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A cautious partnership: The growing acceptance of folksonomy as a complement to indexing digital images and catalogs

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As archives and museums place their photographic collections on the Web, the cost and time of indexing and assigning metadata to these images grows. One potential solution is to allow users to assign metadata to images, a practice known as folksonomy. While detractors label folksonomy as imprecise, sloppy, and overly focused on the needs of individual users, proponents applaud it as being directly tied to users' vocabularies, inexpensive, and a means of directly engaging users. Suggestions for improvements to folksonomy include providing more structure to the tags users can supply, allowing feedback on user supplied tags, and even turning the assignment of metadata into a cooperative online game. Despite limited data on its effectiveness in generating terms relevant to user searches, folksonomy was advocated by the Library of Congress in 2008, and is beginning to be implemented by some libraries as a supplement to their OPAC for users accustomed to searching through Web engines. This paper discusses whether folksonomy can be seen as a substitute for traditional indexing and cataloging methods.

Introduction

Folksonomy, the practice of allowing users to assign metadata to objects, is often criticized as being inconsistent, sloppy, and resulting in metadata only useful to the person who assigned it. Proponents claim that it engages users, encourages them to use their own language in describing objects, and may be the only way to index the vast amount of images being placed on the Web. Both groups admit that folksonomies have proliferated on the Web, although methods used to measure their effectiveness differ. Some suggested methods to correct the most egregious problems of folksonomy have begun to emerge, although most involve attempting to steer users towards a form of controlled vocabulary and may be difficult to implement. Despite criticisms of folksonomies, some libraries have also begun to add tagging options to their OPACs (at varying levels of integration) in an attempt to address expectations of users accustomed to Web-based search engines such as Google. The current consensus seems to be that while folksonomy cannot replace traditional indexing and cataloging, it can be used to complement them and especially to engage users. User engagement is facilitated by the low barrier to entry (generally just creating a user account) of most folksonomies. Folksonomies also take advantage of people's desire not just to organize information for their own use, but the practice of sharing information on the Internet. The Internet is used by most as a means of sharing information with others, and sites which allow tagging also introduce a community aspect to the creation of metadata. Individuals might create tags for their own use, but (intentionally or not) they also contribute those tags to an online community. While the most personal tags may not be relevant to any users but their creator, some users are likely to enjoy the community aspects of sharing information and creating tags not just for digital pictures, but in library catalogs. Folksonomy represents a way to engage users, create online communities, and generate metadata at a relatively low cost.

As archives and museums increasingly establish Web presences, the difficult and time-consuming tasks of providing metadata for the wealth of images in collections becomes increasingly urgent. While scanning can be automated, or at least done with increased speed through advances in technology, computers are currently unable to recognize images in a manner which will allow them to assign meaningful metadata. This leads to a situation where images can be placed online faster than they can be indexed. One potential solution to this problem is to allow users to assign metadata to images. Despite limited data on its effectiveness in providing access to digital images based on either their content or user search terms, user-generated metadata is already appearing on the Internet at a staggering rate. Stvilia and Jörgensen (2009) claim that in 2007 there were 250 million photos on flickr.com (a website where users can upload and tag digital pictures, and the site most studies of digital image folksonomies have focused on) alone (p. 54). To have professional indexers apply metadata to all the digital images being placed on the Web is impractical at best. Even if no additional images were placed on flickr.com, it would take 100 indexers over 60 years (assuming three minutes per image and forty hours per week) to catalog the 250 million images on Flickr in 2007. Even this estimate is likely to be extremely optimistic; Arms (1999) writes that the Library of Congress Prints and Photographs Division estimates that it takes an hour to produce a brief record for the average item for their main catalog, and up to three or four hours for a more complete record (p. 2). Computers cannot recognize the content of photographs, and it is often useful to arrange them into groups based on content or more general concepts. Further, unlike printed matter, most pictures (digital or otherwise) do not have a clear title or creator like printed matter that can be used to organize them into categories. While traditional indexing of images may not be feasible, detractors still maintain that folksonomy is not the answer.

Background

The consideration of allowing user-indexed images is partially a cost-saving measure and partially a reaction to changing user expectations. Matusiak (2006) notes that "traditional indexing techniques are costly and labor-intensive and even practitioners are not sure whether they provide the only or best way to meet user needs" (p. 286). Trant (2003) notes the interdisciplinary uses of digital images, and comments that "researchers concur that retrieval of images is going to be increasingly important for a range of commercial, governmental, and academic purposes" (2.1, para. 2). Bearman and Trant (2005) state that traditional indexing methods applied to Web content may be "alienating a user community by not speaking their language" (p. 283). Golder and Huberman (2005) observe that "collaborative tagging is most useful when there is nobody in the role of 'librarian' to classify information or there is simply too much content" (1, para. 2). A rough consensus seems to have developed that for digital images, the traditional method of indexing is too slow, too labor intensive, and may not even meet an individual user's needs. Folksonomy represents an improvement over tagging by both experts and machines in terms of cost, although it may not currently be as effective as possible in terms of generating useful metadata.

In determining the effectiveness of folksonomy in indexing digital images, it is first necessary to define what the indexing of digital images itself is meant to accomplish. Layne (1994) asserts that there are

two goals in indexing images (p. 583). According to Layne (1994), "indexing of images should provide access to images based on the attributes of those images; and second, the indexing of images should provide access to useful groupings of images, not simply access to individual images" (p. 583). In creating the attributes used to index images, Layne (1994) elaborates on the need "to determine which attributes are needed to provide useful groupings of images; which attributes provide information that is useful once the images are found; and which attributes may, or even should, be left to the searcher or researcher to identify" (p. 587). Matusiak (2006) offers a simpler mandate, stating that "the primary purpose of indexing is to identify images and provide access to them" (p. 284). In both cases, the primary goal is to provide access to images for users, and it is reasonable to extrapolate that Matusiak's definition of indexing could include creating groups of images, as a more convenient means of providing access if nothing else. Therefore, the effectiveness of folksonomies in digital image indexing could be measured in terms of how effectively they allow users to access images, either based on the image's individual content or their arrangement into groups. A before and after study of user satisfaction as determined through surveys, or a statistical analysis of browsing habits of a website which has implemented folksonomy, would be useful in this regard. Yet this does not necessarily reflect the value of assigning image tags that a user would be likely to use in a search.

Considering the value of metadata in how well it reflects search terms users are likely to employ creates a more robust definition for measuring the effectiveness of folksonomy in indexing digital images. Fidel (1994) uses this criterion in her discussion of the two approaches catalogers use to index images: "The document-oriented approach claims that indexing summarizes or represents the content of a document. The user-oriented approach requires that indexing reflect the requests for which a document might be relevant" (p. 572). Fidel has identified two different forms of providing access to images, one with the goal of summarizing the content of a document, the other with the goal of providing access based on likely user searches. With this addition, the overall effectiveness of folksonomy as an indexing tool can be measured on several scales. Indexing should provide access to images (Matusiak, 2006, p. 284), provide access based on both individual attributes and useful groupings (Layne, 1994, p. 583), and both describe the content of the images and allow the images to be found via search terms a user is likely to utilize (Fidel, 1994, p. 572). The effectiveness of folksonomy in satisfying these criteria is not addressed directly in the current literature, but criticisms of folksonomy are still easy to find.

Merits and Flaws of Folksonomies

Criticisms of folksonomies are abundant, but research indicates that benefits are outweighed by flaws, and that some perceived flaws may even be virtues under certain circumstances. For example, one of the major criticisms of folksonomy tagging is that the tags generated are not precise, although some also argue that this can be an advantage. Guy and Tonkin (2006) say that user-generated tags are "ambiguous, overly personalized, and inexact" (2, para. 1). Guy and Tonkin (2006) attribute this to several factors, including the restriction to single-word tags which can result in users creating a single word from an adjective and noun (e.g., "blackcat"); lack of differentiation between synonyms and homonyms, plural versus singular terms, and even unique metadata created by sub-groups of users (2,

para. 1). However, Guy and Tonkin (2006) also state that these characteristics may not be flaws (2, para. 2). They argue that the point of a user-generated tag is to allow the user submitting it to classify that image in a way that is as meaningful to them as possible (Guy & Tonkin, 2006, 2, para. 2). Still, the value of an index is severely diminished if every patron has to classify every image to make them useful for his or her own needs. Ideally, one of the benefits of a folksonomy is spreading the work around to multiple users so that everyone can benefit from tags generated by others, rather than having to generate their own unique tags.

While unique user tags are certainly present, Guy and Tonkin (2006) took a random sampling of image metadata from flickr.com and found that "popularity of tags decreases very rapidly" (Tag popularity, para. 1). In practical terms, this means that a small number of tags are used for most images, while unique or single-use tags only make up "ten to fifteen percent" of overall tags (Guy & Tonkin, 2006, Tag Popularity, para. 3). Golder and Huberman (2005) suggest that even information tagged for personal use can benefit others, provided users interpret context in a manner that would lead them to the same choice of metadata (5, para. 2). Still, if folksonomies are to be a replacement for or even a complement to traditional indexing, it should be demonstrated that at least some users assign metadata so that others may locate images frequently enough to create a useful search tool, and not just for their personal use.

This critical issue is discussed by Mathes (2004), who argues that Flickr's tagging system is designed to allow users to tag their own collections, not apply tags to other people's images (Tagging Content in Del.icio.us and Flickr, para. 5). Mathes (2004) also distinguishes between searches designed to answer a specific, focused question and exploring a general topic to find information through "serendipity" (Browsing vs. Finding, para. 1). While Guy and Tonkin (2006) offer solutions to the anarchic, individual nature of folsonomy, Mathes (2004) sees this as a virtue in browsing of topics for serendipitous information (Browsing vs. Finding, para. 1). Folksonomy in tagging images "directly reflects the vocabulary of users" and also "directly reflects their choices in diction, terminology, and precision" no matter how improperly spelled or grammatically incorrect those choices might be (Mathes, 2004, Desire Lines, para. 1). Mathes (2004) argues that folksonomies work chiefly because they have a low barrier to entry, and can provide immediate feedback, which leads to asymmetric communication between users (Individual and Community Aspects, para. 3). Folksonomies can allow users to assign metadata, see what images other users have assigned that same metadata to, and immediately modify or add further tags to clarify the content or category of their image. The can also retain their original tag in an attempt influence others' choice of tags for similar images (Mathes, 2004, Feedback and Asymmetric Communication, para. 2). Thus, Mathes sees both bottom-up (applying metadata relevant to a single user) and top-down (influencing how a community defines broader concepts) aspects to folksonomies. The immediate feedback and asymmetric communication of folksonomy can lead to a rough consensus in tags, allowing users to search for images using tags assigned by other members in the community based on this consensus.

Stvilia and Jörgensen (2009) analyzed 3,000 photos and their associated metadata on Flickr and found that an individual's collection had metadata that was generated from the bottom up, while a group's

collection of photographs had metadata that was generated from the top down (p. 54). In other words, an individual's photos were likely to have context-specific metadata designed to group them in a way meaningful to that user, while a group photo-set would likely have metadata based around broader concepts in the images that were more relevant to the purpose of the group (Stvilia & Jörgensen, 2009, p. 54). Stvilia and Jörgensen (2009) note the limitations of their study in focusing on a single site (flickr.com) and only using English language metadata (p. 64). Despite the limitation of this study, very few studies offer concrete data on user interaction with folksonomy and its effectiveness in indexing or implementation, with Peters (2009) bluntly stating that "there is also no overview of folksonomies' disadvantages in information retrieval … and no solution statement on how to avoid or neutralize the localized disadvantages" (p. 7). Clearly, more discussion is needed.

Discussion

Notwithstanding the controversies surrounding folksonomies, some libraries have begun to allow tagging of items in their OPACs, to varying degrees. Peterson (2009) undertook a study to determine whether user tags could replace traditional cataloger-assigned subject headings in the Montana State University Electronic Theses and Dissertations database (p. 54). Peterson (2009) notes that after two years of tracking, researchers found that one year after tagging was implemented, 2.4% of the 572 theses and dissertations had tags, with that number increasing to 8% of the 678 titles in the second year (p. 55). Peterson (2009) examined the tags assigned, and found that while the 2% to 8% increase in usage was small, it was significant, and that there was "little overlap between what users want in their tags and those applied by librarians as subject headings" (p. 56). Peterson (2009) found that tags were generally unique to a given author's research, and that most would have been disallowed as traditional subject headings, leading her to conclude that traditional cataloger subject headings were best for patrons searching for information, while tagging was more appropriate for users conducting their own research (pp. 55-56). While how much generalization is possible from a theses and dissertations database is debatable, Peterson (2009) asserted, "it appears that the uses of LCSH and folksonomy are quite different and that these parallel modes of access should continue to maximize usability and ease of access to the database" (p. 56).

Other library catalogs are also starting to implement folksonomies, notably the University of Pennsylvania Library's PennTags and the online search database WorldCat. PennTags (2005) allows users to tag journal articles, OPAC records, online videos, and URLs within the Penn Community (http://tags.library.upenn.edu/help/). WorldCat (2011) also allows users who have logged in to a user account to assign tags to records, and provides a tag cloud for users to see some of the most popular tags assigned (http://www.oclc.org.libproxy.lib.ilstu.edu/support/help/worldcatorg/ApplicationHelp.htm). Other institutions, such as the Oviatt Library at California State University, have implemented user-created metadata from LibraryThing for Libraries (LTFL) (http://www.librarything.com/forlibraries/) (Mendes, Quiñonez-Skinner, & Skaggs, 2008, p. 34). LTFL is an edited list of tags provided by users of the social cataloging site LibraryThing (http://www.librarything.com/), which can be linked to a library's catalog through ISBNs, and provides tags for a library catalog record in a pop-up window via Javascript

(Mendes et al., 2008, p. 33). It should be noted that the tags in LTFL have been screened, with personal tags ("to read," for example) removed (Mendes et al., 2008, 33). As of September 2008, 25 academic libraries and 68 total libraries had implemented LTFL since its release in April 2007, and Mendes et al. (2008) found that implementing LTFL at the Oviatt Library at California State University, Northridge (CSUN) resulted in dramatically increased resource discovery, with users finding four new books using LTFL for each new book they found using Library of Congress Subject Headings (p. 39).

Mendes et al. (2008) do caution that their study did not address relevancy of these additional books, but still maintain that user-generated metadata clearly enhances resource discovery for works where natural language better describes an item than traditional controlled vocabularies, such as works of fiction (p. 39). This move towards natural language usage may also address other user concerns when searching library holdings.

Pera, Lund, and Ng (2009) assert that the movement towards natural language searching is part of a need to address the frustration of library users who are accustomed to the natural language of Web searching (p. 1392). When dealing with a heterogeneous population with little or no formal training in information retrieval, folksonomies can provide added flexibility to the OPAC's controlled vocabulary in allowing users to locate resources (Pera et al., 2009, pp. 1392-1393). Pera et al. (2009) built their enhanced library system, EnLibS, with several design features, but one critical component was the folksonomy generated by LibraryThing (http://www.librarything.com) users (p. 1396). Pera et al. (2009) used a carefully chosen subset of the entire LibraryThing collection of 46.9 million tags, and word-correlation factors in addition to folksonomies, but were able to show a significant reduction in zero-hits query results, and high relevancy in query results (pp. 1396, 1405). Lu, Park, and Hu (2010) compared LibraryThing tags to Library of Congress Subject Headings (LCSH) and determined that while catalogers and users agreed on some terms, "social tags in general are composed of a vocabulary different from that of professionals" (p. 766). Further, many tags were found to be highly personal ("to read," for example) or not related to subject headings, and might impede searches (Lu et al., 2010, pp. 766, 776). Lu et al. (2010) concluded that while tagging might help improve access to library materials, the system is not without flaws (p. 776). Addressing these flaws will be a critical step in making folksonomies more effective in searching.

One of the chief obstacles in addressing the flaws of folksonomies in indexing images or library catalogs is that no one seems to have determined exactly what a folksonomy is actually supposed to do. In the beginning of this paper it was discussed that an ideal indexing system would provide access to images based on both a single image attribute and a useful grouping with like images (Layne, 1994, p. 583), describe the content of an image, and allow it to be found via terms a user might employ to search for it (Fidel, 1994, p. 572). While user-generated tags are (almost by definition) useful in satisfying these criteria for their creator, it remains to be determined how useful they are to the general mass of users.

Current thought seems to embrace a hybrid approach, where folksonomies are used to supplement, not replace, more traditional indexing methods. Matusiak (2006) favors this approach, with professional indexers assigning metadata and providing description using controlled vocabularies to create

consistency and interoperability (p. 295). This can be supplemented by classification by users, which "brings user language, perspective, expertise, and eventually may lead towards more user-oriented indexing. Above all, it offers great opportunities for user engagement" (Matusiak, 2006, p. 295). Given the relatively low cost of user-generated data and seemingly low expectations (Matusiak doesn't offer it as a replacement for traditional indexing), it seems hard to argue that folksonomy will not succeed in the modest goals set for it; however, low cost is still not the same as free. Library staff will have to devote time and resources to implementing folksonomy software, and will very likely have to devote some time to policing tags and removing obscene or inappropriate tags. One method of making this policing more efficient would be to require users to log in to their library account to supply tags, and provide a method to notify staff of tags they feel are inappropriate and should be removed. If a user has a certain amount of their tags removed for being inappropriate, they could lose the ability to tag items from their account while still retaining their other library privileges.

It is also possible that technical solutions exist to improve user-generated tags beyond their current anarchic state without forcing users to abide by strict external standards. For example, Games With A Purpose (GWAP) is a website designed to encourage users to provide tags for images selected from the Web. In the ESP Game at gwap.com, two people are randomly paired and presented with an image selected from the Web ("The ESP Game," 2008, p. 65). The players each submit metadata tags for the pictures without knowing what their partner has submitted until they have generated one tag in common, whereupon they are both awarded points and given a new image until time runs out ("The ESP Game," 2008, p. 65). Points are awarded cumulatively, and users may create an account allowing them to build up points over multiple games and sessions. As of July 2008, gwap.com claims to have indexed over 50 million photos, and search engine giant Google has purchased a license for the game to improve its own image search results (Peters, 2009, p. 101). This suggests one potential method of motivating users to assign tags to digital images generated by others is to add a social engineering and engagement aspect to assigning metadata.

For all their inherent problems, folksonomies and other user-centered methods of assigning metadata seem to be growing in popularity. The Library of Congress (2008) recommended that all libraries "Integrate User-Contributed Data into Library Catalogs" while they also "develop methods to guide user tagging through techniques that suggest entry vocabulary" (p. 32). The Library of Congress (2008) is encouraging this in response to the belief that "the future of bibliographic control will be collaborative, decentralized, international in scope, and Web-based," which sounds very much like a folksonomy (p. 4). In order to improve tagging systems and make them more usable, Guy and Tonkin (2006) suggest creating rules and standards for tags (although a critical second step is getting users to follow those rules), creating search systems that help users assign appropriate tags (such as through spell checking submissions or suggesting tags), allowing users to see who submitted metadata, and allowing users to explain their rationale for using the tags they selected (Methods for improving tags, para. 2-5, Smart systems, para. 1-3). The difficulty lies in creating enough structure to make tagging more useful, while not making it so restrictive that people will not use it.

The question of why users might embrace a folksonomy is generally addressed by Mathes (2004), who

notes that two of the most popular tags in his study of Flickr were "cute" and "me" (From Tags to Folksonomy, para. 6). Mathes (2004) feels that these tags "reflect the dual nature of these systems: the compulsion to share -- what is the Internet if not a venue for sharing cute photographs? -- and conversely the importance of individuality and ego for these systems to work" (From Tags to Folksonomy, para. 6). If these tendencies can help convince users to share their knowledge of the content of pictures, and simultaneously be applied to a system that allows individuals to assign meaningful metadata with minimal guidelines, than folksonomy will likely be quite useful in the future. Regardless of its problems and of user motivations, the Library of Congress encourages all libraries to employ user-generated metadata, thus implying it is here to stay.

Conclusion

Folksonomy is happening. Users are pouring content onto the Web, and classifying it themselves. Indexing by professionals using precise terms, consistent syntax, and image-specific research cannot hope to keep up with the flood of unique photographs and information being put on the Web, either in terms of time or cost. Folksonomy is no silver bullet, and at its worst it is sloppy, inconsistent, and relevant only to a single user. There are ways to improve a folksonomy's consistency, although the balance between rules that users will follow and encouraging them to create unique content is tenuous. Technology may be able to solve some problems with folksonomies, with computer programs someday able to recognize specific content beyond the pixel level and assign metadata (although at that point it becomes highly debatable if it is still a folksonomy). Despite problems even beyond those addressed in this paper (different languages with unique characters, for example) folksonomy will likely continue to happen on some level. Isaksen (2009) notes that in a Google search for "Mona Lisa" the Google PageRank showed "at least two websites of entirely public-generated content which are considerably more influential than that of the host institution [the Louvre]" (p. 2). Fast and Campbell (2004) found that even library patrons who admired the organization of an OPAC still preferred to use Web-based search engines such as Google (p. 144). Meanwhile, libraries face increasing numbers of patrons who equate "searching" with Web searching, and have to choose whether to embrace the open nature of tagging sites such as Flickr or to continue limiting user interaction with holding records to searches. How well librarians are able to play to the strengths of folksonomies while minimizing their weaknesses will go a long way in determining a folksonomy's success. Ironically, traditional indexers and catalogers who previously received little or no direct input from users are in the difficult position of having to find a way to influence the metadata their users are generating. Folksonomies do have limitations, and policing inappropriate tags or even providing their own tags can be a valuable means of creating a mutually beneficial partnership between traditional librarians and their libraries' users.

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