

Applying Boundary Object Theory to Community-Building  
and Collaboration in Digital Libraries

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Boundary object theory, originally developed by Susan Leigh Star, can be applied and used to study the interactions that take place and the objects that people create and use in the context of crossing the boundaries of different social worlds and communities. My research focus is in studying the role digital libraries play in collaborative and community-building activities and behaviors around and within their environments and how they can better support these. Boundary object theory can be applied to this problem, considering digital libraries as boundary objects that are used by multiple social worlds and communities. They should encourage and support coherence between multiple social worlds through interaction, collaboration, and community-building. This paper discusses this proposed application of boundary object theory to my research problem of interest, the study of collaborative and community-building behaviors in and around digital libraries. It also discusses how boundary object theory might be refined and strengthened—especially with regard to a few problems the theory has—through such research.

### **Research Problem**

One of the biggest objectives of digital libraries should be to support and build the differing kinds of “knowledge communities” that use their content and services (Bearman, 2007, p. 245). Digital libraries most certainly “can affect the health of these communities” (Agre, 2003, p. 227), changing their “existing processes” (Van House, 2003, p. 272), “restructur[ing] their relationships” (Adams & Blandford, 2004, p. 71), and hopefully improving them and their health by successfully supporting the “internal workings of these communities and their links to the rest of the world” (Agre, 2003, p. 227). This is especially true since “tools, systems, [and] interfaces” that deal with information are tightly bound with communities (Star, Bowker, & Neumann, 2003, p. 244); digital libraries and their user communities are hard to examine separately (p. 244).

However, many digital libraries are designed or developed with neither the social information needs of communities nor the socio-technical and organizational context they are part of in mind (Adams & Blandford, 2004). Indeed, unlike many physical libraries digital libraries as a rule have not strongly supported collaboration and sharing of information within and between communities (Farooq, Ganoe, Carroll, & Giles, 2009; Gazan, 2008) or community-building activities (Bearman, 2007; Pomerantz, 2008); thus they have effectively ignored the

“ongoing conversation” and context of the communities around them (Gazan, 2008, Introduction section, para. 2). This leads to a practical and research problem: many digital libraries do not support well, through their content and services, the social context surrounding and within them. They should both learn more about and improve their support of social interactions—particularly collaborative and community-building activities and behaviors—to integrate better with social groups and communities (Lynch, 2005) and be able to serve as social spaces and environments akin to the role of physical libraries (Pomerantz & Marchionini, 2007).

My interest in this research problem originates in a desire to improve support for these social aspects of digital libraries, so that they can serve as the social spaces and places Pomerantz and Marchionini—and many others—feel they should. There is certainly a need for digital library and information professionals to provide for this support through the design and development of digital libraries; however, my interest lies in conducting research that provides a better understanding of the social aspects of digital libraries—particularly communities and collaboration—and thus affords a better chance of these aspects being successfully supported and social interaction being encouraged in and around digital libraries. This research problem has not yet been solved; methods for supporting and theories and frameworks for studying community-building and collaboration in digital libraries exist, but no one method, theory, or framework has already proven itself to be vastly better than others. Boundary object theory is one of the most promising theoretical approaches; research applying and refining it in the context of community-building and collaboration in digital libraries will further my research agenda, help solve the research problem, and advance both the study of digital libraries and the library and information science field as a whole.

### **Ways to Apply Boundary Object Theory**

Because they are used by and cross the boundaries of multiple social worlds and communities, digital libraries are boundary objects that should adapt to the “local needs” (Star, 1990, p. 46) of as many of these worlds and communities as possible. Serving as an interface and translation device between social worlds, they should reconcile the “meanings” and understandings across these worlds to allow users to “work together” (Star & Griesemer, 1989, pp. 388-389) to collaborate, interact, and build a broader community around the digital library. The translations they provide also should be coherent and consistent for as many social worlds as possible. Studies of digital libraries as boundary objects should thus consider the social worlds

and communities that use them; whether digital libraries successfully interface and translate between them, and why (or why not); whether digital libraries support users' engagement in collaborative and community-building activities and behaviors within and across social worlds, and why (or why not); and the degree of coherence digital libraries provide between social worlds and communities.

As stated briefly in Paper 1, there are at least two possible approaches to such research. The first focuses on the individual and social information behaviors of the users, groups, and communities that use a digital library, particularly their collaborative and community-building behaviors. The digital library as boundary object acts as an interface, translating between those from different social worlds and communities who are engaging—or want or need to engage—in these behaviors. Per the propositions of boundary object theory (seen in Paper 3), whether such behaviors are successful across social worlds depends on how well the digital library facilitates translation and supports high levels of coherence between social worlds. The success of the digital library depends not just on the success of these information behaviors but also on satisfying the information needs that many of these behaviors express. Both the digital library as a whole and its content, features, interfaces, and services have to be carefully managed in order to produce successful translations, ensure a high level of coherence, and satisfy the information needs of its users and user communities.

The second possible approach instead focuses on the methods digital libraries can use to better support such collaborative and community-building activities. Many methods and models have been tried to produce digital libraries that successfully support community-building and collaboration, with mixed success overall. Many methods are quite promising—wikis, for example—or have been used successfully in some cases—such as social annotations, tagging, and folksonomies—but require further study to see if it is the method that is successful or the specific context it is used in. Boundary object theory could be used to identify which methods allow digital libraries to cross the most boundaries and thus have the highest level of coherence with various communities and users. It could also help explain why some methods are more successful and others are less so.

In both of these cases, the boundary object(s) under question would be defined and given at the beginning of the study: one or more digital libraries. This approach would be opposite to that originally used by Star and Griesemer (1989)—who initially defined social worlds, then

examined what boundary objects they used—but not one without precedent: Star applied her own theory this way at least twice (Bowker & Star, 1999; Star et al., 2003). Bødker and Christiansen (1997); Gal, Yoo, and Boland (2004); Henderson (1991); and Pawlowski, Robey, and Raven (2000) have also used this approach to varying extents. The actual design and development of a digital library would be best approached by first identifying the intended audience, in the form of social worlds, and then constructing the digital library as a boundary object that would translate between those worlds. However, when studying digital libraries that are already in development and use it is much easier to select a digital library first, then examine whether its users build community and collaborate successfully across social worlds and whether the digital library successfully supports those behaviors.

I initially expected my research interests to be closer to the second approach, trying to identify which methods offer the best support for community-building and collaboration. However, I now feel the first approach is the most interesting and potentially insightful; will provide a better application of boundary object theory; and will be the best way to move forward my own research agenda, the digital library field, and library and information science as a whole. This approach should eventually allow for conclusions to be made—if not by me then by other researchers—about particular methods and approaches of providing support, albeit not as quickly and directly.

### **Problems With Boundary Object Theory**

While boundary object theory is generally well-praised and will be very useful for studying the research problem discussed above, there are still some minor problems with the theory as it stands; issues with viewpoints, negotiation, and convergence, in particular, need to be kept in mind.

#### **Viewpoints**

As noted in Paper 3, both Fujimura (1992) and Lee (2007) have expressed concern that boundary object theory does not, in fact, take a sufficiently ecological approach to express all viewpoints. Fujimura (1992, p. 172) felt the theory was “constrained by the availability of information and its associated story-telling perspective”; whichever viewpoint or social world the most data could be collected about would, she argued, be unavoidably central to any study of a given boundary object. This potential issue with the theory must be taken into account in any

study of digital libraries as boundary objects. The viewpoints of as many social worlds as possible must be considered and included in any analysis.

At the same time, the only way to know everything about every possible social world that uses a digital library to collaborate and build community would be to collect data from and about every user, impossible in the vast majority of cases. The number of social worlds and users included in a study's sample therefore has to be limited. Such a sample should, however, be at least broadly representative and carefully selected to ensure the validity of the conclusions drawn and the inclusion of the viewpoints of as many users and social worlds as possible. A truly representative sample might be difficult to draw; it is hard to create an exhaustive sampling frame for most digital libraries because they do not require user registration. Nevertheless, all possible attempts should be made to have the sample drawn represent the lion's share of the social worlds that use the digital library. Multiple studies of the same digital library, drawing on different samples, should also aid in covering as many viewpoints between them as possible.

### **Negotiation**

As also stated in Paper 3, Lee (2007) argued that boundary object theory does not account for "active negotiation of shared understanding" (p. 313). There was no scope in the theory, she claimed, for chaotic negotiation between social worlds as to the nature and meaning of a boundary object. Her concept of "boundary negotiating artifacts" (p. 318), intended to address this perceived limitation, allowed for more conflict around and negotiation of boundaries rather than crossing them "with relative ease" (p. 325). While there is probably no need for a different conception as Lee proposed, there is definitely a strong possibility of active negotiation and discussion taking place about what role the digital library should serve within and across social worlds. This is especially true since there are different viewpoints amongst digital library researchers and practitioners as to what digital libraries are: some feel they are primarily collections of digital content; others feel they are primarily institutions, organizations, and services; and still others feel they should include both content and services in the context of a social environment (Bearman, 2007; Borgman, 1999). The social worlds of digital library users will also likely disagree about what the digital library should do to build community and support collaboration across those worlds. Therefore, digital libraries as boundary objects should maintain flexibility and an ability to actively negotiate their role across the social worlds that use them. Despite Fujimura's (1992) claim that boundary objects have been conceptualized as too

elastic and flexible, they should not try too hard to standardize practices, facts, and methods across social worlds. Research should keep this in mind and further explore the degree of flexibility of digital libraries as boundary objects and how that affects their role in collaborative and community-building behaviors and activities.

### **Convergence**

The concept of convergence as explained by Star, Bowker, and Neumann (2003; see also Bowker & Star, 1999, pp. 46-49) is also potentially problematic. As noted in Papers 2 and 3, Star, Bowker, and Neumann (2003) defined convergence as how well the “tools, systems, interfaces, and devices for storing, tracking, displaying, and retrieving information”—conceptualized as “information artifacts”—“are fitted to” the communities of users that create and work with them (p. 244). A digital library as boundary object is also an information artifact, and thus on first glance convergence appears more directly applicable than the original concept of coherence (seen in Star & Griesemer, 1989). However, Star et al. (2003) attempted to apply the concept of *information worlds*, drawn from the work of Chatman (Burnett, Besant, & Chatman, 2001; Chatman, 1992, 1996), to the result of the convergence process. This potentially introduces a cyclical element because, while social worlds and information worlds originated in different research traditions, they share many similarities. In particular, the role of information behaviors in information worlds is very similar to the role of activities in social worlds. In addition, information and communication technologies (ICTs)—or information artifacts—are used to further behaviors and activities in both social and information worlds. The similarity of the concepts strongly suggests a cycle: social or information worlds converge with information artifacts to create social or information worlds.

However, Star et al. (2003, p. 244) actually defined an information world differently to Chatman, as “the collection of information resources employed by an individual, organization, institution, or other group to solve [information] problems, learn, play, and work.” They therefore removed from the equation not just shared activities and information behaviors, but also the social norms and social types concepts originating in Chatman’s theory of normative behavior. Star, Bowker, and Neumann’s idea of information worlds as the result of convergence cannot be considered to be the same concept as Chatman’s information worlds, despite their statements to the contrary. On the other hand, Star and Griesemer’s (1989) original definition of coherence did not include any discussion of information worlds and does not have this problem.

Because it does not predict or require a cycle and is more compatible with other theories, notably Chatman's theory of normative behavior (Burnett et al., 2001) and Burnett and Jaeger's (2008) theory of information worlds, coherence is a better concept to apply than convergence to the study of digital libraries as boundary objects.

### **Proposed Research**

In applying boundary object theory to my research problem of interest I will focus on the collaborative and community-building information behaviors of the users, groups, and communities that use a digital library. I will examine the role the digital library plays as a boundary object and thus as an interface and translator between the communities and social worlds that use it, as well as the coherence—or lack thereof—it provides and supports between these worlds and communities. I propose to apply boundary object theory in a way that considers the limitations, issues, and problems mentioned above, working to refine the theory based on further exploration and study of them.

It is possible that—along the lines of the cycle introduced in Star, Bowker, and Neumann's (2003) concept of convergence—a digital library that provides a high degree of coherence between two or more social worlds may create a new, overlapping social world, especially if the coherence is particularly high. This would be more likely true for digital libraries that are less flexible in their role as boundary objects, thus standardizing and stabilizing (in Latour's terms; see Fujimura, 1992) the meanings and understandings of information more quickly across social worlds. However, it may instead simply provide a highly coherent set of translations between the social worlds, rather than forming a new world. This would be particularly likely if the digital library is more flexible and adaptable (as it probably should be), since negotiation between social worlds would likely be too chaotic to form a new social world in such a case (Lee, 2007). It is thus likely that the flexibility of the digital library and the degree of coherence affect whether a new social world is created, but what happens in reality—both for individual digital libraries and for digital libraries in general—is an open research question. It is also probable, due to the similarities between social worlds and information worlds, that boundary object theory can be successfully refined through the use of Burnett and Jaeger's (2008) theory of information worlds and particularly the concepts it uses from Chatman's theory of normative behavior (Burnett et al., 2001), as long as those concepts are used carefully and not redefined (as seen in Star et al., 2003).

To explore these issues within the context of community-building and collaboration in digital libraries, gathering data on boundary-crossing activities and behaviors of the users of a digital library would be necessary. To ensure an ecological approach is followed and that as many viewpoints are accounted for as possible, such data collection would be best to continue until no new themes are found to emerge and saturation is reached. Ensuring the initial sample of users is as representative as possible would help reduce the amount of time required to reach saturation. Follow-up studies of the same digital library would also help to confirm findings and conclusions and cover as many viewpoints as possible.

The data collected could and would contribute towards a number of intermediate questions of interest: Who do users interact and collaborate with from other social worlds? Why do they interact and collaborate with them? How tight are the ties between them? How do they use the digital library to collaborate and interact across boundaries? How successfully does it satisfy individual and group information needs, particularly those that cross boundaries? Do they share similar normative behaviors across the apparent boundaries between their existing social worlds? To what degree are negotiations across these boundaries coherent versus chaotic? These questions draw from and build upon not just boundary object theory, but also Strauss's (1978) concept of social worlds, Chatman's theory of normative behavior (Burnett et al., 2001), Burnett and Jaeger's (2008) theory of information worlds, and—albeit less so—on social network analysis (see e.g. Garton, Haythornthwaite, & Wellman, 1997) and related work on social ties (see e.g. Marsden & Campbell, 1984). These questions would also help refine boundary object theory, the concept of coherence, and the process of negotiation.

A research agenda studying community-building and collaborative behaviors in and around digital libraries, using boundary object theory, would revolve around four overarching research questions:

1. Do digital libraries act as boundary objects, facilitating translation and supporting coherence between the *existing* social or information worlds of their users? If so, how do they do this—in other words, what role do they play—and to what degree?
2. How (i.e. what role) and to what degree do digital libraries—as boundary objects—also facilitate and support the coherent creation of *new* social or information worlds amongst their users?

3. What is the relation, if any, between a digital library's flexibility as a boundary object and the degree of coherence or chaos in the translations and negotiations it provides across the boundaries of social or information worlds?
4. What role do the social norms, social types, information behavior, and information value judgments of the existing information worlds that digital library users are a part of play in (a) the building of a new, coherent information world, (b) translating and negotiating between existing information worlds, and (c) collaboration across the boundaries of these worlds?

The first two questions focus on the role digital libraries play in community-building behavior, but could also have implications for the role they play in collaborative behavior as well. The questions also explore whether or not they create new social or information worlds—as raised through the issues with convergence—which could also have implications for their flexibility and the negotiation process. The third question would explore digital libraries' flexibility and the negotiation process in more detail and would relate strongly to collaborative behavior, which naturally involves negotiation. Finally, the last question examines the relationship of the concepts from Chatman's theory of normative behavior (Burnett et al., 2001) and Burnett and Jaeger's (2008) theory of information worlds to the coherent building of both new and existing communities, in the form of social or information worlds; to the translation and negotiation processes; and to collaborative behavior across communities and worlds.

Multiple and mixed methods of data collection could and should be used to help answer these questions and the smaller intermediate questions mentioned above, including survey instruments, quantitative and qualitative content analysis, interviews (likely focusing on critical incidents of behavior), and focus groups. The qualitative measures should be used until a saturation point is reached so as to bring in as many viewpoints from as many social worlds that use the digital library as possible. Initial studies would have to focus on single digital libraries; answering the questions for digital libraries in general and potentially building a theory to explain collaborative and community-building (or perhaps, in actuality, social and information world-building) information behaviors in digital libraries would be a long-term goal, working to synthesize the results from multiple studies. Such research and theory would clearly be strongly based in Star's boundary object theory, but would strengthen and refine it through (a) further exploration of some of its issues; (b) use of the concepts of social worlds and social ties; and (c)

exploration and use of Chatman's concepts from her theory of normative behavior, social network analysis, and Burnett and Jaeger's theory of information worlds.

### **Conclusion**

Susan Leigh Star's boundary object theory can be usefully applied to and refined by examining community-building and collaborative information behaviors in and around digital libraries, looking particularly towards improving digital libraries' support for these behaviors. Considering digital libraries as boundary objects and collecting and analyzing both quantitative and qualitative data on boundary-crossing activities and behaviors of the users of a digital library should provide for a better understanding of these social aspects. With respect to my research problem of interest, boundary object theory can also be refined by further exploring the issues with viewpoints, negotiation, and convergence, as well as incorporating concepts and ideas from social network analysis, Chatman's theory of normative behavior, and Burnett and Jaeger's theory of information worlds. These methods, concepts, and theories would allow research questions to be answered about their role in both existing and new social and information worlds, whether they successfully facilitate translation and support coherence across these worlds, if and how their flexibility relates to their coherence, and the relation of normative behavior to coherent community-building and collaborative behaviors in digital libraries.

### References

- Adams, A., & Blandford, A. (2004). The unseen and unacceptable face of digital libraries. *International Journal on Digital Libraries, 4*, 71-81. doi:10.1007/s00799-003-0071-7
- Agre, P. E. (2003). Information and institutional change: The case of digital libraries. In A. P. Bishop, N. A. Van House, & B. P. Battenfield (Eds.), *Digital library use: Social practice in design and evaluation* (pp. 219-240). Cambridge, MA: MIT Press.
- Bearman, D. (2007). Digital libraries. *Annual Review of Information Science and Technology, 41*, 223-272. doi:10.1002/aris.2007.1440410112
- Bødker, S., & Christiansen, E. (1997). Scenarios as springboards in CSCW design. In G. C. Bowker, S. L. Star, W. Turner, & L. Gasser (Eds.), *Social science, technical systems, and cooperative work: Beyond the great divide* (pp. 217-233). Mahwah, NJ: Lawrence Erlbaum Associates.
- Borgman, C. L. (1999). What are digital libraries? Competing visions. *Information Processing & Management, 35*, 227-243. doi:10.1016/S0306-4573(98)00059-4
- Bowker, G. C., & Star, S. L. (1999). *Sorting things out: Classification and its consequences*. Cambridge, MA: MIT Press.
- Burnett, G., Besant, M., & Chatman, E. A. (2001). Small worlds: Normative behavior in virtual communities and feminist bookselling. *Journal of the American Society for Information Science and Technology, 52*, 536-547. doi:10.1002/asi.1102
- Burnett, G., & Jaeger, P. T. (2008). Small worlds, lifeworlds, and information: The ramifications of the information behaviour of social groups in public policy and the public sphere. *Information Research, 13*(2). Retrieved from <http://informationr.net/ir/13-2/paper346.html>
- Chatman, E. A. (1992). *The information world of retired women*. New York, NY: Greenwood Press.
- Chatman, E. A. (1996). The impoverished life-world of outsiders. *Journal of the American Society for Information Science, 47*, 193-206. doi:10.1002/(SICI)1097-4571(199603)47:3<193::AID-ASI3>3.0.CO;2-T
- Farooq, U., Ganoë, C. H., Carroll, J. M., & Giles, C. L. (2009). Designing for e-science: Requirements gathering for collaboration in CiteSeer. *International Journal of Human-Computer Studies, 67*, 297-312. doi:10.1016/j.ijhcs.2007.10.005

- Fujimura, J. H. (1992). Crafting science: Standardized packages, boundary objects, and "translation". In A. Pickering (Ed.), *Science as practice and culture* (pp. 168-211). Chicago, IL: University of Chicago Press.
- Gal, U., Yoo, Y., & Boland, R. J. (2004). The dynamics of boundary objects, social infrastructures and social identities. *Sprouts: Working Papers on Information Systems*, 4, 193-206.
- Garton, L., Haythornthwaite, C., & Wellman, B. (1997). Studying online social networks. *Journal of Computer-Mediated Communication*, 3(1). Retrieved from <http://jcmc.indiana.edu/vol3/issue1/garton.html>
- Gazan, R. (2008). Social annotations in digital library collections. *D-Lib Magazine*, 14(11/12). doi:10.1045/november2008-gazan
- Henderson, K. (1991). Flexible sketches and inflexible data bases: Visual communication, conscription devices, and boundary objects in design engineering. *Science, Technology, and Human Values*, 16, 448-473. doi:10.1177/016224399101600402
- Lee, C. P. (2007). Boundary negotiating artifacts: Unbinding the routine of boundary objects and embracing chaos in collaborative work. *Computer Supported Cooperative Work*, 16, 307-339. doi:10.1007/s10606-007-9044-5
- Lynch, C. (2005). Where do we go from here? The next decade for digital libraries. *D-Lib Magazine*, 11(7/8). doi:10.1045/july2005-lynch
- Marsden, P. V., & Campbell, K. E. (1984). Measuring tie strength. *Social Forces*, 63, 482-501.
- Pawlowski, S. D., Robey, D., & Raven, A. (2000). Supporting shared information systems: boundary objects, communities, and brokering. In W. J. Orlikowski (Ed.), *Proceedings of the 21st International Conference on Information Systems* (pp. 329-338). Atlanta, GA: Association for Information Systems. Retrieved from <http://portal.acm.org/citation.cfm?id=359640.359759>
- Pomerantz, J. (2008). Digital (library services) and (digital library) services. *Journal of Digital Information*, 9(2). Retrieved from <http://journals.tdl.org/jodi/article/viewFile/227/210>
- Pomerantz, J., & Marchionini, G. (2007). The digital library as place. *Journal of Documentation*, 63, 505-533. doi:10.1108/00220410710758995
- Star, S. L. (1990). The structure of ill-structured solutions: Boundary objects and heterogeneous distributed problem solving. In L. Gasser & M. N. Huhns (Eds.), *Distributed artificial*

- intelligence* (Vol. 2, pp. 37-54). San Mateo, CA: Morgan Kaufmann.
- Star, S. L., Bowker, G. C., & Neumann, L. J. (2003). Transparency beyond the individual level of scale: Convergence between information artifacts and communities of practice. In A. P. Bishop, N. A. Van House, & B. P. Battenfield (Eds.), *Digital library use: Social practice in design and evaluation* (pp. 241-269). Cambridge, MA: MIT Press.
- Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, 'translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39. *Social Studies of Science*, 19, 387-420. doi:10.1177/030631289019003001
- Strauss, A. (1978). A social world perspective. In N. K. Denzin (Ed.), *Studies in symbolic interaction: An annual compilation of research* (Vol. 1, pp. 119-128). Greenwich, CT: JAI Press.
- Van House, N. A. (2003). Digital libraries and collaborative knowledge construction. In A. P. Bishop, N. A. Van House, & B. P. Battenfield (Eds.), *Digital library use: Social practice in design and evaluation* (pp. 271-295). Cambridge, MA: MIT Press.