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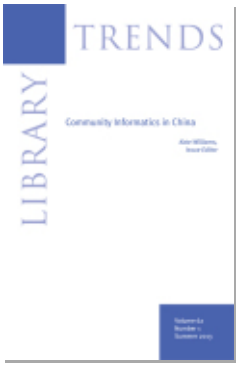

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Trends in Twitter Hashtag Applications: Design Features for Value-Added Dimensions to Future Library Catalogues

Hsia-Ching Chang and Hemalata Iyer

Abstract

The Twitter hashtag is a unique tagging format linking Tweets to user-defined concepts. The aim of the paper is to describe various applications of Twitter hashtags and to determine the functional characteristics of each application. Twitter hashtags can assist in archiving twitter content, provide different visual representations of tweets, and permit grouping by categories and facets. This study seeks to examine the trends in Twitter hashtag features and how these may be applied as enhancements for next-generation library catalogues. For this purpose, Taylor's value-added model is used as an analytical framework. The morphological box developed by Zwicky is used to synthesize functionalities of Twitter hashtag applications. And finally, included are recommendations for the design of hashtag-based value-added dimensions for future library catalogues.

Introduction

The social media world contains a plethora of current information; however, it is not always easy to keep up with the volume or retrieve valuable information using traditional search engines. Various applications have been developed to help information consumers locate and share social media resources that match their interests. Twitter, a social media platform with 140 character limits, serves as a real time information communication network. A Twitter hashtag is a unique tagging format with a prefix symbol, #, that associates a user-defined tag with Tweet content. Beyond supporting different search criteria, various Twitter hashtag applications may also provide users with functionalities to organize, share, save, or publish the search results of twitterverse resources.

Management of information and information systems often emphasizes the importance of user needs. Taylor's value-added model is one of

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the few models that provides the notion of adding value to both information and information systems as a way to meet user needs (Taylor, 1982). The core function of information systems is to manage the information required to perform business processes, regardless of the devices adopted to implement it. Hence, this study discusses Twitter hashtag applications available for use in computer and mobile devices.

The morphological box developed by Zwicky (1969) is a design tool that supports generating ideas and detailing. The primary processes include (1) defining user requirements, (2) collecting functional characteristics from existing systems, and (3) listing attributes for each functional characteristic. Based on user requirements suggested by Taylor (1986), this study explores notable functional characteristics of Twitter hashtag applications and compares Twitter adoption and hashtag use on leading library and social cataloguing Web sites. The findings demonstrate hashtag use patterns from different perspectives, and suggest two value-added dimensions that combine effective functional characteristics and existing best practices. The suggestions from this case study can be used to generate new ways to address user needs in the library catalogues of the future.

Rationale

Taylor's value-added model has played a prominent role in user-centered design of information systems for more than two decades. However, the model does not specify any particular context of system use. Integrating a taxonomy of tagging motivation into Taylor's model provides an effective approach to analyzing user requirements and value-added dimensions.

The Essence of Taylor's Value-Added Model

Taylor's value-added model has been recognized as a visionary framework and is highly relevant for use in evaluating information systems (Eisenberg & Dirks, 2008) and knowledge organization systems (Pimentel, 2009). The following features of Taylor's model are used in this analysis: information spectrum and underpinning system features.

Information Spectrum

The notion of the "information spectrum" refers to a hierarchical structure of information, which clearly outlines a series of value-added processes and associated methods (Taylor, 1982). The spectrum identifies five phases of increasing complexity and sophistication as: data, information, informing knowledge, productive knowledge, and action. For instance, transforming raw data into information requires the efforts of organizing processes through grouping, classifying, relating, formatting, signaling, or displaying. An information professional engages in synthesizing and making judgments in order to make the transition from the information phase to the informing- or productive-knowledge phases that can support action and decision making. The entire information spectrum represents

how different levels of information processing enable and advance the creation of value-added processes.

Value-Added Model

Besides focusing on information, another influential value-added model by Taylor (1986) reflects the focal points of values: *user criteria* (of choice), *system*, and *interface*. Taylor suggested six user requirements that have the potential to add value to information systems: ease of use, noise reduction, quality, adaptability, time saving, and cost saving. These areas of user criteria define an effective interface for bridging the gap between user and system. The value-added processes in the system instantiate at the interface level. Thus, developing examples of value-added processes helps focus and deliver functional features to users.

User Perspectives: Taxonomy of Tagging Motivations

Understanding user needs and how users make sense of the environment and their experiences are critical aspects of information system design. Optimal design pays close attention to the study of information behavior; such study seeks to understand why and how people seek and use information as they try to make sense of the environment and attempt to remain well informed. Tagging is a form of information behavior. Understanding the motivations underlying tagging behavior is becoming increasingly important to the design of information systems. This is especially true in library catalogues as user tagging becomes progressively more prevalent. Hashtags have also become a popular form of information organization for users of social media; the diffusion of innovation theory explains why users adopt new communication behavior, such as hashtagging (Chang, 2011).

While Taylor's model addresses the aspect of user feedback and offers universal design principles, an understanding of specific user requirements together with a holistic user perspective is also necessary for designing hashtag systems design. Ames and Naaman (2007) examined the tagging motivations of users and developed a two-dimensional taxonomy of tagging motivation: *function* and *sociality*. As per this taxonomy, users engage in tagging for the purpose of organization and communication, and this constitutes the *function* dimension. The *sociality* dimension reflects that tagging could be undertaken to meet individual needs or to meet the needs of others, especially social needs. The resultant four categories are *self organization, self communication, social organization,* and *social communication*. Tagging for *self organization* supports personal search and retrieval; users tag for personal information management intended for future retrieval. Tagging for *self communication* provides for personal context and also serves as a memory cue. In essence the user motivation to tag is to aid in personal organization and communication. On the other hand, from the social or collective viewpoint, the organization and com-

munication function is intended for others. Thus in the *social organization* category, the primary motivation for tagging is to facilitate public search and self promotion. In the *social communication* category, tags are intended to communicate contextual information to others thereby taking advantage of the wisdom of crowds to assist in public search and communication with friends or family. Amongst these four categories, the social organization aspect dominates tagging motivation; as Ames and Naaman (2007) discovered, taggers are motivated by the urge to share their organized information with the public. The *function* dimension in this taxonomy aligns closely with the user criteria depicted in Taylor's model discussed in the previous section.

Research on tags and tagging indicates that general users prefer the flexibility and control of using their own vocabulary to convey certain meanings to personalized information organization, (Eden, 2005; Vander Wal, 2007). An interesting case by Sinha (2005) distinguished categorization behavior from tagging behavior based on the cognitive process and concluded that taggers seem to encounter less cognitive overhead. Taggers typically do not hesitate to tag, while professional cataloguers often must comply with subject authority rules when using subheadings to combine concepts. Taggers have the freedom to upload as many tags as they want, whereas cataloguers often make parsimonious use of subject headings by combining more than one concept through the use of subheadings.

Drawing from Soergel's (1985) concept, Hjorland (1997) addressed the difference between content-oriented indexing and need-oriented indexing. Content-oriented indexing (for example, the Library of Congress Subject Headings [LCSH]) reflects the document perspective as a way to identify the item. This is less likely to reveal user contexts. In contrast to LCSH, hashtagging offers greater support and aligns more closely to need-oriented indexing. Therefore, when evaluating whether hashtagging systems meet user needs, it is important to note the different standpoints between professional and lay users. What matters most for design decisions is understanding the targeted user needs: whether the hashtag applications are adopted or integrated for professional use or library patron use.

Case Study Method: Morphological Box

A morphological box lists, in a table-like form, the attributes of a product or service based along a matrix of user needs. This can be an effective device for creative idea generation and results in various new alternatives created by recombining attributes in the matrix (Ritchey, 2011; Zwicky, 1969). The Zwicky box has been applied to multiple domains, such as management, public policy, and natural science (Ritchey, 2011). In the information systems context, the salient attribute might be functional design elements. The problem is that each hashtag application fulfills cer-

tain aspects of information needs. This can cause difficulties in arriving at definitive hashtag management. These are the steps for creating a morphological box: (1) identify user requirements; (2) list the function attributes as column headings; (3) list available variations of the attributes; (4) select one item from each column randomly or mix interesting combinations of items; (5) evaluate whether the combination is feasible or alternatively recombine the elements in another new way.

Each user requirement in table 1 is drawn from Ames and Naaman's (2007) two dimensions of tagging motivation: communication and organization. This table indicates its corresponding functional attributes (called *interfaces* by Taylor 1986) in the first entry and the subordinate attributes (called *value-added examples* by Taylor 1986) in the second entry. This case study outlines five functional characteristics, including memory, social signaling, search, directory, and archive, based on Ames and Naaman's taxonomy. As shown in table 1 for the first user tagging requirement, "communication," if a strand of the table is followed vertically for the first functional characteristic "memory," it leads to more detailed value-added function attributes, acquired through system analysis of existing applications, such as self-publishing, scheduling to send tweets, archiving, and saved searches. On the other hand, the horizontal path emphasizes moving forward to the next user requirement or functional characteristic.

Table 1. Morphological box of Twitter hashtag applications

User Requirements	Communication		Organization		
Function Characteristics (Interfaces)	Memory	Social Signaling	Search	Directory	Archive
Function Attributes (Value-Added examples)	self-publishing scheduling to send tweets archiving	Retweet Mention sharing photos/ videos	Tweets Time #hashtag	Interest Subject Industry	Compile Save Analytics
	saved searches	sharing organized tweets URL	Keyword	recent searches	Visualizations
			Language	Location	recent 500-1500 tweets
			from @name	real-time trends	making it public or private
			mentioning @name	user-contributed definitions of real-time trends	

The list of user requirements and functional attributes are notably neither comprehensive nor prescriptive. One of the disadvantages of the morphological box is that it is difficult to select or evaluate the best path among the potential combinations of ideas. For instance, our morphological box has 4032 (= 4*4*7*6*6) possible solutions. In brainstorming sessions, the process of elaborating details often gives support for expanding ideas. On the contrary, when attempting to converge ideas, listing more categories does not guarantee better results. To benefit from the method, adopters must identify elements most appropriate to their needs and omit those that are not.

Trends in Twitter Hashtag Applications

Because of advances in technology, Twitter hashtags can blend both communication and organization by helping information professionals enhance research or reading experiences and by bringing users and resources closer together. As with other social media platforms, Twitter can be used to quickly connect people and to allow them to follow updates about each other. Alternatively, a person could connect with new people by joining the information networks and news channels that reflect one's own interests, link to breaking news, or disseminate business updates—which may take a great deal more effort. Brevity is another reason why Twitter has become an efficient means of communication; especially with the introduction of hashtags, which facilitate searching or keeping track of updates on relevant resources. A number of Twitter applications enhance communication capabilities to distribute tweets with music, photos, and videos. Twitter Hashtag applications turn Twitter into a research and archive tools especially when it is integrated into applications that provide structured directories, advanced search, content organization, content presentation, and analytics. These functions are useful for people or businesses that need to organize and keep track of tweets that mention specific names, hashtags, keywords, or topics. Such functions not only allow content customization and presentation but also provide analytics that monitor illustrative statistical trends such as the top ten tweeted hashtags, tweet volume over time, top users, and the percentages of tweets and retweeting.

Table 2 presents the comparison of Twitter adoption and hashtag use (recent two-month tweeted #hashtags, from September 1, 2011, to November 17, 2011) between the leading library and social cataloguing Web sites. The leading library cataloguing Web sites include OCLC, Worldcat, and the Library of Congress; the representative social cataloguing Web sites are Goodreads and LibraryThing.

The Library of Congress joined Twitter in 2007 and is the earliest Twitter adopter in the case study followed by Goodreads, OCLC, Worldcat, and LibraryThing. Similarly, the Library of Congress has the most follow-

Table 2. Twitter Adoption and Hashtag Use of Leading Library and Social Cataloguing Sites

Twitter account	@OCLC	@Worldcat	@library congress	@Library Thing	@Goodreads
Description of the Twitter account	"OCLC is about connecting people to knowledge through library cooperation."	"WorldCat is the world's largest library catalogue and is a great place online to find materials in libraries, worldwide."	"We are the largest library in the world, with millions of books, recordings, photographs, maps and manuscripts in our collections."	"Watch this space for feature announcements, site news, and more from the team at Library Thing.com"	"The largest site for readers and book recommendations. Find new books, recommend books, track your reading, join book clubs, win advanced copies, and much more!"
Twitter profile	Following: 162 Followers: 5605 Tweets: 2016 Favorites: 0 Joined on April 8, 2009	Following: 258 Followers: 2293 Tweets: 594 Favorites: 1 Joined on April 8, 2009	Following: 6 Followers: 302,385 Tweets: 1579 Favorites: 0 Joined on June 29, 2007	Following: 3022 Followers: 4398 Tweets: 1303 Favorites: 3 Joined on January 20, 2011	Following: 10,160 Followers: 223,784 Tweets: 1963 Favorites: 1 Joined on August 19, 2008
Recent two-month tweeted hashtags	#oclcr (4)	#WorldCat	#natbookfest (15)	#Library ThingReads (10)	#quoteofthe day(9)
	#orrapcap	#Spotify	#thankyou steve	#fridayreads (9)	#NBA 2011
	#wms4aca	#declaration		#bookhaiku (4)	#Goodreads Choice (10)
	#orss (2)	#wanttohelp		#AllHallows Read	#neardalert
	#orarchive grid	#birthdays #oclc #ala11		#ows	#weekend goodreads
	#wcid	#playlearn		#NatBook Festival	
	#DDC11	#librariannerd humor			

Note: The number within parentheses indicates the frequency of tweeted hashtags from September 1, 2011, to November 17, 2011.

ers of the institutions in the case study and follows the fewest. Interestingly, OCLC has the highest number of tweets, but the Worldcat catalogue is the lowest contributor of tweets, although it joined Twitter on the same day. OCLC and the Library of Congress have used hashtags more regularly (e.g., #oclcr reused 4 times) than WorldCat.

Frequently tweeted hashtags tend to fall into a few categories. The most consistently adopted type of hashtag relates to events or announcements. This type of event hashtag (#natbookfest) stands for "national book festival". This hashtag also appeared on the most frequently tweeted hashtag list at the Library of Congress. Other events might include tweets about online book club events, for example, which bear hashtags such as #LibraryThingReads, #GoodreadsChoice, #fridayreads, and #quoteoftheday. These are fairly common on the two social cataloguing Web sites examined in this case study, Librarythings.com and Goodreads. Other similar hashtags relate to collections of research resources (e.g., #oclcr) and knowledge sharing gained from reading (e.g., #quoteoftheday). One notable difference among sites relates to the number of followers. With the exception of Librarything, Twitter followers on other sites outnumber the ones they are following. However, social cataloguing Web sites appear to focus on creating two-way conversation, whereas professional cataloguing Web sites seem to focus on one-way broadcasting, or pushing news or announcements out to their Twitter followers.

Suggestions for Value-Added Dimensions to Future Library Catalogues

Libraries and social cataloguing organizations have used Twitter (as well as hashtags) in various ways. Professional cataloguing organizations tend to adopt Twitter primarily for broadcasting or communication purposes to send out the latest news and announcements. Social cataloguing sites go beyond communication and actively engage followers in idea exchanges through adding hashtags to create and organize particular topics. Once a site regularly starts creating and organizing hashtags (such as #fridayreads), interactions with followers connect people with informative content. This study suggests two approaches to exemplify possible dimensions to establish such connections through hashtag applications: connecting the process through a value-added interface, and connecting the materials through providing value-added information.

Connecting the Process through Value-Added Cataloguing Interface

Use of the Zwicky morphological box presents many paths forward for conceptualizing innovative use of Twitter hashtag applications to solve information problems. Whether this is possible depends heavily on the willingness of library catalogue service providers to add hashtag features in support of existing library catalogue services. This is not beyond the realm

of possibility; for example, WorldCat already integrates user-generated book reviews by connecting to Goodreads.com. This application embeds a Twitter icon into each book page, thereby allowing book sharing by making it simple to tweet a book title that includes a link to Goodreads. This not only retains and extends the catalogue format but also can greatly improve accessibility to materials.

According to the morphological box (table 1), one of the potential combinations for value-added dimensions to future library catalogues might lie in the combination of "#hashtag, analytics, and visualizations"—one possible use of this combination would consist of allowing patrons to see the relevant hashtags assigned to a book title or an author's name by providing visualizations or listing analytics. Such an approach might be especially suitable on a library Web page promoting an author or a set of titles on a particular subject.

Connecting Library Materials through Value-Added Information

Taylor's value-added information spectrum suggests different levels of providing value-added information. Thus, another practical combination arrived through morphological analysis is archiving, real-time trends, user-contributed definitions of real-time trends, and sharing organized tweets URL. For users who are curious on the meaning of real-time trending topics (hashtags or keywords), the Hootsuit mobile application enables quick and easy browsing of current definitions by clicking the question marks next to the trends. If users are interested in coauthoring trend definitions, Whatthetrend.com provides a Wiki system that allows users to update the definitions of real-time Twitter top ten trends grouped by countries and cities.

For new users needing to locate social media connections that match their interests, Twitter's official mobile application has a built-in directory structured according to interests. Twitter users are interested in many other novel features and interesting content, as are readers. Taking recent record-breaking tweets per second (SR7 Online News, 2011) as an example, when Steve Jobs passed away on October 5, 2011, four hashtags (#SteveJobs, #ThankYouSteve, #RIPSteveJobs, and #iSad) and two related keywords ("Think Different" and "Stay Hungry") dominated the top ten trend list. Many Twitter users worldwide shared various Internet resources including image collections, videos, quotes, and links to news on that day. This user-generated content could be archived and in such a form would be ideal for connecting with library materials. For example, this archived Web content could be linked to Steve Jobs' newly published autobiography and any other related publications on Steve Jobs.

Conclusions

Twitter's real-time updates represent a wealth of timely information. The issue is how to extract and transform potential information on almost any subject into knowledge that can be used. Twitter hashtag applications enable users to add value to the tweeted content by reorganizing, publishing, and distributing the content based on different criteria, ranging from hashtags to keywords to user names. Carrying out a morphological analysis can help discover new combinations of value-added services, though some of these combinations might be more practical than others. This is where the cataloguing experience and practice comes into play. Inherited from the spirit of Twitter open API, Twitter hashtag applications allow developers to configure their applications according to user requirements. Hence, as long as library organizations have the Twitter data stream connections, they can optimize third-party applications equipped with functions that include search, directory, and archiving functions and allow analysis and visualization of Twitter hashtags used within the library catalogue environment and linking out to the richness of the Twitterverse. Information professionals familiar with advanced searching techniques may readily adopt hashtags as a useful search strategy. For example, imagine a reader following one hashtag connection to another and finding useful material. Such success might lead the reader to share and communicate their discoveries with others through the use of hashtags, thus adding to the value-added processes. As a design method, the morphological box has the potential to inspire creativity and assist in organizing user requirements into tables and decomposing categories of design features through which innovative solutions can be developed to enhance next-generation catalogues.

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