole’s Index clearly demonstrates an emphasis on the value of service, a value also acknowledged by ALA as core to the profession. However, Poole’s attitudes and actions clearly

¹⁸ Jeanne Liedka, “Design Thinking: The Role of Hypothesis Generation and Testing,” in *Managing as Designing*, ed. R. J. Boland and F. Collopy (Stanford, CA: Stanford University Press, 2004).

¹⁹ Candice Branum. “The Myth of Library Neutrality,” (May 2014), accessed June 3, 2016, <https://candisebranum.wordpress.com/2014/05/15/the-myth-of-library-neutrality/>

reflect a particular interpretation of how service “should be” in librarianship. While ALA emphasizes the value of service excellence through maintaining and fostering ongoing education and professional development,²⁰ the case of Poole’s Index clearly demonstrates a different interpretation. To Poole, service meant that librarians should be willing to sacrifice their own time and skills, and perform professional work off the clock and without pay. Such self-sacrificing labor is what drove the completion of the third edition of the Index and arguably assisted in the externalization of design in librarianship. Poole’s idea of using off-hours labor to create a product that he believed would demonstrate its own value—and thus what librarianship should value—backfired.

In contrast, the WCFL book wagon is a prime example of seeking purposeful change through design. From the outset, the book wagon was created to foster one particular perspective: that the county residents should have library service equal to that provided to those in the town. This is already a particular judgement about how the library should function, albeit based on the norms of government in the state of Maryland. However, like many librarians of this time period, Titcomb felt a strong pull towards progressive social change, especially regarding literacy and its relationship to democracy and informed citizenry.

“Miss Titcomb believed that giving out books to those who came for them was but a small part of a library’s purpose. The important part was to popularize its wares and to create a demand for them within the community.”²¹

²⁰ American Library Association, “Core Values of Librarianship: Service,” (June 29, 2004), accessed June 3, 2016, <http://www.ala.org/advocacy/intfreedom/statementspols/corevalues#service>

²¹ Jean R. Moser, “Mary Lemist Titcomb, 1857-1932, Creator of the Bookmobile,” in *Notable Maryland Women*, ed. Winifred G. Helmes (Cambridge, MD: Tidewater Publishers, 1977), 378.

Creating a demand for books—especially the “best” books—meant that patrons were more interested in reading and therefore increasingly educated and literate. Titcomb had an entire list—nearly a manifesto—of what a county library “should” be: it should provide the best reading, it should supply technical books, it should gather and arrange materials for Club and Sunday School programs; it should supply reading material to local hospitals; it should maintain a children’s story hour; it should maintain an expert to liaise with school system; it should provide a network of service throughout the county.²² This was not just how she thought WCFL should be, but all county libraries should undertake these tasks.²³ Titcomb’s strong position about how libraries should be reflects both the evangelistic perspective of librarianship at the time as well as the purposeful state of change sought in design epistemology.

XC also explicitly and purposefully sought change, with a vision of how librarianship—or at least library catalog software—should be. XC aimed to “provide better tools than the ones people are currently using.”²⁴ Not only does this demonstrate a value judgement (that existing tools are unsatisfactory), but XC clearly delineates what comprises “better” (i.e., how it should be):

- XC should specifically meet identified work practices and preferences
- XC should be intuitive and innovative
- XC should meet current and emerging needs²⁵

²² Mary Lemist Titcomb, “General Federation of Women’s Clubs, Department of Applied Education, Library Extension,” (n.d.), Titcomb scrapbook, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland, 58.

²³ Ibid.

²⁴ Nancy Fried Foster and Ryan Randall, “Designing the Academic Library Catalog: A Review of Relevant Literature and Projects,” (September 25, 2007), 1, accessed February 16, 2016, <http://www.extensiblecatalog.org/learnmore/literature/61>

²⁵ Ibid.

XC presented not only a position on how catalog interfaces should be designed for library patron use (including features like faceted browsing, user recommendations, tagging, etc.) but also on how these systems should function for library professionals through the provision of a metadata platform supporting interaction with multiple metadata schemas.²⁶ XC claimed to offer the potential to allow library users to “get more out of academic collections” and “give academic libraries more control over how best to help people gather information,”²⁷ clearly demonstrating a value judgement by claiming to know what would be “best.” The XC team clearly had a vision of how library catalogs should be: open-source, user-intuitive, congruent with the FRBR model, locally customizable, interoperable.

This idea of creating normative designs partially stems from the idea that users can’t or don’t always articulate what they want, therefore it rests on the designer to elicit desiderata to “give the users what they didn’t know they wanted.”²⁸ Library users did not come to Poole and ask for a comprehensive subject index to periodical literature. But Poole understood, through problem finding and framing, repertoire, and a dedication to user service, that some solution was necessary, and that solution should take the form of a periodical index. The rural residents of Washington County did not know they wanted or needed books and literacy. In fact, many stated they would have preferred a mill or hospital to a library.²⁹

“We meet all kinds of people, nice kind people, gruff and surly men who would not have hesitated two years ago to tell Mr Thomas that the country was throwing away money

²⁶ Ibid.

²⁷ “Mellon Grant Funds Planning Analysis for Future Online Services.” Press release from University of Rochester (April 14, 2006), accessed February 16, 2016, from Xerox DocuShare, <https://docushare.lib.rochester.edu/docushare/dsweb/Get/Document-22096/Mellon%20Phase%201%20press%20release.pdf>

²⁸ Nelson and Stolterman, *The Design Way*, 42.

²⁹ Edward I. Farrington, “A Public Library on Wheels,” *Suburban Life* 9, no. 6 (December 1909), 299-300.

spending it on ‘such foolishness’ as books and the book wagon. Now, however, public opinion is sufficiently won to make them think it wise not to disapprove too openly.”³⁰

But Mary Titcomb felt that the role of a library was not to satisfy the users’ stated needs, but to show them why they should readjust their stated needs and desires.

“Furthermore, the work of a Library in a community is never solely to supply known wants but ever and always to be on the alert to create a demand. The gospel of books is like the gospel of eternal life for which the world has never hungered until it has been brought to them by the zeal of its ministers. So with books. The time has passed when it seemed all sufficient to open the doors with the invitation, ‘Here is a Library free as air to all who wish to use it.’ The Librarian has learned that as far as lies within his resources, it is his business to see that the right book reaches the right person, even if it involves convincing that person that he wants the book.”³¹

Titcomb often described libraries and librarianship in relation to missionary work, reflecting the evangelical and missionary spirit so prevalent in the discipline at the time. Even XC espoused a viewpoint that library software should be cooperative and shared, that libraries should embrace a DIY mentality and should not be beholden to commercial products and vendors. But over the course of American librarianship, an increasing focus on technical skills and standards first put forth by Dewey, as well as an increased commitment to scientific objectivity and neutrality that emerged with the advent of formal education for librarianship, seemed an attempt to leave the

³⁰ “Second Session: Work in the field, a series of personal experiences in the east and west,” in *Papers and proceedings of the Thirty-First Annual Meeting of the American Library Association held at Bretton Woods, New Hampshire, June 26-July 3, 1909* (Chicago, IL: American Library Association, 1909), 355.

³¹ Washington County Free Library, Seventh Annual Report 1907-1908, 6-7.

missionary mentality behind.³² However, it seems clear from these and other examples that the prevalence of the “should” in librarianship only reveals a continued evangelical standpoint. ALA’s motto, “the best reading for the most people at the lowest cost,” coined by Dewey in the late 19th century,³³ has been the subject of heated debate and criticism for being paternalistic and condescending.³⁴ Others continue to support and laud the admittedly judgement-laden motto.³⁵ Despite motions to rescind it, it continues to represent the organization today,³⁶ demonstrating a continued normative focus on what libraries should be. Likewise, the contemporary #WeNeedDiverseBooks campaign touted by libraries and librarians also asserts judgement about what kinds of resources should be published, distributed and read. Both the 19th century motto and the 21st century hashtag make strong statements about how the world should be, and how librarianship can help achieve that state.

My reason for bringing these examples is not to criticize them for being non-neutral. Instead, I use them to demonstrate that no matter how strongly librarianship asserts itself as a profession underscored by objective and neutral scientific approaches, these types of normative judgements that rest solidly in the realm of design are present throughout librarianship. As such, these powerful assertions about access, literacy, diversity, and intellectual freedom—the core values of the field—may be considered a form of design desiderata. Perhaps the evangelical and missionary nature of librarianship that some in the profession are quick to dismiss is actually a

³² Dee Garrison, *Apostles of Culture: The Public Librarian and American Society, 1876-1920* (Madison, WI: University of Wisconsin Press, 1979).

³³ Melvil Dewey, “Origin of A.L.A. Motto,” *Public Libraries* 11, no. 2 (February 1906), 55.

³⁴ Michael A. Golrick, “ALA’s Motto,” (January 7, 2013), accessed June 3, 2016, <http://michaeltgolrick.blogspot.com/2013/01/alas-motto.html>. This blog post contains a transcript from the ALA Council meeting CD#57, Rescinding the ALA Motto, which took place at ALA Midwinter 2004. Per the author’s note the original transcript is in an outdated system and no longer easily available.

³⁵ John N. Berry III, “Editorial: Dewey’s ALA Motto Still Works Fine,” *Library Journal* 129 no. 3 (February 15, 2004), 8.

³⁶ Golrick, “ALA’s Motto.”

feature, not a bug. Rather than fighting against the tide, and changing what the field is to fit the scientific paradigm, a design epistemology that specifically allows and advocates for normative perspectives may be a better fit.

6.2 Recommendations

Based on the elements of design epistemology revealed in this study as well as the critical reflection, I turn now to recommendations for how design epistemology might be made more explicit in American librarianship and ways in which a more explicit approach to design epistemology might reflect the core values of the field in a proactive manner.

In this section, I recommend significant shifts in the cultures of research and publication in librarianship; changes for education and training for the field; and supporting the reframing of library practice as design. To anyone familiar with design, many of these recommendations may seem minor. However, in the context of librarianship, recommending such a paradigm shift challenges many established contexts and norms. Although these recommendations may seem tame to those outside the field, within librarianship many of these suggestions could be considered radical.

6.2.1 Shift the culture of research and publication

Research in librarianship is traditionally conceptualized according to established models and norms of scientific epistemologies. Therefore, to make design explicit, new methods and paradigms for library research are necessary. Design research in librarianship has traditionally been defined in a very narrow way, and still in line with the paradigms of science. However, paradigms for research based on design epistemology do exist, although they are known by different names and may be defined slightly differently by different scholars and in different fields. “Research through design,” “design-based research,” “design inquiry,” “design research

methods” (among many other phrases) are used to describe, in some form or fashion, the application and incorporation of elements of design epistemology into research inquiry, either in addition to scientific approaches or as distinct from them. Due to the spread across disparate domains, numerous terms and phrases have arisen with regard to design research, and naturally these different fields will harbor different definitions. Work to disentangle these terms and definitions is ongoing, with inevitably divergent conclusions depending on disciplinary perspectives and domains. The space needed to adequately explicate and synthesize the nuanced differences across these myriad perspectives would constitute a dissertation in and of itself, and thus that task remains far out of scope for this context. But in general, some definitions focus on “design research” as a type of action research method, by designing, implementing, and evaluating artifacts intended to solve problems through intervention.³⁷ In addition to solving such problems, goals of a design artifact may also include improved products or user experiences. For example, in the field of information systems management, “[d]esign science research requires the creation of an innovative, purposeful artifact for a special problem domain. The artifact must be evaluated in order to ensure its utility for the specified problem. In order to form a novel research contribution, the artifact must either solve a problem that has not yet been solved, or provide a more effective solution.”³⁸ Others propose related yet different models: “design-based research goes beyond merely designing and testing particular interventions,” beyond simple evaluative measures of success or failure, to look at human interaction with design artifacts to reveal new knowledge about human behavior.³⁹ The key difference lies in the intention to produce

³⁷ John M. Carroll and Mary Beth Rosson, “Design rationale as theory,” in *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science* (New York, NY: Morgan Kaufmann Publishers, 2003).

³⁸ Alan Hevner and others, “Design Science in Information Systems Research,” *MIS Quarterly* 28, no. 1 (2004), 75-105.

³⁹ The Design-Based Research Collective, “Design-based Research: An Emerging Paradigm for Educational Inquiry,” *Educational Researcher* 32, no. 1 (2003), 5-8.

knowledge rather than solely a problem solution artifact.⁴⁰ Therefore, this model concerns itself primarily not with the artifact and its function, but rather the use and interaction with said artifact and what that might reveal. These are both different from the model of “design research” intended to reflect the study of design itself, that is, research *about* design activities, methods, techniques, and processes.⁴¹ Other similar phrases may be used to describe very different notions, such as the difference between “research-oriented design” (meaning design that draws on scientific research, such as user studies) versus “design-oriented research” (referring to the gleaning of new research knowledge through the process of design).⁴²

Some of these models of design research already exist in librarianship. A notable example is the idea of design as form of action research, such as the method put forth by Bowler and Large.⁴³ But the design-as-action-research model is still framed in a traditional scientific epistemology, and therefore hinges on traditional ideas of research rigor, validity, and assessment. Alternative models, such as the one articulated by the Design Research Collective above, focus less on the evaluation of an artifact’s success and more on the human behavior that surrounds it. Although myriad examples of research regarding human information behavior around artifacts does exist in librarianship (for example, catalog use studies), I would hesitate to call these design-based research in the same sense, because those artifacts were not made with the intention and purpose of studying human behavior. The artifacts were created first and foremost to solve a problem;

⁴⁰ John Zimmerman, Jodi Forlizzi, and Shelly Evenson, “Research Through Design as a Method for Interaction Design Research in HCI,” *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI 2007)*, 493-502.

⁴¹ Nigan Bayazit, “Investigating Design: A Review of Forty Years of Design Research,” *Design Issues* 20, no. 1 (2004), 16-29.

⁴² Daniel Fallman. “Why Research-Oriented Design Isn’t Design-Oriented Research: On the Tensions Between Design and Research in an Implicit Design Discipline.” *Knowledge, Technology, Policy* 20 (2007): 193-200.

⁴³ Leanne Bowler and Andrew Large. “Design-based research for LIS.” *Library and Information Science Research* 30, no. 1 (2008): 39-46.

understanding human information behavior surrounding them is secondary at best. The idea of intentionally creating an artifact with the main purpose of studying library patrons' behavior is an intriguing one, and should not be ruled out as a possibility for research in librarianship. But this model also often relies on social science methodologies, such as ethnographic investigation, to surface knowledge about human behavior, and is therefore still shaped by scientific epistemologies. Instead, I suggest that research fundamentally rooted in design epistemology, and the forms of knowledge considered valid in design, is more appropriate to research in librarianship. This aligns most closely with the models of "design-oriented research" or "research through design," which reflect epistemological perspectives based in design, rather than applying scientific ones. To make design more explicit in librarianship, the field needs to harness these methods instead of (or at least in addition to) scientific research approaches.

Such a paradigm shift may be easier said than done. How does a field even go about starting such a major conceptual shift in research? One way might be to focus on the established idea of design artifacts as knowledge. Although librarianship has a long history of making design artifacts, when it comes time to share or disseminate that artifactual knowledge, traditional venues reject or chastise such submissions because they lack scientific rigor. For instance, a paper I was once assigned to review discussed a library's creation of a new database of mural art. Yet the paper was not published, one of the reasons being that the authors did not include a section on assessment, like a patron use survey, to demonstrate some sort of improvement effect. Projects like these from practicing librarians seeking to contribute knowledge to their field are often chastised for what have come to be known as "this is how I did it in my library" projects. But scientific methods cannot measure design success. Traditional forms of scientific assessment assume a linear design process: assess needs, build, evaluate. But even though that model has

long been disproven in design, it continues to be applied in librarianship. As Lindahl noted, we need to be explicitly cognizant of design as process-focused rather than product-focused.

Therefore the standard final scientific evaluations, like patron use surveys or pre- and post-use comparison of web log data, are inapplicable. There is no final build to evaluate, because the iterative nature of design means the design is never done.

Instead, the process of how an artifact is created—be it a tangible tool or intangible service—is the epitome of design knowledge and is a legitimate form of knowledge in design. Rigor in artifact making then comes from explicit rationale, expert critique, and reflection. “Whenever practitioners describe their influences, discuss the rationales for design decisions, and articulate their assessment of what they have made and its importance, they engage in a form of implicit conceptual work by highlighting important issues, dimensions of similarity, and criteria for choices and success.”⁴⁴ In the case of the paper submission about the mural art database, the component of scientific assessment should not have been a determining factor in evaluation of rigor. Instead, if the discipline explicitly considered rigor in terms of design epistemology, then the discussion of the artifact and its significance—the first database to tackle description of this prevalent local art form—and the challenges faced and decisions made during its creation would qualify as a legitimate contribution to knowledge in the field. Additionally, while a more scientific-based user assessment component may have offered knowledge about local adoption and needs, the discussion and reflection around challenges and decision rationale possibly offer more universally applicable knowledge, and would therefore be more useful to other professionals and researchers in the field. Thus, rather than being chastised, the “this is how I did

⁴⁴ William Gaver, “What Should We Expect From Research through Design?” *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI 2010)*, 937-946.

it in my library” paradigm should be acknowledged as a valid contribution to knowledge in librarianship.

For librarianship to support this artifact-based approach, the evaluative elements of design epistemology—rationale, critique, reflection—that are currently implicit in tool and service creation need to be made explicit through institutional support and structural scaffolding. For instance, research outlets, such as scholarly journals, need to not only accept that these concepts reflect rigor, but also help to communicate and support these concepts through reviewing and mentorship of submissions. Publications should require sections on rationale and/or reflection as mandatory inclusions for any submissions. If existing venues are not willing to support this approach, new venues for sharing and disseminating information surrounding library designs that acknowledge the legitimacy of evaluation methods based in design epistemology need to be created. Other institutional structures, like ALA or similar organizations, should foster and support expert critique for evaluating artifacts, using examples such as the annual video and website critique sessions offered at conferences like Museums and the Web as springboards.⁴⁵ Such critique sessions hinge on the idea that participants have expertise not only in the library-related subject area, but also in giving and receiving critique, which requires explicit education, training, and practice.

6.2.2 Change library education and training

Explicitly instantiating foundations of design epistemology into library research cannot emerge from thin air. Rather, librarians must be educated about design epistemology, its principles and tenets, and how to explicitly incorporate those ideas into the practice of librarianship. Much of

⁴⁵ See for example <http://mw2016.museumsandtheweb.com/session/video-crit/> and <http://mw2016.museumsandtheweb.com/session/web-crit/>

our epistemological understanding (be it conscious or no) stems from our educational background. Yet a pilot study at the University of Washington Information School reveals a significant lack of MLIS students with educational backgrounds and experience in design fields.⁴⁶ One way to increasingly incorporate design epistemology into librarianship is for library education and graduate degree programs to specifically recruit students from design backgrounds to counterbalance the myriad students coming from the humanities and social sciences and bringing understanding of those specific paradigms to their work.

Additionally, I recommend re-envisioning library education to correspond more closely with design education, which focuses on the central tenet of “learning by or through doing.”⁴⁷ A large component of education in librarianship in America is a graduate level degree still rooted in the scientific epistemological focus established in the 20th century. Contemporary graduate level education in librarianship has seen a shift to more practical, real-world, problem-based projects, such as the increasing shift from research theses to capstone projects and other problem-solving culminating experiences.⁴⁸ Individual course projects may also be problem-based or related to professional practice, which is also to be lauded in terms of offering hands-on experience to students. Yet many of these projects occur at the culmination of a term or a degree, leaving little space for iteration or reflection.

However, the “learning through doing” model of education in traditional design fields such as architecture, product design, etc., extends beyond individual assignments to the entire

⁴⁶ Rachel Ivy Clarke, “Where do Librarians Come From?: A Pilot Study Investigating the Educational and Disciplinary Backgrounds of MLIS Applicants,” presented at the Association for Library and Information Science Education conference (Boston, MA, January 5-8, 2016).

⁴⁷ Philippa Lyon, *Design Education: Learning, Teaching and Researching Through Design* (Farnham: Ashgate Publishing, 2011).

⁴⁸ Susan K. Burke and John T. Snead, “Faculty Opinions on the Use of Master’s Degree End of Program Assessments,” *Journal of Education for Library and Information Science* 55, no. 1 (Winter 2014), 26-39.

atmosphere of the educational environment. Schön explicitly calls out the difference between practica in professional schools and his reflective practicum of the design studio:

“...it would not be organized to apply classroom knowledge to practical [i.e., real world] problems. It would be studio-like in the sense that it would organize itself around projects of simulated practice and would ask students to plunge into these before they know what they need to be doing or learning. It would expose students to the demonstrations, advice, and criticism of master practitioners. It would focus on the messiness of problematic situations which need to be converted to well-formed problems before they can be solved by the application of established techniques. It would pay attention to the strangeness of unique cases that escape the categories of established theories. And it would engage the appreciative, value-laden questions as well as the technical ones. It would not eschew the use of research-based knowledge, but it would not assume that project tasks are only done, or best done, through the use of such knowledge.”⁴⁹

Exposure to the skills of idea generation, production, and critique is notoriously difficult and elusive to convey in a traditional classroom environment.⁵⁰ The model of the design studio—a physical and intellectual space specifically created to support learning by doing—lets students learn from the actual practice of designing itself, helping them internalize covert and implicit elements of design epistemology can that cannot be adequately conveyed through other forms of education like lectures.⁵¹ The contemporary model of the design studio sees students tackling projects under the supervision of master designers and in close proximity with their peers, which

⁴⁹ Donald A. Schön, *The Design Studio: An Exploration of Its Traditions and Potentials* (London: RIBA Publications for RIBA Building Industry Trust, 1985), 89.

⁵⁰ Robert Heckman and Jamie Snyder, “The Role of the Arts in an I-School Education,” *Proceedings of the iConference 2008: iFutures: Systems, Selves, Society* (Los Angeles, CA, February 28-March 1, 2008).

⁵¹ Schön, *The Design Studio*, 55-56.

can foster camaraderie among students.⁵² Throughout the term, student work is evaluated by classmates, the instructor, and/or panels of outside experts. These “crit” sessions not only provide students with direct feedback on the project at hand, but they also prepare students to give and receive constructive feedback as well as construct frameworks for evaluation (i.e., not just “I like it” vs. “I don’t like it,” but the ability to see what a client needs and how well or poorly any given design may address those needs).⁵³ Students learn not only from their own successes and mistakes, but those of other classmates as well, affording them opportunities to witness other problem-solving approaches and alternative solutions within a short time frame.⁵⁴ Schön explicitly argues that the design studio model of education should be the next liberal arts mode of education.⁵⁵ Design studio models of interaction have also been shown to offer a useful approach and provide a necessary complement to more traditional scientific models underlying professional technical education, especially in information science and technology.⁵⁶ Given the relevance of both liberal arts and information science to librarianship, it stands to reason that studio-based education may also be useful and applicable to library education.

The concentrated interactions fostered in studios also help students build their repertoires of knowledge. In addition to project outcomes, design education harnesses the ideas of iteration and process. Students are often required to keep notebooks, sketchbooks, or journals, not just to record ideas for future remembrance, but also to allow for the exploration of and experimentation

⁵² Jeffrey A. Lackney, “A History of the Studio-based Learning Model,” (August 2, 1999), accessed June 3, 2016, http://edi.msstate.edu/work/pdf/history_studio_based_learning.pdf

⁵³ Jon Kolko, “Endless Nights—learning from design studio critique,” *Interactions* 18, no. 2 (March/April 2011), 80-81.

⁵⁴ Jaime Snyder, Robert Heckman and Michael J. Scialdone, “Information Studios: An Arts-Based Approach to Educating Technical Professionals,” *Journal of the American Society for Information Science and Technology* 60, no. 9 (2009), 1926.

⁵⁵ Schön, *The Design Studio*.

⁵⁶ Snyder, Heckman and Scialdone, “Information Studios.”

with new ideas. Such journals also represent an ongoing instantiation of a student's burgeoning repertoire of knowledge. Reframing education in librarianship as a foundation for repertoire-building not only reflects the field's core value of lifelong learning, but it can also reduce the pressure from the ever-increasing range of knowledge students expect library education to provide. Currently students leave graduate library education programs complaining that they still lack sufficient knowledge, and employers opine that students are under-knowledgeable in key areas. Yet given double the time and resources, graduate library education could still not hope to cover everything a professional librarian needs to know. Instead of trying to achieve a quantity of knowledge, explicitly framing graduate library education as teaching students problem-solving and repertoire building would better prepare them for the ever-changing situations they will face in their professional careers.

The above suggestions are predicated on the current framing of library education as graduate level education governed by a formal accrediting body (in America, the American Library Association). However, much of the problem-based focus and integration of repertoire, critique, and lifelong learning described above are not inherent to a graduate level education. I recommend reconsideration of the mandate for library education to be offered at the graduate level. Multitudes of programs for design education exist in both formal undergraduate education as well as apprenticeship spaces, providing evidence that education in design techniques, methods and epistemology does not require an advanced degree. While I acknowledge the many potential political and professional ramifications, graduate education is becoming increasingly less sustainable financially for many prospective librarians, and the prerequisites for graduate level education may contribute to reducing diversity in the field. I am not recommending an immediate disregard of existing graduate library education programs; however, careful

reconsideration of the purposes and benefits offered by graduate level education compared with the goals of librarianship and advocacy for increased design epistemology can lead to new forms of education that better serve both prospective librarians and the field at large.

6.2.3 Support the reframing of library practice

One of the major observed reasons of the lack of explicit design epistemology in librarianship was a lack of support: intellectual, infrastructural, and individual leadership. The first of these, intellectual support, ideally emerges from the previous recommendations for new approaches to research and education in librarianship. So too might the third, as more and more design-knowledgeable librarians move into managerial and leadership roles in the profession, both within individual libraries and systems as well as larger supporting organizations like the Institute for Museum and Library Services (IMLS), the American Library Association (ALA), and the Library of Congress (which serves as the default American national library). In terms of individual leadership, some libraries are already benefitting from strong guidance that embraces design, such as Brian Bannon, Commissioner for the Chicago Public library system, who has mentioned a focus on hiring librarians with design knowledge and mindsets.⁵⁷ Bannon is committed to hiring design thinkers at CPL, but in conversation his understanding of design was limited to public services, and he seemed surprised—yet intrigued—to hear about the conceptualization of other aspects of librarianship (such as technical services like cataloging) as design. In addition to abstract recommendations that rely on design trickling down from research and education into leadership and practice, one way libraries might explicitly acknowledge and begin to incorporate design would be to re-examine and even revise job descriptions. This would include both the reconceptualization of library work tasks as design activities, but also adjusting

⁵⁷ Brian Bannon, personal communication (2015).

the language used in position descriptions and advertisements to include design-related verbiage. Qualifications, too, might be adjusted to attract people with design backgrounds, similar to recruitment for education. Bannon himself mentioned that he might prefer to hire a non-librarian with an understanding of design over a trained librarian without design knowledge.

Additional infrastructural changes need to be manifested through revision of articulated values and ethics in the professional library community. Evidence from this study shows that additional values beyond those currently articulated do influence library practice, and acknowledgement and inclusion of these values will help reshape library work. Additionally, if librarians are to explicitly harness their position as change agents, as design allows for, existing ethical guidelines need to be reconsidered in this light. I recommend revisiting and revising both the ALA Core Values and the Code of Ethics to better reflect additional values evidenced in librarianship, to include consideration of values regarding both library patrons and librarians, and to reframe the profession as an explicitly non-neutral one. Overall, in all three areas, a change in discourse needs to occur to get librarians thinking of themselves as designers and their work in terms of design.

6.3 Implications

6.3.1 Implications for Librarianship

I have spent the last 200 pages arguing for the conceptualization of librarianship as a design field. But why? Most librarians perform their work every day with little conscious consideration of the epistemological underpinnings of their field. Yet even if epistemological perspectives are not consciously drawn upon by researchers and practitioners, they shape our worldviews and approaches to knowledge. Understanding librarianship as a design discipline offers the potential

to address three major ongoing areas of contention that have pervaded the field since its inception in America.

First, reconceptualizing librarianship as a design discipline offers the potential to empower librarians as makers and creators of tools and services. American libraries and librarians ceded the ability and power to create innovative tools and services to external providers, leaving libraries on the trailing edge of technology. Given that tool and service creation is such an integral component of librarianship, libraries and librarians need a way to regain creative power if they are to remain relevant in the coming years. Librarians need to reclaim their professional identity as makers—as creators, not consumers, of tools and services—and the accordant methods, techniques, and conceptual approaches that underlie this kind of work.

Reconceptualizing librarianship as a design discipline offers the potential to empower librarians as makers and creators of tools and services, rather than conceptualizing vendors and other information service providers as the sole sources of library-related products. Such empowerment is especially necessary if the field is to move toward enabling advocacy and positioning librarians as change agents.

Second, understanding librarianship from a design perspective may help people to better navigate the notorious professional vs. paraprofessional divide in the field. In the past the dividing line between professional librarians and paraprofessional library staff was more clear cut: for example, the American Library Association considers people with formal library education to be professional librarians while those without serve in paraprofessional support roles.⁵⁸ As formal education for librarianship shifted to graduate-level education, the master's

⁵⁸ American Library Association, ALA Policy Manual, B.7.1. Graduate Programs in Library and Information Studies (n.d.), accessed June 3, 2016, <http://www.ala.org/aboutala/governance/policymanual/updatedpolicymanual/section2/56libeduc#B.7.1>

degree became the default dividing line between professionals and paraprofessionals. But with increasing incorporation of technology in library operations (as well as budget and other resource reductions), paraprofessional support staff increasingly take on tasks that were once the purview of professional librarians.⁵⁹ Relying on an educational degree or a task-based interpretation of delineating professionals is increasingly problematic and contentious. I propose then that design might be used to help resolve this issue. Empowered members of the field who create tools and services and are responsible for decision-making surrounding such creations, who have built up repertoires of expert knowledge, might be considered the new form of professionals, while those who carry out the day-to-day operations that enact and enable these designs are envisioned as a new type of design support staff. This is not to say that one role is inherently better than the other—both roles are necessary for library practice to succeed. However, it may help alleviate confusion and contention, or at least add new and interesting consideration to the ongoing debate. Ultimately, it may not be one's degree, level of education, or job title that distinguishes professionals from paraprofessionals, but rather the extent of one's design repertoire.

Finally, reconsidering librarianship as a design discipline may also assist with another contentious divide in the field: the ongoing tension between theory and practice. Librarianship has increasingly struggled with this tension throughout the 20th century, to such an extent that formerly notable schools of graduate library education such as the ones at University of Chicago and Columbia University could not find means to serve both camps and, finding themselves with reduced resources, were forced into closure.⁶⁰ However, design by its very nature bridges the perceived gap between theory and practice, because design theory stems directly from practice,

⁵⁹ Jennifer S. Kutzik, "Bridging the Gap," *Library Mosaics* (July/August 1997), 11.

⁶⁰ Bill Crowley, *Spanning the Theory-Practice Divide in Library and Information Science* (Lanham, MD: Scarecrow Press, 2005), 22-23.

and because knowledge stems from creation. Artifacts and knowledge cannot exist independently of one another. Therefore, the challenge rests in connecting the outcomes of artifact creation—“the creation of the particular”—with “the creation of the universal,” that is, overarching, abstract, theoretical findings.⁶¹ It is this connection that lies at the heart of design-based research and offers a bridge between communities of theoretical research and those of professional practice. The previously noted disconnect between these levels—the universal and the ultimate particular—in librarianship reflects a substantive theory/practice divide, as the role of theory is to apply more universally, while context and particular artifacts are seen as instantiations of practice. But embracing an understanding of the relationship between the universal and the ultimate peculiar, as is inherent to design, can help librarianship overcome this divide and ultimately create better particular tools and services and also come to improved understandings of universal theory.

6.3.2 Broader Implications

Although elements of design epistemology are evident throughout librarianship, it is clear that much of this evidence is interpretive, and not intentional on the part of the actors and artifacts under analysis. Even in the case of XC, which reveals the most explicit examples of design epistemology and intentional use of design methods and techniques, only parts of the project can be said to have been intentionally informed by design epistemology. This raises the question: does a discipline have to purposefully, consciously and intentionally harness design epistemology to be considered a design discipline?

⁶¹ John Zimmerman and Jodi Forlizzi, “The Role of Design Artifacts in Design Theory Construction,” *Artifact* 2, no. 1 (2008), 41-45.

Additionally, the lack of observable intentionality of design epistemology in librarianship also reveals a larger overall lack of intentional engagement with epistemology in the field. The discipline of American librarianship reveals a dearth of self-reflection, understanding and acknowledgement regarding its epistemological underpinnings, especially regarding practice. That librarianship has gone so long without examination of its paradigms reveals a distressing lack of self-reflection and a need for increased inclusion of epistemology and history of the field in library education. Regardless of what epistemological perspectives are taught, be they science-based, design-based, or something else entirely, without intentional inclusion of epistemology and history as part of library education, librarians lack both context for understanding and ability to move forward.

Throughout this work, I have emphasized the differences between science and design. I have treated them with a high degree of polarity to help clarify my points. However, science and design do not exist in separate universes; indeed, they are often closely intertwined in a symbiotic relationship. Design frequently harnesses scientific findings to help with problem finding and framing and other decision-making throughout the design process. Scientific knowledge contributes to a designer's repertoire of knowledge, and it informs and shapes the domains in which designers work.

On the other hand, science, like all epistemologies, is a human construct, and as such, it may be considered an intellectual artifact. Many prominent scholars have argued that science itself is socially constructed.⁶² Unlike early scholars of design, who attempted to understand design in terms of science, I suggest that we might do the opposite—understand science in terms of design.

⁶² See for example seminal works like Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago, IL: University of Chicago Press, 1962); and Bruno Latour and Steven Woolgar, *Laboratory Life: The Construction of Scientific Facts*, 2d ed., (Princeton, NJ: Princeton University Press: 1986).

What is science, after all, but an intention to move humans from their current, ignorant state to a preferred state of new knowledge? And indeed, while there are many epistemological choices that could be harnessed by humans, the accord currently afforded to scientific knowledge reflects the designerly standpoint of creating the way the world “should be.” To go out on a provocative limb, I suggest that science and scientific epistemologies are the result of design, rather than vice versa.

Chapter 7 Conclusion

7.1 Objectives of the research

This research sought to explore the role of design epistemology in American librarianship through the following research questions:

1. In what ways does design epistemology manifest in American librarianship?
2. What is uniquely revealed about librarianship when examining the discipline from a design standpoint?
3. What are the implications of reconsidering librarianship from a design standpoint, and how might these implications be explicitly made manifest?

Following a broader discussion of elements of design epistemology and their relationship to the library profession, this research subsequently examined three cases in depth, each one representing a significant era of library history:

- *Poole's Index to Periodical Literature* (est. 1848)
- The Washington County (MD) Free Library book-wagon (est. 1909)
- The eXtensible Catalog (XC) project (est. 2006)

Critical inquiry and analysis allowed for opportunities to challenge the status quo of epistemology in American librarianship as well as offer critique of elements of design epistemology observed in the three cases. The cases were then examined in a broader context to better understand what role design plays in the profession of American librarianship at large.

7.2 Summary of results

Examination of the three cases shows ample evidence that librarianship does harness design epistemology and can be viewed as a design discipline. Much of librarianship aligns with

fundamental epistemological approaches and tenets of design, including wicked problems, problem finding and framing, iteration, repertoire, service orientation, and evaluative approaches to design like critique, rationale, adoption, and reflection-on-action. Other elements of design epistemology, such as the use of representations, abductive reasoning, and reflection-in-action, were not observed in the cases; however, the absence of evidence of these elements is not equivalent to their actual absence in practice. Practical limitations of time distance and recordkeeping contribute to an inability to concretely establish these elements as inherent to librarianship, warranting further investigation in these specific areas.

In addition to the presence or absence of these elements, a critical examination of the ways in which they manifested in these cases demonstrates that design epistemology tends to be implicit and passive in American librarianship. Many notable elements of design epistemology are evident in each case; however, they are not explicitly identified as such by participants in each case, nor are they harnessed or enacted at the same levels as in other fields that explicitly identify as design fields guided by design epistemology. Additionally, even when design epistemology is explicitly considered or discussed in these cases, it is often done so in a context that renders it external to librarianship—as something that other fields and other professions do. Elements of design epistemology present in librarianship also help to concretely support the idea of librarianship's focus on users.

Three major themes are revealed when examining American librarianship from a design-based standpoint that are often overlooked in other analyses. First is that many forms of library knowledge not considered valid in a scientific context are in fact valid in design epistemology, such as the creation of artifacts. Second, viewing librarianship from the perspective of design allows for the consideration of materiality, which reveals new perspectives on affordances and

constraints regarding library artifacts. Previous lack of consideration of materiality also demonstrates a possible limitation on innovation in library design. Third, an examination of librarianship from the perspective of design epistemology reveals insights about values in librarianship. While many core values of librarianship are innately embedded in library artifacts, evidence of other values, notably cooperation and standardization, is clearly present, sometimes even more strongly than other traditional values.

Finally, critical reflection on the cases in this study reveals that design may be implicit and externalized in librarianship due to both lack of support and character of leadership. The examination of values in the context of design also reveals that the normative agenda of librarianship never really disappeared with the shift to an ostensibly neutral and objective scientific epistemology. While this may present conflict and tension in a scientific epistemology, looking at librarianship from a design perspective legitimizes the field's evangelism.

7.3 Relevance of results to librarianship

Understanding librarianship as a design discipline offers the potential to address three major ongoing areas of contention that have pervaded the field since its inception in America.

First, reconceptualizing librarianship as a design discipline offers the potential to empower librarians as makers and creators of tools and services. American libraries and librarians ceded the ability and power to create innovative tools and services to external providers, leaving libraries on the trailing edge of technology.¹ Given that tool and service creation is such an integral component of librarianship, libraries and librarians need a way to regain creative power if they are to remain relevant in the coming years. Librarians need to reclaim their professional

¹ Stuart Sutton, "Core Competencies for the Information Professions and the Evolution of Skill Sets," *Education Libraries* 18, no. 3 (1995), 6-11.

identity as makers—as creators, not consumers, of tools and services—and the accordant methods, techniques, and epistemological approaches that underlie this kind of work.

Reconceptualizing librarianship as a design discipline offers the potential to empower librarians as makers and creators of tools and services, rather than conceptualizing vendors and other information service providers as the sole sources of library-related products.

Second, understanding librarianship from a design perspective may help people to better navigate the notorious professional vs. paraprofessional divide in the field. Relying on educational degrees or a task-based interpretations of delineating professionals is increasingly problematic and contentious. Instead, design allows a reconsideration of what it means to be a “professional”: empowered members of the field who create tools and services and are responsible for decision-making surrounding such creations, who have built up extensive repertoires of expert knowledge.

Finally, reconsidering librarianship as a design discipline may also help alleviate the ongoing tension between theory and practice, since design by its very nature bridges the perceived gap between theory and practice by connecting the outcomes of artifact creation with overarching, abstract, theoretical findings.² Embracing an understanding of the relationship between the universal and the ultimate particular, as is inherent to design, can help librarianship overcome this divide and ultimately create better particular tools and services as well as come to improved understandings of universal theory.

² John Zimmerman and Jodi Forlizzi, “The Role of Design Artifacts in Design Theory Construction,” *Artifact* 2, no. 1 (2008), 41-45.

7.4 Recommendations

Given these findings, the overarching recommendation for the field at large is to take steps to incorporate design epistemology explicitly (rather than implicitly) into American librarianship. Several broad recommendations are provided to offer ways to support the explicit manifestation of design epistemology in librarianship in the future:

1. shift the culture of research to design-based research, and create publication outlets that legitimize and support this shift
2. revise library education and training to include studio-based education, instruction in developing repertoire and critique skills, and reconsidering the need for mandatory education at the graduate level
3. support the reframing of library practice as design practice through education, infrastructural support, and evolving discourse

Changing the publication and knowledge dissemination culture within the discipline, changing educational curricula in librarianship, and changing the way professional practice is framed and described may all assist in making design more explicit in the discipline. The first is accomplished through new avenues for and models of publication of design products; the second through not only revamping MLIS and graduate library education programs but even potentially phasing them out in favor of alternative educational settings; and the third through change in discourse around job descriptions, work tasks, leadership perspectives, and professional codes. Additionally, the following recommendations for future work that outline a substantive research agenda in this area may also offer support for making design explicit in librarianship.

7.5 Future work

To continue investigation and strengthen the argument for design epistemology in American librarianship, more work is needed than can be addressed in the current research. Additional work is needed, especially in the following areas:

- Investigating elements of design epistemology not explored in this study, especially reflection-in-action, abductive reasoning, and the use of representations
- Development of new educational curricula grounded in design epistemology and appropriate evaluation of said curricula
- Building infrastructure to support design evaluation methods in library research and practice, including new venues for and models of dissemination and communication regarding library designs
- Creation of new library artifacts that explicitly incorporate and reflect the core values of librarianship

Some of this proposed work is research-based, while other necessary work involves pedagogical or professional development. All are critical to moving librarianship forward in this area.

7.5.1 Investigation of elements of design epistemology not explored in this study

Further examination of elements of design epistemology not addressed in depth in this work may reveal additional reasons for not conceptualizing librarianship as a design discipline as well as additional suggestions and recommendations for supporting this paradigm shift. Although this study demonstrates a major foray into understanding librarianship as a design discipline, several elements of design epistemology—specifically the use of reflection in-and on-action, abductive reasoning, and representations—could not be concretely identified in this work. It is unclear

whether these went unnoticed because they were not legitimately present in the course of the work; they were present but not recorded in the artifacts or documents surrounding the design; or they were recorded but records were subsequently lost. Given that the answer to this conundrum is unknown, further research into areas of design epistemology not easily observable or not observable *ex post facto* is needed.

Emergent work regarding assessment and evaluation in library storytimes reveals potential evidence of both reflection-in- and on-action. The Valuable Initiatives in Early Learning that Work Successfully (VIEWS2) project found that librarians implicitly rely on reflection as a component of storytime assessment.³ In conjunction with members of the VIEWS2 team, new research into the nature of reflection in- and on-action in library storytimes and explicit ways to use reflection as a form of assessment in this area is underway. Other methods for recording evidence of reflection-in-action, such as observation or think-aloud protocols, might also be used to better understand reflection-in-action.

Rather than inductive or deductive reasoning, design epistemology relies on abductive reasoning. Like reflection, this mental process is difficult to record, and nearly impossible to glean from historical research. Instead, I propose contemporary projects that draw on existing methods for understanding forms of reasoning, such as the use of established tests to determine individual reasoning types. Such instruments vetted through previous use in fields like psychology can help determine which types of reasoning strategies librarians use in the course of their professional practice. For instance, the Ambiguous Reasoning Task, a protocol created to distinguish between

³ Kathleen Campana and others, "Early Literacy in Library Storytimes: A Study of Measures of Effectiveness," *The Library Quarterly* (forthcoming).

respondents' propensities for deductive and inductive reasoning,⁴ might be adapted to include abductive reasoning and presented to librarians.

Although representations are an established element of design epistemology, they often emerge from the creation and development of tangible, physical products. Drawings and prototypes act as quick, informal instantiations of ideas for physical end results. Although the creation of physical information tools certainly falls under the purview of librarianship, an increasingly large portion of design in librarianship deals with intangible products, be they digital (like software or computer interfaces) or intellectual (like services, events, or processes). This makes the identification and examination of design representations challenging, to say the least. While sketches and prototypes may exist for digital products, what, if any, design representations emerge in the creation of intangible services? This is a research question worthy of investigation not solely in the context of librarianship, but for the field of design at large.

7.5.2 Development of new educational curricula grounded in design epistemology

Education for librarianship requires substantial changes if it is explicitly to incorporate design epistemology. Future work is needed in both the development of new curricular approaches as well as evaluation of those approaches to understand their impact on the field.

Revamping library education to correspond more closely with design education requires re-envisioning library coursework in terms of a studio environment. While much hands-on knowledge may currently be gleaned through internships and practica in the field, these experiences lack the direct guidance and feedback of the kind offered by instructors in studio environments. Efforts to evolve spaces for education into more studio-like spaces are already

⁴ Ascensión Fumero, Carlos Santamaría and P. N. Johnson-Laird, "Ambiguous Reasoning Task," *PsycTESTS* (2010): PsycTESTS, EBSCOhost, accessed April 26, 2016.

underway.⁵ I anticipate taking this one step further to bridge the gap between design studio situations that offer instructor support and feedback as well as in-situ real-world experience through the development of a teaching library. Akin to a teaching hospital, a teaching library is a functioning library staffed by future professionals under the supervision and auspices of trained educators. Students are directly responsible for real patron services akin to an internship, but are afforded ongoing supervision, feedback and critique. You could also think of this as akin to the beauty academy model, where, for a reduced price, clients receive haircuts from students under the watchful eye and interactive feedback of instructors.

Future work in pedagogy for library education also needs concrete means to support repertoire-building. Another proposed idea is to investigate the use of sketchbooks or other similar devices for scaffolding repertoire-building in librarianship. What kinds of activities can help students understand and foster repertoire both during their studies and throughout their professional careers? Longitudinal studies tracking the use of repertoire throughout librarians' careers can also offer insights into techniques for scaffolding design epistemology in library education.

Additionally, epistemological foundations and the lack of design therein appear to be at least partially shaped by the educational backgrounds of those that enter the profession. A pilot study at the University of Washington Information School reveals that the majority of students admitted to the MLIS program come from humanities and social science backgrounds, with less than 6% coming from design and design-related fields.⁶ I am currently continuing research in

⁵ Jaime Snyder, Robert Heckman and Michael J. Scialdone, "Information Studios: An Arts-Based Approach to Educating Technical Professionals," *Journal of the American Society for Information Science and Technology* 60, no. 9 (2009), 1923-1932; Melanie Feinberg, "Writing the Experience of Information Retrieval: Digital Collection Design as a Form of Dialogue," *Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI 2012)*, 357-366.

⁶ Rachel Ivy Clarke, "Where do Librarians Come From?: A Pilot Study Investigating the Educational and Disciplinary Backgrounds of MLIS Applicants," presented at the Association for Library and Information Science Education conference (Boston, MA, January 5-8, 2016).

this area across ALA-accredited library programs to discover whether this trend is localized or pervasive. Based on the results, I anticipate developing recruitment programs to attract potential students from design backgrounds, and monitoring the outcomes and effects that may arise from more diverse educational cohorts.

7.5.3 Building infrastructure to support design evaluation methods

Design offers legitimate alternative evaluation methods for assessing projects, yet most outcomes in American librarianship are assessed according to social science criteria. Much of this is embedded in infrastructure such as funding associations, professional organizations, and publication venues. I anticipate two major areas of work to build new infrastructural support for evaluation methods rooted in design epistemology.

First, I propose facilitating structure for expert critique by creating a professional forum where librarians can bring design artifacts and ideas to share and receive feedback from experts and peers. This may take the form of conference sessions, workshops, or other avenues, even perhaps a specific themed meeting devoted to this and other topics related to design epistemology.

Second, new venues for sharing and disseminating information surrounding library designs that acknowledge the legitimacy of evaluation methods based in design epistemology need to be created. New journals or other alternative venues are critical. These new venues might be modeled on ideas like Library Design Share,⁷ a website where librarians can upload, download, and share graphic design artifacts like signage and posters. Or they might be embedded in a

⁷ <https://librariandesignshare.org/>

broader context, such as a section of the *Journal of New Librarianship*,⁸ which is actively seeking to support alternative paradigms.

7.5.4 Explicitly advocating values of librarianship through artifacts

Finally, no future work in this area would be complete without including the actual design of library artifacts. I intend to demonstrate the explicit use of design epistemology in librarianship through the purposeful and systematic creation of new library artifacts intended to actively reflect the core values of librarianship, such as privacy and diversity. Here I draw heavily on the idea of critical design, a form of research inquiry that uses the creation of provocative artifacts to challenge established assumptions. Proposed future projects highlight the ways in which artifacts can advocate for diversity, such as library catalogs that return search results only from female authors, and a descriptive taxonomy that represents a feminist perspective on video games. Ultimately, I hope to combine aspects of critical design with storytelling and other arts-based research methods to foster advocacy and support for the reconceptualized role of libraries in the 21st century as cultural institutions and spaces for knowledge creation.

7.6 Contributions

This work provides several new contributions to both the fields of librarianship and design. First and foremost, I have demonstrated that understanding the field of librarianship from the perspective of design epistemology is a valid and legitimate interpretation. This is a completely different and distinct way of viewing librarianship, both the work of librarians as well as the fundamental epistemological constructs that support the discipline.

⁸ See <http://newlibs.org/>

Second, this work provides a more comprehensive synthesis and understanding of elements of design epistemology across fields, disciplines, and scholarly perspectives. The elements of design epistemology presented in this research are drawn from across many authors and sources. Within the field of design, such scholars offer what may seem to be differing perspectives on what constitutes design epistemology and which elements are essential to design. Here I present a holistic, synthesized interpretation of these viewpoints.

Finally, I provide actionable recommendations to support progress in moving forward with reconceptualizing librarianship as a design discipline. Proposals for future work, new methodological paradigms for research, design-based approaches to formal education, and alternative recruitment strategies are all recommendations that can be immediately harnessed to foster change in the direction of design in librarianship.

7.7 Conclusion

American librarianship in the 21st century is at a crossroads. People increasingly rely on non-library-based information tools and services to meet their information needs. Yet libraries are set apart from these other information providers by a commitment to core values like democracy, diversity, privacy, intellectual freedom, and lifelong learning. Libraries and librarians need a fundamental epistemology that highlights and advocates this difference. Additionally, libraries and librarians are faced with choices about how to support and advocate for these values through tools and services in the midst of ever-changing technologies, ongoing funding reductions, and the fear of a greying workforce, among many other challenges. The decisions made in librarianship today will have significant consequences down the line. This dissertation has offered one possible solution to address these challenges at a broad, fundamental level: to explicitly re-envision the field of librarianship as a design field.

As with all research projects, this dissertation itself is a work of design. By reframing librarianship in an alternative epistemological viewpoint, it makes the statement that not only that librarianship *can* be viewed in this manner, but that it *should* be, in order to better meet each and every one of these challenges—known and unknown—as they arise.

American librarianship has always been a service profession and, as the research in this dissertation shows, a value-laden design field. Reconceptualizing librarianship based on explicit design epistemology rather than the traditional “library science” is not only more closely related and reflective of the goals and purposes of librarianship, but the way to empower libraries to explicitly advocate for the values of the field, remain relevant in rapidly changing environments, and be successful in the face of future challenges.

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8.1.1 Editions of Poole’s Index to Periodical Literature (in chronological order)

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——— and Mary Poole, *Poole’s Index to Periodical Literature; Fourth Supplement from January 1, 1897, to January 1, 1902*. Boston, MA: Houghton, Mifflin and Co., 1903.

——— and Mary Poole, *Poole's Index to Periodical Literature; Fifth Supplement, from January 1, 1902, to January 1, 1907*. Boston, MA: Houghton, Mifflin and Co., 1908.

8.2 Archival Collections

8.2.1 Regarding Poole's Index to Periodical Literature

Carl B. Roden - William F. Poole Papers, The Newberry Library, Chicago.

Newberry Library Archives, The Newberry Library, Chicago.

W.L. Williamson - William F. Poole Research Papers, The Newberry Library, Chicago.

8.2.2 Regarding the Washington County (MD) Free Library book wagon

Annual Reports of the Washington County Free Library, Hagerstown, Maryland.

Mary Lemist Titcomb Scrapbook, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

Mary Lemist Titcomb Vertical File, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

Minutes of the Washington County Free Library Board of Trustees, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

Washington County Free Library Administrative Archives, Western Maryland Room, Washington County Free Library, Hagerstown, Maryland.

8.2.3 Regarding the eXtensible Catalog

eXtensible Catalog Organization, <https://www.extensiblecatalog.org/>

UR Research Institutional Repository, University of Rochester,
<https://urresearch.rochester.edu/home.action>

Xerox Docushare, University of Rochester,
<https://docushare.lib.rochester.edu/docushare/dsweb/HomePage>

Chapter 9 Appendix: XC Interview Protocol

9.1 Opening

Personal introductions/small talk

Explain the purpose of the study:

- The purpose of this research is to better understand the role of design in American librarianship. Design offers a different way of thinking and different approaches, methods, techniques, and tools than the traditional social science approaches and methods typically used in librarianship. By exploring design projects, I aim to better understand the way design methods, techniques, and ways of knowing are (or are not) used in librarianship.

Explain the interview structure

- We'll start off with some basic demographics and information about you and the project in general.
- The next part of the interview will ask you to jog your memory about the history of the project and your involvement with it.
- Then we'll go a little deeper into certain areas, specifically, the role of design in this project and how you think about design.
- The second and third sections might overlap somewhat, but that's okay.

Explain the process

- Ask for consent to audiorecord (even if they've already said okay by email)
- Transcription: After the interview, the recording will be transcribed. The audio recording will be deleted and I will work from the transcription. If you like, I can send a copy of the transcript to you for review and confirmation, at which point you can request changes or deletions.

Explain the risks

- Because of the unique nature of the eXtensible Catalog project and because the reliability and validity of this research hinges on provenance and demonstrable connection to source materials, I will not be able to keep your responses confidential. What you say in this interview may be summarized or quoted in my dissertation or any publications that result from it. If I ask any questions that you either cannot or would prefer not to answer, just tell me so, and we'll move on.

Ask if they have any questions before starting.

9.2 Demographics

- What is your age, gender, nationality?
- Could you briefly describe your educational background?
- Could you briefly describe your professional background?
 - Potentially follow up with any mention of design related background

- Where do you work now?
- What is your role there?
- How long have you been in that role?

9.3 General involvement with eXtensible Catalog

- In your own words, can you please tell me what the eXtensible Catalog is?
 - Where did the idea come from?
- How did you come to be involved with the eXtensible Catalog project?
 - When did your involvement start?
- What is/was your role?
 - How long were you in that role?
 - What tasks did you perform as part of your role?
 - What were the major responsibilities of that role?
- From your perspective, what were the major goals of the project?
 - In what ways did your role/tasks support these goals?
 - Did the eXtensible Catalog set out to solve a problem? If so, what problem?
- Can you please tell me about the process of creating the eXtensible catalog?
 - How long did the project take?
 - What kinds of teams/meetings? What were meetings like?
 - How were decisions made (i.e., consensus, voting, debate, etc.)?
 - What did you do when you hit a snag?
 - What kinds of documentation did you keep?
 - What kinds of outputs or results were created?
- How did you know when the eXtensible Catalog project was done?
 - How many versions of the eXtensible Catalog have been created?
 - Do you consider the project successful?
 - Why? What constitutes success for the eXtensible Catalog?
 - Is there anything about the project you wish had happened differently?

9.4 The role of design in the eXtensible Catalog

- How would you define the word “design”?
- Were any formal design strategies used during the development process?
 - Were some parts or phases of the project more design-related? I.e., were processes limited to certain tasks/times, or was design pervasive throughout?
 - How much of these design-related parts were you involved with?
- The eXtensible Catalog has been called a “participatory design” project. Can you tell me what that means?
 - How did you learn about participatory design?
 - What parts/phases of the project drew on participatory design? Which did not?

- What specific elements of participatory design were/were not included in the project?
 - How relevant was participatory design was to those elements?
- Do you think the participatory design approach was useful/successful?
 - In what way (or not)?
 - Would you use it again on another project?
- Have you worked on any other projects involving participatory design?
 - In vs. outside of libraries?
 - Other design projects not participatory design?
- What, if anything, did you learn about design from working on the eXtensible Catalog project?
- Ultimately, would you consider the eXtensible Catalog project more of a scientific research project or more of a design project? Why or why not?

9.5 Conclusion

- Is there anything else you'd like to add?
- Is there anyone you think it might be especially important for me to interview for this study?
 - Would you be comfortable providing contact information and/or making an introduction?
- Thank you for your time!