"Connections Above and Beyond": Information, Translation, and Community Boundaries in LibraryThing and Goodreads

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Abstract

The connections and contexts surrounding information shared in social settings must be accounted for, and this is particularly true for online communities that are information-centric. This paper presents a mixed-methods study of LibraryThing and Goodreads, which have characteristics of information-centric online communities and social digital libraries, with attention to their roles as boundary objects, users' information values and information behaviour, and other boundaries and boundary objects at play. Content analysis of messages, a survey of users, and qualitative interviews show LibraryThing and Goodreads help establish community and organizational structure; support sharing of information values; and facilitate the building and maintenance of social ties. Translation of meanings and understandings within and between communities is a key activity in these roles. Online communities and social digital libraries should highlight translation processes and resources; provide user profiles and off-topic spaces and encourage their use; take a sociotechnical approach to tailor technology and community features to the right audiences; and facilitate the establishment of shared structure, values, and ties and the work of boundary spanners. Further implications exist for research on and theorizing of information-centric online communities, boundaries, and boundary objects as part of the sociotechnical infrastructure surrounding online information sharing.

JASIST keywords: *virtual communities* < communities < (persons and informal groups)
social aspects < (sociocultural aspects)
information use < information operations < (activities and operations)

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Introduction

When information is shared in social settings, such as online communities, the surrounding connections and context must be accounted for. Social norms, information values, information behaviours, activities, organizations, and most notably community boundaries all have important sociotechnical impacts (Jaeger & Burnett, 2010; Meyer, 2014; Sawyer & Jarrahi, 2014; Star & Griesemer, 1989), especially when an online community is centred on information. When digital libraries take on social aspects, akin to other information-centric online communities, how they are used and the roles they play for users within and across the boundaries of social spaces require exploration and understanding (Lynch, 2005; Marshall & Bly, 2004; Star, Bowker, & Neumann, 2003; Van House, 2003). They may act as boundary objects (Star & Griesemer, 1989), facilitating the establishment of norms, values, and behaviours between communities, or the emergence of new communities around their use (Star et al., 2003). However, our understanding is limited of how a social digital library and information-centric online community may act as a boundary object and whether it supports this establishment and emergence. A significant research gap exists in our understanding of the systems, environments, and contexts at play around a social digital library as a boundary object.

This paper presents a mixed-methods study of LibraryThing (librarything.com) and Goodreads (goodreads.com), which share characteristics of both information-centric communities and social digital libraries. The study's objective was to examine the information values and information behaviour of users; the boundaries and boundary objects at play; and the roles these sites play for users, as boundary objects themselves. Research questions asked about these roles and how they may or may not facilitate the processes of translation, coherence, and convergence—taken from boundary object theory (Star & Griesemer, 1989; Star et al., 2003)—between existing and of emergent communities around LibraryThing and Goodreads. Findings from qualitative and quantitative methods—including content analysis, a survey, and semi-structured interviews—show these two sites play three key roles for users, with translation an important activity. Clear implications exist for design and practice in digital libraries and online communities, and for research on and theorizing of boundaries and boundary objects in such contexts. This paper begins by reviewing relevant literature on online communities, social digital libraries, and boundaries and boundary objects, with an eye to the unexplored overlaps between them.

Background

Online Communities

An online community is a social aggregation of people online who interact and communicate with each other, often forming social ties, through the mediation of information and communication technologies (Ellis, Oldridge, & Vasconcelos, 2004; Preece & Maloney-Krichmar, 2003; Resnick & Kraut, 2012; Rheingold, 2000; Rosenbaum & Shachaf, 2010). Much akin to offline communities, they incorporate human emotion, personal relationship formation over time, important social ties, and emergent social constructions as people seek, share, and create information and knowledge (Chayko, 2014; Haythornthwaite, 2007; Tufekci, 2013; Wellman & Gulia, 1999).

Reviewing conceptions of online communities, digital libraries, and virtual book clubs (Elsayed, 2010; Fister, 2005; Foasberg, 2012; Rehberg Sedo, 2003, 2011) led to selecting Strauss's (1978) social worlds perspective and Jaeger and Burnett's (2010) theory of information worlds as lenses through which to view online communities. Each of Strauss's (1978) social worlds includes (a) "at least one primary activity … strikingly evident"; (b) "sites where activities occur"; (c) "technology … [for] carrying out the social world's activities"; and (d) in established social worlds, "organizations" furthering those activities (p. 122). Jaeger and Burnett's (2010) theory of information worlds moves beyond Chatman's focus on small worlds to explicitly multi-levelled communities, as advocated by Strauss (1978) and Rheingold (2000). It considers five phenomena: (a) social norms, or the agreed-on "sense of the appropriateness … of social appearances" in a world (Jaeger & Burnett, 2010, p. 22); (b) social types, how people are "socially defined" and the roles they fulfil in a world (p. 22); (c) the information value judgments and hierarchy within and across worlds; (d) "the full range of possible normative [information] behaviors" world members engage in (p. 23); and (e) the boundaries where "information worlds come into contact" and where "information exchange can—but may or may not—take place" (p. 8). Both theories consider communities of multiple sizes, shapes, and settings, which may or may not nest or overlap. As separate but compatible theoretical lenses, they capture the complex, sociotechnical contexts and boundaries surrounding LibraryThing and Goodreads users and these two online communities, which also share many characteristics of digital libraries.

Social Digital Libraries

Early digital library conceptions had little in common with online communities, many focusing on technological components (Borgman, 1999). While not considering digital libraries to be exact equivalents to online communities, many have since considered digital libraries as sociotechnical systems and infrastructure (Bishop et al., 2000; Gazan, 2008; Levy & Marshall, 1995; Lynch, 2005; Marshall & Bly, 2004; Van House, 2003) with a clear connection to the user communities they serve, a view paralleling libraries as physical and conceptual spaces (Lankes, 2011; Pomerantz & Marchionini, 2007). A *social* digital library (drawing from Borgman, 1999, and Lankes, 2011, 2012) (a) features one or more collections of digital content collected on behalf of user communities; (b) offers services, relating to the content, by or through the digital library to user communities; (c) is part of one or more formal or informal organizations managing these content and services; and (d) focuses on facilitating information and knowledge creation and sharing, excluding other primary motivations (e.g. selling products).

Many experimental approaches showed great promise in studying and facilitating communities in and around digital libraries, but were relatively less successful over time at addressing social aspects (e.g. Bieber et al., 2002; Gonçalves, Fox, Watson, & Kipp, 2004; Kolbitsch, Safran, & Maurer, 2007; Marchionini, Plaisant, & Komlodi, 2003; Renda & Straccia, 2005). Social annotations are promising (Arko, Ginger, Kastens, & Weatherley, 2006; Neuhold, Neiderée, & Stewart, 2003) and used in some online communities (Gazan, 2008; Zarro & Hall, 2012). Social constructionism was applied in the ScholOnto prototype (Tuominen, Talja, & Savolainen, 2003) and sociotechnical research studies (Bishop et al., 2000; Star et al., 2003; Van House, 2003).

Information-Centric Communities

Many social digital libraries, including LibraryThing and Goodreads, now take on characteristics of online communities. These remain digital libraries, with content, services, and organizations, but online community features such as social and emotional ties and connections; emergent informational and organizational constructions; and sharing of users' information, knowledge, and everyday lives are equally important. This suggests the concept of *information-centric* online communities. These remain clusters of people around a common factor, using the Internet to communicate and interact, but they increasingly and particularly emphasize information and knowledge creation, sharing, and use as a primary activity, instead of a by-

product of social interaction (cf. Faraj, Jarvenpaa, & Majchrzak, 2011). Other online environments, such as question-and-answer sites (Gazan, 2011; Worrall & Oh, 2013), are similarly centred on information, whereas other online communities may emphasize other facets such as social ties, gameplay, or roleplay. Information-centric online communities remain distinct from social digital libraries—with not all of the former being necessarily the latter and vice versa—but there is significant overlap; see Figure 1 for a visual overview. Lessons from one system, environment, or set of literature may impact another; taking into account a range of views enhances reasoning about sociotechnical infrastructure and the transferability of findings.

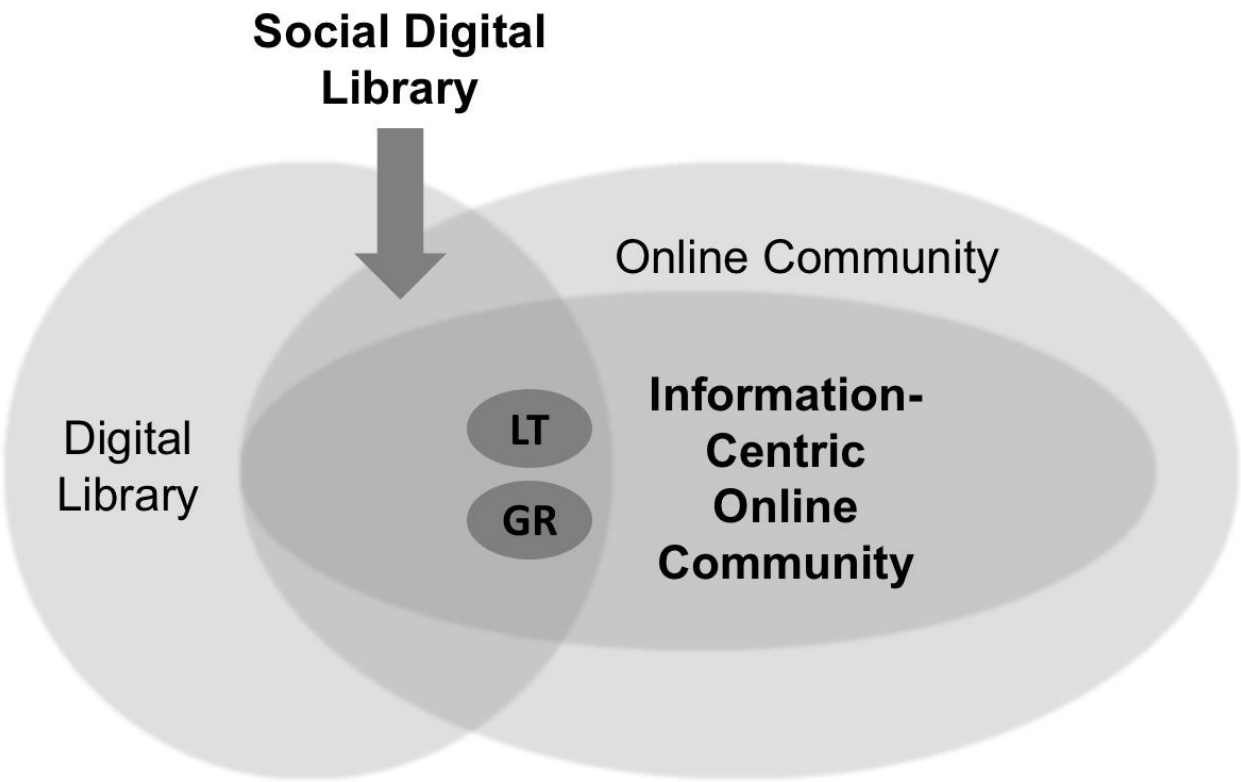

Figure 1. An illustration of overlaps between digital libraries, social digital libraries, online communities, and information-centric online communities. LibraryThing (LT) and Goodreads (GR) are examples of all of these.

Boundaries and Boundary Objects

One such view is that provided by research on boundaries, which are a significant factor in online communities and information behaviour (Hara & Fichman, 2014). Boundary spanners

(Davenport & Prusak, 2000; Leonard-Barton, 1995) are individuals who cross the boundaries between multiple communities, helping share, transfer, and translate information and knowledge between them. Translation is an important information mediation role where the meanings and understandings of one community's information and knowledge are communicated to and negotiated with another, including associated social processes, transformations, and actor networks, with both positive and negative impacts (Bechky, 2003; Butler & Wang, 2012; Kazmer et al., 2014; Star & Griesemer, 1989). Not all such boundary spanners are people; abstract or concrete boundary objects (Star, 1989; Star & Griesemer, 1989) interface between multiple communities, used within and adapted to many communities "simultaneously" (p. 408). A critical role of boundary objects is in maintaining "coherence" between communities (p. 393); "mismatches" due to differing or overlapping meanings require negotiation and translation, alongside careful management of boundary objects and their interfaces (p. 412). These interfaces impact on and are impacted by communities and their characteristics, including those in Strauss's (1978) social worlds perspective and Jaeger and Burnett's (2010) theory of information worlds. (See also Huvila, Anderson, Jansen, McKenzie, & Worrall, 2017.)

A significant research gap exists in our understanding of the systems, environments, and contexts at play around a social digital library as a boundary object, and of the types and nature of boundary objects within the contexts of social digital libraries and information-centric online communities. Conceiving of these as boundary objects means (a) they are socially constructed (Van House, 2003); (b) they should adapt to communities' "local needs" (Star, 1989, p. 46); (c) they should facilitate negotiation, translation, and coherence of social norms, social types, information values, and information behaviours (Jaeger & Burnett, 2010); (d) they should serve as common sites and technologies for shared information-based activities (Strauss, 1978); and (e) they may facilitate potential convergence of one or more emergent communities over time, as users share and translate information and knowledge and establish social ties (Star et al., 2003).

LibraryThing and Goodreads

LibraryThing and Goodreads are large-scale, public, and multi-faceted web sites, intended for lovers of books and related media, that feature characteristics of both social digital libraries and information-centric online communities (as seen in Figure 1). They were chosen for this study because they (a) collect and make available digital content for user communities; (b) offer services relating to this content to these communities; (c) are managed by formal

organizations and draw on the resources of others; (d) intend to facilitate users' information and knowledge sharing, social ties, and formal and informal organization of information and community structure; and (e) are open to the public. Both sites feature groups that users can create and join, which feature shared discussion spaces, book lists, ratings, and reviews.

There is little existing research explicitly casting LibraryThing or Goodreads as online communities or boundary objects. A notable and recent exception is Albretchslund's (2017) study of community reactions when Amazon acquired Goodreads, which overlaps the present study in considering boundary and norm negotiation but emphasizes contested ownership and agency. This study's research questions take a different view of this space while remaining focused on boundaries, asking about the roles LibraryThing and Goodreads play, as boundary objects, in (a) translation and coherence between the existing social and information worlds they are used within; and (b) coherence and convergence of new social and information worlds around their use.

Methods

Following social perspectives to information science, incorporating social informatics (Kling, 1999; Meyer, 2014), sociotechnical systems (Sawyer & Jarrahi, 2014), and social constructionism (Tuominen & Savolainen, 1997), this study examined LibraryThing and Goodreads as two case studies and as boundary objects, under the objectives and research questions detailed earlier. Data collection used three sequential methods, allowing clear focus during each phase and instrument design, data collection, and data analysis to build on earlier findings. First, qualitative content analysis was used to examine 519 messages scraped with permission from the discussion forums of five LibraryThing and four Goodreads groups—featuring shared discussions, book lists, ratings, and reviews—sampled at random from recent activity lists showing the 100 most recently active groups on each site. Second, users from these nine groups were invited to complete a structured survey featuring five-point Likert scaled questions on concepts from the social worlds perspective, theory of information worlds, and boundary object theory; 142 users completed the survey. Third, 11 LibraryThing and Goodreads users who completed the survey took part in semi-structured qualitative interviews, focusing on critical incidents (Fisher & Oulton, 1999) of interactions with others while using the two sites. Official membership of the five LibraryThing groups, labeled as Groups A-E in this paper,

ranged between 307 and 5,187 members, although all allowed non-members to view and post messages as well, Membership of the four Goodreads groups, labeled as Groups F-I in this paper, ranged between 148 and 4,438 members, with all allowing non-members to view but not post. Survey data were analysed using nonparametric statistics in SPSS; qualitative data was coded and analyzed using NVivo qualitative analysis software, with closed codes from the theoretical framework and open codes emerging from the data.

Potential differences in other groups beyond these nine were not uncovered, and the non-random nature of the survey sample further limits generalizability. However, transferability of these findings to other LibraryThing and Goodreads groups, to other information-centric online communities, and to other social digital libraries should still be high, given the random selection of groups, continuation of interviews until saturation, and research framework used. Validity, reliability, and trustworthiness of data were further ensured through reliability analysis of survey Likert scales and intracoder reliability testing[1] of a 20% subsample of the qualitative data (Cohen's $\kappa = 0.7011$ for content analysis, $\kappa = 0.7374$ for interviews, representing substantial agreement; Landis & Koch, 1977), alongside other means of increasing credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Further details of these methods are available (Worrall, 2014). All names used herein are pseudonyms; the nine groups are assigned letters as detailed above.

Findings

This section reports findings from across all three methods covering the normative information behaviours and activities, information values, translation activities, and boundary objects and boundary spanning of LibraryThing and Goodreads users. These phenomena come from social worlds, information worlds, and boundary object theories, as part of the theoretical framework for this study. Under this framework, these specific phenomena have the strongest connections to and impact on the roles played by LibraryThing and Goodreads, as boundary objects interfacing with social and information worlds; power in describing and explaining the

[1] Intercoder reliability testing was piloted, but found inappropriate given the novel combination of theories in use and the resulting complexity of the emergent, interpretive coding scheme and procedures.

facilitation of negotiation, translation, coherence, and convergence by LibraryThing and Goodreads; and implications for digital library and online community research, theory, and practice.

Normative Information Behaviours and Activities

Spanning the "full range" of potential information interactions (Jaeger & Burnett, 2010, p. 23), information behaviours and activities—drawn from social and information worlds theories—played a highly significant role (survey median = 3.75; $p < 0.001$) in potential community coherence and convergence, driven by social norms. Group moderators set and enforced these when starting threads as sites for particular activities. For example:

> "ONE nomination per member. There is no need to second or third a nomination. Do not nominate books the group already has read. LINK the title and book you are nominating. If you cannot link please include the title and author in your nomination. If there is no author included in your nomination I will not accept it."

Moderators and frequent posters often invoked explicit group norms—e.g. "please take time to read the group rules on posting"—and made reference to the norms and normative behaviours of intersecting communities (e.g. LibraryThing and Goodreads themselves). Moderators further encouraged and engaged to help build community, including relevant discussions and information sharing; displaying interest when others share; and managing the group in a welcoming style:

> "… this seems to be one of those books that you either love or hate …. I'll be keen to see which camp you fall into, Susan! I would really love to have a group discussion on this at some point. There's SO much to talk about."

This Goodreads moderator displayed clear enthusiasm for encouraging members' normative behaviours and activities here and elsewhere. Other moderators and active users had similar tendencies, as shown by interviewee Melissa's comment that

> "[Group C] was, just, such a great group of people … every once in a while, I say, 'Hey, still thinking of you!' *chuckle* 'Come on [and post] if you get a moment.'"

Users' behaviours were coherent and normative as individuals and collectives, including

- introducing themselves and welcoming others;
- discussion of what they were reading;
- using common and understood abbreviations and language;

- following common online community conventions (e.g. quoting previous posts, editing to correct typos);
- engaging in group reads;
- sharing or requesting relevant information via existing or new threads;
- linking within the digital libraries to pages for relevant books, authors, or series;
- exchanging books of interest with other members;
- thanking others who shared useful information or otherwise helped out; and
- general geniality and friendliness.

Nuances further established normative behaviours, and many groups stuck to these, but not all. For example, Groups C and E did not link to the book series and author they discussed since these were core to the groups' topics and familiar to most.

Digressions and conversation away from a given thread or group's topic were often accepted by users. New topics sometimes emerged within threads and became normative within the thread or through a new thread starting. An example from Group F shows off-topic digression into everyday-life discussion:

Angela:	"I will not be done [reading] by [then]. One of my senior cats required emergency surgery …. He seems to be doing well but he has a 14-day recuperation ahead."
Marie:	"I will keep my paws crossed for your cat's recovery, Angela!"
Angela:	"Thanks Marie. So far, he is better every day… :-)"
Vanessa:	"I hope your little guy is still doing well."
Amelia:	"Angela - I do hope your cat's doing better now. Sending purry thoughts his way :)"
Angela:	"Thanks, he is doing better every day."

This everyday life information sharing, while off-topic, was seen to encourage the building, coherence, and convergence of community and social ties. Across multiple examples it would often become a normative activity and behaviour in itself as communities cohered and converged, emphasizing most participants' human and social nature in accepting the furthering of cultural, social, and emotional connections that fostered community coherence and convergence. User Marie noted in Group F "the derailing is [often] the best part of these threads." In some cases these interactions led to clear social tie formation between users, as seen in interviewee Sam's comment that "by now, [another user is] someone I'd welcome to my home" (although this had taken three years of interaction). From his interview Sam clearly had

become part of a tight-knit, convergent community. Other interviewees echoed community ties and connections would drive acceptance and desire for off-topic information sharing:

> "…somebody a couple [of] weeks ago was like, 'oh, I'm going out and the husband and I are building a chicken coop today.' … So it's like, that [Goodreads] thread lets you get to know the people …. So you know their book taste as well as some personal stuff that people talk about." (Rachelle)

> "You see people on a regular basis and talk about things that … interest you, and the rest of your life does creep in; … people know when you're having health issues, and financial issues, or whatever. … But, there's an awful lot of emotional support when you allow that to be there [on LibraryThing]." (Miriam)

Information Values

Information values—per the theory of information worlds, "a shared sense of a relative scale of the importance of information, of whether particular kinds of information are worth one's attention or not" (Jaeger & Burnett, 2010, p. 35)—often cohered and converged group interests and understanding, but this was not always explicit and acknowledged, as seen in the survey (median = 3.00; $p = 0.709$). However, findings from qualitative analysis stressed values, their negotiation, and their translation were often implicit in users' interactions. For example, Rachelle had suddenly realized what she had discovered:

> "…I went in, you know, because of recommendations, and then we started talking about books and I'm like, oh! Here are people who read the same books that I read, and I can talk to them about it. Because I know *no*body in real life who reads the same books that I do."

Rachelle had found others whose information value judgments about discussions of historical genres and books aligned with hers. Values did not instantly cohere and converge for everyone; despite the group not reading historical romances, per Rachelle many visitors would ask "'oh, can we read the romance?'" Users who valued discussions of historical romances were pointed to another group which did read this genre.

Smaller sets of convergent values also emerged. Interviewee Ann found "about four or five readers [in one group] who are quite curious about fantasy, which I do read a lot of, and how women turn up in it." This resulted in a small emergent community where these users shared and compared interpretations and values, although Ann noted not all interests aligned. Interviewee Miriam created a thread for discussions of illustrations from editions of an early 20th century children's novel, inviting other existing connections from outside the group who would be interested to help create and strengthen convergence around common information values.

Users' existing values from existing communities shaped coherence between individuals and groups. When values conflicted, users who learned understanding—as author Will did after promoting his book, which violated LibraryThing policy, deleting his post when user Brian noted his violation—were often forgiven. Coherence had impact on existing communities, too: One LibraryThing user stated they shared with their daughter, "a *Dune* fan and a knitter," a link another user posted to a knitted *Dune* character. In contrast, interviewee Tanya implied authors outside the community may not share coherent information values of "accurate" subject description with herself and other Goodreads users.

Occasional conflicts and disagreements led to a lack of coherence or convergence of information values, sometimes accepted. For example, per interviewee Ann members of one group "would not slag you off at all; not even if you went on there and said"—contrary to shared information values—"that you loved *Twilight* and said it was the best thing ever written." Interviewee Melissa said any value differences in Group C would be "deal[t] with like a real friendship." Other disagreements were more problematic. Conflicts in values within one group interviewee Jennifer visited led her to value the community less, stating "you know you do have that one thing"—a love of reading—"in common … [but] a lot of times that's the *only* thing you have in common." Interviewee Taneesha felt few common interests besides genre with members of a Goodreads group, although she valued Goodreads itself and was not in actual conflict with group members. When there was actual conflict, a clear contrast existed with groups sharing information values. Interviewee Betty related a disagreement over the value of a famous science fiction author's writing, and how some "exited [a group] en masse" because of this; it led Betty to participate less often, although she still followed and checked in occasionally.

As Rachelle did, many interviewees noted shared information values contributed to a sense of community:

> "When I was reading books when I was a child, little did I know that there … would be such a thing as the Internet, and you could talk to people you do not know in real life. And it's—I mean, it's a happy surprise." (Lindsey)
>
> "[I know] very few people in my real life community [with] a passion for the things that I have a passion for …. And it's affirming, to know so many other people who like the same things. And, we know that since we like the same things, we like each other too." (Miriam)

Although he struggled to explain his strong sense of community, after further interviewer prompting interviewee Sam agreed there was a certain something similar to the "tavern" (as he

called it) where "everybody knows your name" from the American sitcom *Cheers*, helped along by shared values and interests among the group, that helped him feel part of a convergent, tight-knit community. Ann stressed this same sense:

> "… people are making connections above and beyond, you know, 'oh it's nice that I have something in common with him, we've read the same book.' You know, this is, it's obviously meaning quite a lot to people."

Translation

In making these "connections above and beyond" the process of translation, taken from boundary object theory (Star & Griesemer, 1989), is important to communicate the meanings and understandings of information and knowledge in one community to another. Back-and-forth negotiation of meaning and understanding plays a significant role (for questions on LibraryThing and Goodreads's role in translation, survey median = 3.83, $p < 0.001$) in potential community coherence. Consider interviewee Tanya's conversation with an author:

> "His book had been characterized as modern history and he did not understand why. And I looked at the description on Goodreads and I *also* did not understand why. I told him that I thought it was urban fantasy. … He says that he thinks he has a 'Dan Brown' sort of book … [which] makes it a *thriller* of some kind. But, it has a historical *element* in it, apparently. But it also looked like it had a fantasy element from the description. … It looks like it may be hard to categorize."

This was an ongoing translation process, "not developed enough yet … for [a] common understanding to have been built," as Tanya related. Ann experienced similar translation and negotiation around gender identities and roles in fantasy literature. Through the interactions of "five or six people, all who've read different kinds of books, and some overlapping," she felt there was "really quite good coverage …. When you're actually to-ing and fro-ing about examples … it can go quite detailed."

Users' posts often requested information from others they needed or desired. In response, translation would occur as others shared their understandings and the developing collective sense of a group (or parts of one) around such a request. In elaborated examples, such as Ann's, meaning and understanding became socially constructed as multiple users engaged in discussion and translation processes. The discussion of the welfare of Angela's cat (above) included further extended negotiation around the group read, with multiple users expressing they would not be done by the original deadline for varied reasons; this led moderator Amelia to suggest a two-week extension. The meaning and understanding of the deadline and the purpose for the group read were socially constructed and translated through back-and-forth conversation.

Translation helped users "get to know the people" better (as Rachelle put it), including in introduction threads that allowed for "learning what interests" new members (in Kevin's words). Betty believed interaction would not lead to her knowing people personally, but she "*did* get a sense of who they were, and sort of felt that [she] knew them … at an acquaintance level." Over time, such translation could lead to close social ties, as with Sam. However, translation would not always be successful; meanings and understandings could still differ *despite* users trying to reconcile. For example, one Group A member offered reading suggestions but then concluded it "rather depends on your tastes in humour of course." This was not always a problem; interviewee Miriam, in relation to a discussion of children's novel illustrations, stated "we did have a difference of opinion there" but this did not seem problematic to her. A contrary perspective, in discussion of reviews of novels, comes from Jennifer:

> "Whatever my opinion is, it is, and you can either agree with it or not agree with it. But, you know, most likely I'm not going to change it …. Like, I cannot stand romances; I could not read one to save my soul, like I cannot, I just could not do it. And yet, some other people absolutely love them."

Other comments from Jennifer make it clear she would read and discuss other people's opinions on novels, but any translation of those opinions would be partial, with full coherence unlikely.

Boundaries

As translation took place, other objects besides LibraryThing and Goodreads played roles and were invoked by posters and interviewees as boundary objects as part of discussions and activities on the two sites. Findings on boundary spanners and boundary objects uncovered books as popular other boundary objects mentioned, including their classification; as objects of common interest and discussion, particularly when suggested to others; or collectively as genres and series. Users often discussed and translated their understanding of and value placed on the plot and characters of books. Other boundary objects mentioned included other web sites, publishers, TV networks, webcomics, newsletters, quizzes, ebook readers, MP3 players, illustrations, book reviews, web search results, libraries, and the activity of writing.

Boundary spanners were often users who frequented two groups and commented on one's activities and behaviours in the other; for example, one user posted a book suggestion "which I'm reading for the International Readers theme read." Boundary spanning also occurred when inviting or welcoming new members, who then thanked those who led them to join. This Group G exchange illustrates these facets:

Jared: "Have you found the … German Literature group ([link]), yet?"
Mia: "Oh wow thanks! :) I'm sure to find more authors there."
Jared: "My pleasure. I also sent you a friend request …. Also there is a 'Books set in Germany' thread in this group, under [folder name] …"
Mia: "Thank you for the tips and for the friend request. I accepted it. I'll look into that as well. Cheers."

For Rachelle, boundary spanning could be difficult given "overlaps" between groups were often small in membership and characteristics; she saw Goodreads as many smaller communities, not an overarching one. Betty expressed similar differences in her experiences with LibraryThing, stating "it's a totally different group of people that I run into" in each group.

Despite this, interviewee Lindsey said she would sometimes

> "…invite somebody I've come to know in another group because I think they'd be good for this group … and, I'd suggest they read a couple of the threads and get an idea of what it's like, and see if it's something for them."

By serving as a bridge between the group and another user, Lindsey furthered and facilitated translation, coherence, and convergence in her boundary spanning. Miriam also did so, in starting a thread on illustrations from an early 20th-century children's novel; she went beyond one group's membership to consider others who she knew valued illustrations or this novel, and invited them to join her thread. Other users then passed the link around and spanned further boundaries. Some who joined the thread ended up joining the group, a greater level of coherence and convergence than Miriam had perhaps expected. She helped facilitate the convergence of a new community around her thread and, to an extent, strengthened the group the thread was within as a community.

Discussion and Conclusions

Roles of LibraryThing and Goodreads

As seen in the previous findings, summarized in Table 1, LibraryThing and Goodreads served three major roles as boundary objects.

Structure-based. Many participants stressed how the sites fit their chosen and valued behaviours and activities, as digital libraries should "fit with … [existing] practices" (Van House, 2003, p. 290). Moderators and other key members further established explicit rules as normative behavioural guides for the community, leadership encouraging the sharing and creation of information and knowledge (Ardichvili, 2008; Butler & Wang, 2012). Translation entered a structural role, allowing existing coherence and emerging convergence to be maintained through negotiating meanings and understandings behind a community's

Phenomenon	**Key Findings**
Normative Information Behaviours and Activities	• Highly significant role (survey median = 3.75; $p < 0.001$) • Driven by setting, enforcement, encouragement of social norms by moderators, frequent posters • Coherent, normative as individuals, collectives • "Off-topic" digressions into everyday life information sharing accepted, became normative in encouraging community and social tie building, coherence, and convergence
Information Values	• Not always acknowledged (survey median = 3.00; $p < 0.709$), but values and their negotiation and translation often implicit in users' interactions • Both planned and unplanned convergence • Users' existing information values shaped coherence • Lack of coherence and convergence sometimes accepted, but other disagreements problematic • Interviewees noted shared information values contributed to sense of community, connections "above and beyond" simple interaction
Translation	• Important and significant (survey median = 3.83; $p < 0.001$) in communicating, negotiating understandings • Meaning and understanding became socially constructed, translated through elaborated back-and-forth conversation • Translation helped users get to know each other and could tighten social ties over time, but did not always lead to perfect coherence
Boundaries	• Books, other media, media intermediaries (e.g. publishers, TV networks) invoked as other boundary objects • Boundary spanning, although sometimes difficult, occurred when inviting or welcoming new members, suggesting books other groups were reading, and connecting different groups' members with common interests • Boundary spanning occasionally led to highly successful coherence and convergence, creating and strengthening communities

Table 1. Summary of study findings.

organizational and social structure. Too much structure could lead to conflicts and potential groupthink, avoidable through greater consideration of broader socio-cultural and organizational contexts and boundaries (Star et al., 2003; also cf. Albretchtslund, 2017). Technology use strengthened the fit and emphasized LibraryThing and Goodreads having characteristics of both digital libraries and online communities.

Values-based. Here the role of LibraryThing and Goodreads was in facilitating the often-invisible work (Star & Strauss, 1999) of value translation, negotiation, coherence, and convergence in cases where users, perhaps without realizing it, had interests and opinions to share. This could lead to implicit or explicit coherence, implicit convergence, and better understanding of divergences and contexts where coherence lacked, which were themselves often valued. This parallels the concept of "common ground" (Ardichvili, 2008; Bechky, 2003; Davenport & Prusak, 2000) and views of distributed knowledge in online communities (Haythornthwaite, 2006; Kazmer et al., 2014), which do not require perfect agreement or groupthink for successful sharing and community. (See Worrall, 2015a, for extended discussion of values-based roles.)

Social network-based. Many users felt they had established social ties and a sense of community through convergence of continued activities, behaviours, values, and sites. Off-topic and everyday life information behaviour (Savolainen, 1995) became accepted because it furthered users' cultural, social, and emotional connections to each other. Boundary spanners further strengthened convergence in connecting networks together. Such a tie-based community was not as reliant on LibraryThing and Goodreads as sites and boundary objects, but they still played roles in allowing connections and interactions around normative activities and information behaviours. This perspective echoes Fister's (2005) tight-knit virtual book club, Wellman's (1999) network-centric view of community, and the significance of social and emotional connections in other online communities (Chayko, 2014; Haythornthwaite, 2007; Kazmer et al., 2014; Tufekci, 2013; Wellman & Gulia, 1999; Worrall & Oh, 2013). Contextual complexities exist and are hard to explain for some (Sam), but for others boil down to "family" (Rachelle), "real friendship" (Melissa), and "real community" (Ann).

Design and Practice Implications

The roles and findings above, and their connections with the research literature, have many implications for the design of and practice in systems and environments with characteristics of social digital libraries or information-centric online communities, including LibraryThing and Goodreads. Changes may well enhance their roles and success as boundary objects facilitating translation, coherence, and convergence.

Provide and highlight translation resources. Preece stated nine questions users beginning and continuing engagement in online communities may ask (Preece & Maloney-

Krichmar, 2003, p. 609).[2] From Preece and findings herein, community structure should state a clear purpose, clearly explain membership and rules, provide for help and lists of frequently asked questions, facilitate users' information seeking, and stimulate continued interaction. Groups in this study created resources covering these needs, which helped facilitate engagement in establishing and maintaining coherence around community and organizational structure and shared values, and in turn helped the community and users recover in case of conflict. Perfect coherence is not the goal; partial negotiation and translation of understanding is often enough (cf. Rehberg Sedo, 2003), but such translation is key to any successful coherence. Since this often lacks explicit visibility (Star & Strauss, 1999), highlighting translation processes and provided resources will make them visible to users and help them negotiate and reconcile understandings. Community leaders can engage in ongoing resource construction and maintenance that builds sociotechnical infrastructure (Edwards et al., 2009; Sawyer & Jarrahi, 2014); increases distributed information and knowledge creation and sharing (Ardichvili, 2008; Faraj et al., 2011; Haythornthwaite, 2006; Kazmer et al., 2014); and enhances the role of the digital library or online community as a boundary object.

Support social ties without collapsing contexts. When translation leads to coherence and perhaps convergence, social ties often begin to be established. The forming and maintenance of such ties, in a social network-based role, should be supported and will facilitate deliberate and serendipitous information sharing and collaboration (Marshall & Bly, 2004). Features such as user profiles, "get to know" threads, and off-topic discussion spaces allow users to learn about each other from the information and identities they choose to present. These features can remain optional, since the specific context of behaviours, activities, norms, and values is important as identities are constructed (boyd, 2014). Technological features taking context collapse into account, where users can choose whether and how to socially identify themselves and others, can help facilitate social ties, strengthen the role played as a boundary object, and reduce major conflicts.

Express site-wide expectations. The norms, values, and normative behaviours applying across a broader community should be stated with clarity and negotiated over time. A community can sometimes close off ways of working outside its existing boundaries (Star et al.,

[2] Initial thoughts around this were presented in Worrall (2016).

2003); such groupthink may weaken a boundary object's role and lead to conflicts, as seen herein and by Albretchtslund (2017). Facilitating coherence and reconciliation of meanings and understandings requires expressions of site-wide norms and rules, what types of information are valued, and expectations for normative behaviours be made (cf. Butler & Wang, 2012). An ongoing, interactive discussion of the meanings and understandings behind these expressions should also take place, to help maintain coherence with the norms, values, and behaviours users expect based on their pre-existing communities and experiences. Boundary spanners can further facilitate and encourage links between parts of communities and different pieces of information, allowing boundaries to become permeable to relevant information and those wishing to cross (see boyd, 2014). Juggling of, bridging between, and adapting to multiple communities encourages formation of common ground and the likelihood of successful, high-quality collaboration and information sharing (Burnett et al., 2014); encouraging boundary spanning can further this and strengthen roles as boundary objects and sociotechnical infrastructure.

Sociotechnical and infrastructural balance. Since different users favour different roles, the right features should be promoted to the right audience. A socio-technical balance is necessary by designers and practitioners between technological features and social context, rather than forcing technology or community adoption (Edwards et al., 2009; Kling, 1999; Lynch, 2005; Sawyer & Jarrahi, 2014; Van House, 2003), or problems may occur (cf. Marchionini, Plaisant, & Komlodi, 2003). Users who value particular features benefit without others with different values having to know they exist. Balance between social and technical, sociability and usability (Preece & Maloney-Krichmar, 2003), will lead to a more successful digital library or online community.

Research and Theory Implications

Further implications exist for research on and theorizing of boundary spanning and boundary objects as part of the sociotechnical infrastructure surrounding information-centric communities. Other boundary spanning individuals and activities were identified besides LibraryThing and Goodreads, as perhaps expected given the deep literature on boundaries (Hara & Fichman, 2014; Huvila et al., 2017). Hara and Fichman's (2014) review classifies boundary types from an organizational perspective. Their synthesized framework (pp. 96, 99) includes the structural boundaries seen around LibraryThing and Goodreads and groups within the sites as organizations; the cognitive boundaries crossed by boundary spanners and others engaged in

translation; the social boundaries around norms, behaviours, and activities as potential coherence and convergence took place; and the political boundaries that may emerge around extended conflicts. Other roles seen here fall outside their framework, but this is not unexpected given its different focus. This study alone cannot fully extend or clarify the potential types of boundaries and boundary objects. "Further development of boundary types in online communities" (p. 100) will strengthen our theoretical understanding and help expand on Star's (2010) call to catalogue boundary objects' types and interfacing roles, as part of a broader, boundary-aware and boundary-sensitive research agenda. In doing so, I believe working across the streams (Worrall, 2015b) and being familiar with the research and practice lessons from social informatics and sociotechnical systems, online communities, information behaviour, and digital libraries, combined with bridging and spanning of boundaries, will help connect what are sometimes disparate literatures and studies together. This echoes the synthesis of Star, Jaeger, Burnett, and other theorists of multiple framings and research traditions to address round-peg "real-world research" that may not fit into square-holed "orderly disciplinary categories" (Palmer, 2001, p. vii).

Star (2010) believed the scale and scope of objects conceived of as boundary objects should be *useful*. For example, we would expect little insight from conceiving of a word as a boundary object. Many of the other boundary objects identified herein fit the original theory, but their scale and scope are not near the level of LibraryThing and Goodreads; the latter have greater scale and scope than a webcomic mentioned only in one LibraryThing discussion, for example. They, and boundary spanners, serve as small parts of the multi-scaled sociotechnical infrastructure (Edwards et al., 2009; Sawyer & Jarrahi, 2014), part of the wide range of scales, scopes, contexts, and systems studied in social informatics (Kling, 1999; Meyer, 2014). A useful, main boundary object and technology of interest can remain the focus, as here, but other objects, artifacts, and individuals of potential interest should not be ignored; placing artificial restrictions on the potential objects serving as boundary objects is not particularly helpful towards understanding them, and would have limited the descriptive ability of the current study.[3] Instead, remaining pluralistic and flexible with the scope, scale, and units of analysis is necessary in

[3] Thanks to Lori Kendall (personal communication, Oct. 23, 2013) for stimulating my initial thinking here, and to other collaborators and colleagues for help with further reasoning.

considering boundary objects and boundary spanning, and as we reason about sociotechnical infrastructures and their design, development, use, and study (see also Huvila et al., 2017).

Conclusion

This paper shows social digital libraries and information-centric online communities can support pre-existing and emergent social aggregations within or overlapping their boundaries. They can play at least three important roles in the processes of coherence, convergence, and translation: (a) establishing community and organizational structure; (b) facilitating sharing of information values; and (c) supporting social ties and community culture. Designs and services for both digital libraries and online communities can support these roles and users' social information behaviour across the existing and emergent communities they are part of by including and highlighting translation resources, supporting social ties without collapsing contexts, expressing site-wide expectations, and providing for sociotechnical and infrastructural balance. Further research is underway to address the limits herein, to examine deeper facets of the roles and implications above for a broader range of information-centric online communities, and to further study the processes of coherence, convergence, and translation occurring. Taking a boundary-sensitive view of the above may shed further light on the "connections above and beyond" and the negotiation and reconciliation of norms, values, meanings, and understandings.

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