Toward a Design Epistemology for Librarianship

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ABSTRACT

The design of information tools and services is an integral component of librarianship, yet American librarianship has self-identified as a social science for more than 100 years. This article suggests an alternative epistemological perspective to the scientific tradition in librarianship: design epistemology. The article discusses key elements that compose design epistemology and presents examples of manifestations of these elements in librarianship. Analysis reveals that librarianship has much in common with design epistemology, yet the field lacks explicit acknowledgment of design as a fundamental epistemological framework. The article concludes with a call to reconceptualize librarianship as a design discipline.

For thousands of years, libraries and librarians have made artifacts to enable access to and use of information resources. From the earliest libraries of Sumeria, where workers created cuneiform lists of holdings, to the famous library of Alexandria, which implemented the first known deposit model to foster access to knowledge, and from Dewey's decimal-based classification system, enabling patrons to browse shelves by subject rather than acquisition order, to modern databases such as NoveList that support readers' advice and recommendations, the thing that separates a library from merely a collection is the creation of tools and services that unite users with information.

Despite this propensity toward creation, the contemporary field of American librarianship is traditionally considered a social science field. As librarianship became established as a profession in America, influences such as the increasing formalization of education for librarianship, especially its inclusion in the university system at the graduate level, shifted focus away from procedural training and toward more scientific approaches (Carroll 1970). Situating librarianship in the academy helped legitimize it as a profession but also emphasized scientific research and publication over practice (Richardson 1982). Librarians were increasingly educated in an environment steeped in science and the academy, taking those epistemological understandings with them as they moved into practice. Scholars and researchers in library science emphasized the need for scientific evidence to justify libraries' social and educational value, rather than reliance on practitioners' experience-based assumptions and conclusions

Library Quarterly: Information, Community, Policy, vol. 88, no. 1, pp. 41–59.
0024-2519/2018/8801-0004$10.00

(Williamson 1931). Throughout the twentieth century, practitioners drew upon various methods and methodological approaches to gathering this scientific evidence, including positivistic approaches (Butler 1933), social epistemology (Egan and Shera 1952; Shera 1972), qualitative inquiry (Fidel 1993), hermeneutics (Budd 2001), and evidence-based librarianship (Eldredge 2000, 2006). Scholars often argue about the nature and underlying philosophical and epistemological assumptions of library science.[1] Yet few scholars since the beginning of the twentieth century have approached librarianship as if it were not a science at all. This focus on librarianship as science did more than simply shape librarians' perspectives on knowledge. As the focus on science increased, design waned (Buckland 1996).

This article explores the possibility of design as an epistemological perspective for librarianship. It presents the idea that design is an integral aspect of American librarianship and that the field reflects key elements of design epistemology, an inherently different approach from scientific epistemology. To do this, it introduces an overview of design epistemology through an explication of elements that compose this perspective, emphasizing those that distinguish it from traditional scientific epistemologies. The discussion also offers examples of manifestations of these elements in librarianship. The article concludes with current approaches to design in librarianship and possible suggestions for moving forward with this epistemological perspective.

A Different Approach: Design Epistemology

In the twentieth century, design epistemology emerged as a legitimate alternative to traditional scientific epistemologies. 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, whereas design centers on the artificial world: objects created by humans to institute change and to solve problems. Science is about what is, whereas design is about what could be (or, arguably, what should be; Liedtka 2004). The objectives of design are to "create things people want" (Konsorski-Lang and Hampe 2010, 3) by "addressing problems or ideas in a situated context" (Binder et al. 2011, x). Thus design epistemology is 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 Nigel Cross (1999, 2011) calls a designerly way of knowing.

What is this way of knowing? Scholars from the 1960s, when the first formal investigations of design began, to the present day have identified consistent aspects of design across a diverse range of disciplines. Designers from all fields—from architecture to engineering, from fashion

1. See, for example, the published replies of Sandstrom and Sandstrom (1995, 1998, 1999) to Nyce and Thomas or the debate between Zwadlo (1997, 1998) and Radford and Budd (1997).

to technology—undergo similar processes, revealing a common set of fundamental principles that underlie what constitutes knowledge in design epistemology (Thomas and Carroll 1979; Schön 1983). These underlying principles—what I call "elements of design epistemology" in this article—include consistent approaches to knowledge and what constitutes knowledge in design. See table 1 for a list of these elements. Although they appear to be carefully categorized, these elements are highly interconnected. For instance, reflection is a form of knowledge generation in design that may also serve as an evaluative method. I acknowledge the complexity among these elements and group them this way purely to present an organized analysis.

These elements appear in all design disciplines. I posit that these elements also appear throughout the discipline of librarianship. To support my argument, I will define and discuss each of these elements, drawing on examples from traditional design fields and librarianship where applicable.

Creation of Problem Solutions

Artifacts

One of the first to examine design in a rigorous way, Herbert Simon described the design process as "creating artifacts to obtain goals" (Simon, 1969, 59; 1996) and claimed that this focus is a key factor in distinguishing professional disciplines from those of pure scientific research and inquiry. Similar definitions can be seen for design in creative or craft-oriented domains, such as Charles Eames and Ray Eames's ([1972] 2000) definition of "design" as "a plan for arranging elements in such a way as to best accomplish a particular purpose." This squarely defines design as a domain that hinges on the action of creation.

Creation results in some sort of output. In libraries, physical space (architecture and interior space planning) is often an explicit focus of design. However, physical artifacts are not the

Table 1. Elements of Design Epistemology

	Element
Creation of problem solutions	Artifacts
	Wicked problems
	Problem finding and framing
	Service orientation
Generation of knowledge through making	Iteration
	Repertoire
	Reflection
	Use of representations
Design evaluation methods	Rationale
	Critique
	Criteria-based evaluation

only artificially created things in our universe. People also create intangible conceptual systems, which then may be represented by or documented in physical artifacts. Such intangible conceptual objects can also be considered artifacts themselves, in addition to any techniques or records used to embed them. Myriad examples of these design artifacts exist in librarianship, from knowledge organization tools such as the Dewey Decimal Classification or the Library of Congress Subject Headings to services such as telephone reference service and storytimes and internal programs such as the Library of Congress Card Distribution Program or the Farmington Plan. Arguably, every tool and service created in librarianship is a design artifact. The 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 (Östman 2005).

Wicked Problems

Creation in design serves a specific purpose: to solve problems. Although design artifacts are created with the intention of solving problems, not all problems need design solutions. Many problems can be solved with the application of traditional scientific methods. L. Bruce Archer ([1965] 1984) notes that if a solution can be seen to arise automatically and inevitably from the interaction of the data, then the problem is not a design problem. Unlike rational scientific problems, design problems are ill-defined from the outset (Cross 1984). Problems that cannot be definitively described are referred to as "wicked problems." Horst W. J. Rittel and Melvin M. Webber (1973) identify characteristics that qualify a problem as wicked: they are unique, constantly changing problems that have no single correct solution. Wicked problems lack definability, true-or-false solutions, conclusive endings, scientific tests for solutions, and lists of acceptable moves. Because they 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 (Conklin, Basadur, and VanPatter 2007). Design is often used to tackle wicked problems that have failed to be solved via more traditional research approaches (Wieringa 2010).

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 such as 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 today) to specific instantiations at local institutions, including how to increase circulation or teach information literacy. For example, what is the definition of the problem that contemporary online library catalogs attempt to solve? Is it a question of materials inventory, or of information 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, and issues of integration with circulation and statistical reporting. It must include consideration of back-end ar-

chitecture, display, descriptive cataloging, subject analysis, and authority control. Patrick Wilson (1968) wrote that library catalogs are not faulty because of poor workmanship or outmoded organizational schemes but rather a deeper inherent complexity. Because of such complexity, many problems libraries attempt to address could be considered wicked. Since scientific approaches are not appropriate approaches to these wicked problems, design is left as the only currently established, appropriate approach to addressing them.

Problem Finding, Framing, and Reframing

Because design problems are ill-defined, thorough investigation and understanding of a problem is necessary. Early scholars of design conceptualized it as a rational and systematic progression with variations of the following stages: (1) analysis, (2) synthesis, and (3) evaluation (Jones 1963; Archer [1965] 1984; Luckman 1967; Thomas and Carroll 1979). The first stage, analysis, consists of activities to understand the problem. The second stage is the actual creation of a solution, and the final stage addresses how well the solution fits the problem. Tasks such as compiling exhaustive lists of requirements (Alexander 1963) and identifying goals and constraints (Archer [1965] 1984) 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. Then, after rank ordering these subproblems and deciding on acceptable subsolutions and combinations of them, these combinations of partial solutions would lead to larger, overall solutions (Alexander 1963; Archer [1965] 1984; Luckman 1967; Simon 1969). However, it quickly became evident that design could not be reduced so simply. For instance, Jane Darke (1979) found ethnographic evidence refuting the idea that designers identify constraints in a formalized way. Instead, designers impose a "generating concept," or a set of objectives from one particular perspective, to find a "way in," or to frame the problem. This idea of framing and reframing—looking at a problem from different angles or points of view—recurs throughout the literature on design and across fields, including industrial product design, software and technology development, and architecture (Cross 2011). In libraries, for example, the problem of accessing e-books can be viewed from many perspectives: how patrons find and download titles requires a different approach from how library staff acquire titles and make them accessible. Viewing an issue from the point of view of both patrons and library staff is a common occurrence in library projects. What other ways could we frame this problem? How about different types of patrons: adults, children, teens? How about different environments: the library, work, school, home, commuting? Other ways of reframing include setting boundaries around the issue (e.g., How do children use library e-books?), selecting particular aspects to emphasize (e.g., How can we make the download process quick and easy?), and imposing coherence (e.g., What is the process children follow to find a library e-book?). Donald A. Schön (1987) emphasizes the idea of "design domains": clusters of concepts, such as

features, norms, relations, actions, and constraints, that designers draw upon to guide their framing.

The way in which a problem is framed guides subsequent design decisions. Vinod Goel and Peter Pirolli (1992) observe that designers not only interpret problems through the lens of personal familiarity, but they also "explicitly try to change the problem situation so it more closely fits their expertise, knowledge, and experience" (418). Such reframing affects the entire process of design because rather than changing from the initial state to a preferred state, as is the traditional conceptualization of the design process, designers actually change the initial state itself. Problem finding, framing, and reframing is such an integral part of the design process that Bryan Lawson (1994) points out that it is designers' abilities to find the problems—not solutions—that distinguishes good from bad design.

Emphasis on Service

An emphasis on service seems self-evident for a field concerned with solving problems. However, the element of service in design is deeper than just problem solving. Service in design is intentional compared with other traditional approaches from science and art (Nelson and Stolterman 2012). These epistemologies may offer contributions to others in the form of scientific discoveries that affect social policy or emotional experiences that influence personal behavior. But Harold G. Nelson and Erik Stolterman argue these are secondary outcomes. Preliminary motivation in science and art typically serves personal 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" (Nelson and Stolterman 2012, 43). Design "makes" meaning literally through artifact creation and metaphorically though contributing to service in the lives of others. Although Silke Konsorski-Lang and Michael Hampe (2010) define design as "creating things people want" (3), Nelson and Stolterman argue that to truly offer intentional service, design offers people more than what they want: a "surprise of self-recognition" (42). In other words, design is not 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 the surface level.

We see this in librarianship, which also explicitly calls out service as a core value of the profession (American Library Association 2004). One illustrative example is the reference interview, where librarians are trained to delve into, explore, and determine a patron's true underlying information need because it is not directly stated (Fields 2006). For example, a patron may ask a librarian, "Do you have *Time* magazine?" The solution to the problem as presented would be yes or no. However, the patron may actually be looking for articles about the U.S. war in Iraq and may associate *Time* magazine with articles of that genre and topic. Or the patron may be looking for a recent article about new cancer treatments and recalls the

article being published in *Time* magazine although it actually appeared in *Newsweek* (example from Brown 2008). It is the explicit job of the librarian to give the patron more than what he or she has expressed as the need, to solve the problem beyond its presentation.

Generation of Knowledge through Making

Iteration

Unlike the linear phases identified in early design research, researchers increasingly note that problem finding in design is ongoing throughout the process. Even early proponents of the three-stage model of design noted that designers continually cycle through these stages rather than progress linearly (Luckman 1967). Subsequent work shows that design problems and solutions develop together, concurrently, in an interconnected and interdependent way (Davies 1985). Designers move quickly between explorations of the problem and ideas for solutions (Rowe 1987) and hone definitions of problems by making attempts at solutions (Lawson 1990, 1994). 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 (Levin [1966] 1984; Rowe 1987).

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 design problems 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. In addition, wicked problems are also characterized as interconnected: every attempt at a solution changes the problem. This is also reflected in the design process, where requirements may be interdependent (Jones 1963). This interdependent iteration is also reflected in what Schön (1983) called a "web of moves" (101): 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. We see similar evidence of moves and their effects in other design studies, such as Rowe's (1987) study of architectural designers.

Repertoire

"Repertoire" is the name given in design to previous experiences and bodies of knowledge. Designers draw on repertoires both to guide current choices and to evaluate decisions and artifacts. Schön (1983) 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" (68). He notes 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 be more informed in making decisions in uncertain situations. Peter Lloyd and Dirk Snelders (2003) highlight the idea that repertoire need not be limited solely to pre-

vious design experiences but can expand to other external factors such as passive information reception. Lloyd and Snelders's case study of Phillippe Starck's Juicy Salif—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.[2] A prime example of repertoire in librarianship is evident in the work of readers' advisory, a service requiring librarians to supply reading recommendations to patrons (Saricks 2005). To perform this work, a librarian must draw on his or her own personal experience: every book and book review he or she has read; recommendations and reports from other professionals, friends, and family; advertisements on television and in magazines; and all manner of unpredictable sources. This librarian's range of knowledge will differ from another librarian's, who may offer different suggestions based on his or her own repertoire. Saul Greenberg and Bill Buxton (2008) 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.

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 (1983) calls "reflection-in-action." Many of us are familiar with reflection, or the idea of looking back on a completed project or past situation with serious thought and consideration. Designers, too, look back on projects reflectively, often drawing on such reflection as an evaluation technique. Reflection can help designers learn from their experiences, become more conscious about design activities and choices, and analyze what worked well and what did not (Reymen and Hammer 2002). 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 epistemologies. Design is often attributed to innate talent or intuition by people unfamiliar with design epistemologies. Numerous studies show that designers rely on their personal discretion or intuition when making choices (see Levin [1966] 1984; Davies 1985). 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 to be a type of knowledge based in reflection-in-action (Cross 2011). 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 a key component of design epistemology. Preliminary investigations show that libraries engage in both

2. An image of the lemon squeezer may be viewed at the Museum of Applied Arts and Sciences website (http://www.powerhousemuseum.com/collection/database/?irn=9354).

reflection in and on action when providing storytimes, although they may not be aware of their reflective processes. The incorporation of explicit, purposeful reflection is a key component in the continuous improvement of storytimes intended to increase literacy skills (Campana et al. 2016).

Use of Representations

Throughout the process of creating artifacts to solve problems, designers create design representations. Such representations may take a variety of forms depending on the discipline and context in which a designer is working, including notes, sketches, models, and prototypes. 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. J. Christopher Jones (1963) advocated recording and storing ideas, past solutions, requirements, and so on for later use. However, using design representations as "memory backups" or communicative vehicles is a limited and superficial view of how designers use representations (Blanco 2003). The representations used during the design process are not formal records, such as those that might be used to communicate finished work after a solution has been finalized. Process representations are fast, spontaneous, transient creations allowing designers to experiment with ideas on the fly without prematurely committing to one (Buxton 2007). When working with a representation—unlike when working with the actual product itself—no moves are irreversible (Schön 1983). The flexibility of working with representations affords designers the ability to explore and experiment with options. Peter Olpe (1997) notes that drawing itself is a process that facilitates discoveries, mistakes, and successes. 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 (Davies 1985; Greenberg and Buxton 2008). 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 help designers understand problems as much as they help generate solutions (Lawson 1994).

Abductive Reasoning

Scientific epistemologies rely on conventional forms of inductive and deductive reasoning: analytical and evaluative activities that prove something must be or that demonstrate that something is actually operative (March 1976). But design relies on abductive reasoning. This kind of reasoning is not based in analysis or evaluation but in synthesis, or the suggestion that something may be possible (Cross 2011). Heinrik Gedenryd (1998) provides a comprehensive analysis from a cognitive science perspective of why induction and deduction are inappropri-

ate reasoning methods in design, as they represent abstract thought alone, which cannot address the actual task of creating an artifact. This reinforces the idea of making as knowing because it is only through the actual manifestation of making that we can discover whether something is really possible (Scrivener and Chapman 2004). Scholars across all eras in systematic studies of design emphasize the idea of synthesis inherent in abductive reasoning. Lawson (1990) discusses the difference between scientists who tackle problems through analysis (i.e., breaking a problem apart to understand its rules before proposing a solution) and designers who tackle problems through synthesis (i.e., by discovering more about the problem by proposing solutions and discovering acceptable solutions). Jon Kolko (2010) details how designers use frames and constraints to shape synthesis and solutions.

Design Evaluation Methods

Such alternative approaches to knowledge generation naturally will not hold up to scrutiny and critical evaluation from scientific epistemologies. Unlike science, which aims for predictable, consistent results, design specifically aims for deviations and variations (Jonas 2012). Because what counts as legitimate knowledge in design is different, evaluation methods must also be different. Whereas science relies on specific epistemological constructs of evidence, design considers interpretation as a valid form of epistemological evidence (Nelson and Stolterman 2012). Scientific evidence may assist designers by describing existing situations to inform frames, conditions, and constraints. But the purpose of design itself is not to describe the existing world factually or objectively; rather, it actively seeks to change situations and add meaning to them.

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 (Snodgrass and Coyne 2006). The lack of preestablished and explicitly defined criteria does not automatically mean that an evaluator's subjective opinion comes arbitrarily. 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 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 from the perspective of social construction. Trevor J. Pinch and Wiebe E. Bijker (1984) posit that "there is nothing epistemologically special about the nature of scientific knowledge: it is merely one in a whole series of knowledge cultures" (401). They reference ways of knowing of "'primitive' tribes" and other indigenous cultures, but there is no reason that the epistemology of design is not also a different, yet legitimate, knowledge culture. At min-

imum, design evaluation should consist of a reflective critique by the design's creators (Greenberg and Buxton 2008). The following sections describe some additional examples of evaluative techniques in design epistemology, all of which are considered valid, rigorous criteria in design.

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 (Moran and Carroll 1996). In a casual application of design, as many examples in librarianship are, these reasons may be tacit or unarticulated. However, capturing the reasoning behind decisions for creating artifacts is critical in the idea of design rationale. In librarianship, this can manifest as warrant in classification. Although not specifically framing it in the language of design, Claire Beghtol (1986) deems "warrant" to be the "semantic rationale" (110) underlying a classification system. The congruency or divergence of articulated rationale with the artifact itself offers evaluative information. For example, 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, disconnect between the stated rationale and the execution of the artifact offers evaluative insights into 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 (Moran and Carroll 1996). Thus, rationale becomes part of the knowledge-making process contributing to greater theory, rather than just a technique for assessment (Carroll and Rosson 2003).

Critique

Design critique serves as an epistemological process of knowledge formation (Blevis et al. 2007). This knowledge formation may be used to offer evaluative insight, so designers with large, well-developed repertoires 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 (Nelson and Stolterman 2012). 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 (2011) 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. Frameworks are often drawn from repertoires of experience and may be based on multiple aspects, such as rationale or other criteria such as those described in the following section.

Criteria-Based Evaluation

Criteria such as novelty, innovation, and relevance to users may also be used for evaluative purposes and may vary based on context (Forlizzi, Zimmerman, and Evenson 2008). For example, market adoption might be a viable criterion for commercial viability of a design, but the other 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, unlike in scientific knowledge mechanisms, which purposefully try to detach from context with techniques such as controlled laboratory conditions.

Because design creates artifacts to solve problems, the implication is that such artifacts did not previously exist. Therefore, two criteria used to assess design are novelty and innovation. Scholars of design note that some level of originality must be present for something to be considered design (Luckman 1967). Design focuses on initiating novel forms and aims for new phenomena (March 1976; Jonas 2012). If innovation is an underlying objective, then it should be a valid assessment criterion. Novelty is not binary; it may be assessed along a spectrum. For instance, newness may be context dependent: an existing idea implemented in a new setting may be novel. So many libraries now circulate nontraditional materials, such as cake pans, that the idea of circulating nonbibliographic materials may seem to lack novelty. But the service could still be considered new if implemented at another library not yet providing such a service. In addition to just being new, designs should exhibit and communicate imagination (Nelson and Stolterman 2012), which may be recognized in various ways. For example, the Los Angeles Public Library "Book Bike"—a custom-built bicycle that can carry books and internet-enabled technology—won the 2015 Mayor's Civic Innovation Award for being a new way of reaching city residents who previously did not participate in library services.

Discussion: Where Is the Design in Librarianship?

The consistent overarching theme of creation and making in design epistemology is the fundamental difference between design and other epistemologies. Whereas other disciplines see a distinction between scholarship and practice, in design epistemology, practice is scholarship. Because creative making is itself a practice yet acts as the fundamental form of knowledge generation in design, the two cannot be separated. This is a different view from earlier approaches to design that characterized it as a form of scientific epistemology, acknowledging the legitimate contributions of knowledge occurring in practice-based fields. Design epistemology is increasingly called out as underlying professional fields that include both theoretical and practical contributions, such as engineering, medicine, education, journalism, information systems, and yes, even librarianship (Simon 1996; March and Storey 2008; Niblock 2012). These practice-based professions need practice-based epistemologies (Calvert-Minor 2012). Michael Buckland (2012) agrees that even information science (which in his view encompasses librarianship) is a "science of the artificial" (6) focused on the creation and study

of design objects that affect change. But despite numerous examples of design evident in librarianship (those described in earlier sections, among others), 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 (Hildreth and Aytac 2007), and design is conspicuously absent from research methods books for librarians, even recent publications (see, e.g., Beck and Manuel 2008; Connaway and Powell 2010; Pickard 2013). On occasions where design is discussed as a research method, it is still framed in scientific epistemology. Applications are often drawn from education and reflect validity and reliability concerns inherent to science, not design (see Bowler and Large 2008; Rawson and Hughes-Hassell 2015). 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 made in the context of architecture and interior design (see, e.g., *American Libraries*' annual "Library Design Showcase," which covers only innovative architecture and new and newly renovated libraries), graphic design (e.g., Librarian Design Share, a website where librarians can share and trade flyers, handouts, signs, etc.), and technology (e.g., web design). This is reflected in vocabularies and classification systems describing documents in librarianship (Clarke 2015). Other, broader references to design, such as Buckland's (1992) *Redesigning Library Services: A Manifesto*, 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's designerly way of knowing) has begun to emerge in conference presentations and toolkits.[3] The technique of participatory design, a form of design process that supports cooperation and collaboration between users and designers (Schuler and Namioka 1993) has recently been popular in librarianship. Workshops from the Council on Library and Information Resources focused on the methods and technique of participatory design but did not seem to broach the underlying epistemological assumptions that support and contribute to it. One notable exception is the recent work of Mega Subramaniam and colleagues (2013a, 2013b), which draws on codesign techniques to gain knowledge about youth information behaviors. Although the implementation of design techniques from these sources has certainly helped libraries, many are still centered in ways 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.

Others in librarianship have embraced the empowerment of creation—but for library users, not for the profession itself. The advent of makerspaces and other opportunities to fos-

3. A well-known example is "Design Thinking for Libraries: A Toolkit for Patron-Centered Design," http://designthinkingforlibraries.com/.

ter creation in libraries certainly lends credence to the idea of knowledge via making. Resources such as the *Let's Make Guide* from the Gates Foundation emphasize the value of making in libraries.[4] But they are couched in the context of the value of making by users, not by librarians. R. David Lankes (2011) emphasizes this transition, advising that the future of libraries rests in the shift from passive information consumption to active information creation. However, the focus in all of these endeavors is on library users as creators—there is no acknowledgment, much less encouragement, for librarians to reconceptualize themselves as creators and their field as one of design. Currently, none of the top 20 ALA-accredited master's level library degree programs require core coursework in design (Clarke, Lee, and Mayer 2017), although innovative programs such as the youth experience specialization at the University of Maryland and other reconceptualizations of design-based library education are emerging (Clarke and Bell, forthcoming).[5] And even though user experience (UX) librarian positions—roles based on similar positions in design communities—are on the rise, UX librarians do not consider themselves designers and assign responsibility for design to others (MacDonald 2015). Other innovative efforts to reconceptualize libraries ignore design entirely, even as they describe its very nature: Jeffrey Schnapp and Matthew Battles (2014) specifically call for "a way of talking about what libraries are" (123) and refer to Dewey as a "gadget creator." They use metaphors of creation (e.g., cooking) and references from design (e.g., Alexander's pattern language) to describe libraries, but they somehow never frame these discussions in epistemology of design. Perhaps the "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.

Conclusion

Although the field of American librarianship has self-identified as a social science for more than 100 years, this analysis reveals that librarianship has much in common with design epistemology. Recent years have seen an increased interest in using design methods and techniques. However, there is little explicit acknowledgment of the field of design as a fundamental epistemological framework: design is relegated to work processes and methods and supported for patrons but not yet fully understood as or encouraged to be a fundamental aspect of librarianship itself.

As librarianship continues to face new and evolving challenges, it needs a fundamental philosophy and epistemology that can support not just discovering but understanding and solving these problems. The identification of design as an epistemological framework for librarianship is a small step toward a long-term epistemological shift. To enable such a shift, librarianship needs to explicitly acknowledge and embrace design epistemology in research,

4. Bill and Melinda Gates Foundation, *Let's Make Guide*, http://www.letsmakeguide.com/.
5. See University of Maryland, "Youth Experience," http://yx.umd.edu/.

education, and practice. Future work is necessary to create research and publication venues that legitimize and support design epistemology; new education and training models including studio-based education, instruction in developing repertoires and critique skills, and new infrastructural support and evolving discourse around job descriptions, work tasks, leadership, and professional codes. Reconceptualizing librarianship based on explicit design epistemology rather than on the traditional concept of library science is not only more closely related to and reflective of the goals and purposes of librarianship but is also the way to empower libraries to explicitly advocate for the values of the field, to remain relevant in rapidly changing environments, and to be successful in the face of future challenges.

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