Factors Influencing User-Generated Vocabularies: How Basic are Basic Level Terms?†

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Hajibayova, Lala, Jacob, Elin K. **Factors Influencing User-Generated Vocabularies: How Basic are Basic Level Terms?** *Knowledge Organization. 42(2)*, 102-112. 60 references.

Abstract: Studies of user-generated tagging vocabularies (e.g., Yoon 2009) suggest that tag agreement across users is due to wide-spread use of basic level category terms. This study investigated whether differences in the superordinate, subordinate or basic level of abstraction were influenced by resource content. Analysis of 7617 tags assigned by 40 participants to 36 online resources representing four content categories (i.e., TOOL, FRUIT, CLOTHING, VEHICLE) found significant differences in the frequency of occurrence of subordinate and basic level tags assigned to resources in the FRUIT content category and of superordinate and basic level tags assigned to resources in the CLOTHING content category. This study suggests that variation in the level of abstraction of content related tags is natural in that perception and understanding arise out of the individual's contextualized experiences of engaging with objects.

† We are immensely grateful to Dr. Deborah Shaw, Professor Emerita, School of Informatics and Computing, Indiana University Bloomington for her suggestions and comments on an earlier version of the manuscript. We thank reviewers for their recommendations and insights.

Received 18 February 2015; Revised 19 March 2015; Accepted 22 March 2015

Keywords: tags, basic level terms, user-generated vocabularies, categories

1.0 LIS Studies of User-generated Tagging Vocabularies

Over the past few years, the proliferation of social bookmarking applications such as Delicious (http://delicious.com) and Flickr (http://flickr.com) has sparked numerous studies on folksonomies and the tagging practices of individuals. Vander Wal (2007) defines the term folksonomy as the set of tags that an individual user assigns to resources for future retrieval. However, the idea of a folksonomy is nebulous: The variety of definitions appearing in the literature reflects the lack of a common understanding regarding tagging and user-generated vocabularies. For example, Mathes (2004) argues that tag-

ging is "user-metadata" that represents the "best and worst in the organization of information" (Conclusions section, para. 1); Shirky (2005) defines tagging as free-form labeling; and Glushko et al. (2008, 129) characterize tagging as "categorization in the wild." In a pioneering study of tagging, Golder and Huberman (2006) argue that tagging is a process of sensemaking that allows users to categorize and identify information through emergent meaning. Mai (2011, 115) argues that folksonomies have emerged, in part, in response to the "perception that many classificatory structures represent an outdated worldview and in part from the belief that since there is no single purpose, goal, or activity that unifies the universe of knowledge." In spite of the lack of terminological agreement, studies of tagging behaviors and the folksonomies they generate have entered the mainstream of scholarly research in multiple domains, including library and information science (LIS) and computer science.

Overall, the evolution of folksonomic studies has involved four paradigms: early studies focusing on defining the phenomenon and positioning it in the universe of knowledge representation (e.g., Hammond et al. 2005; Kapucu et al. 2008; Lund et al. 2005; Quintarelli 2005; Mathes 2004; Peterson 2006; Shirky 2005); research analyzing tagging vocabularies and users' tagging behaviors (e.g., Bar-Ilan et al. 2008; Golder and Huberman 2006; Kipp 2006; Konkova et al. 2014; Marlow et al. 2006; Noruzi 2006; Paolillo and Penumarthy 2007); studies proposing further structural and functional development or the application of folksonomic systems (e.g., Abel et al. 2009a; Abel et al. 2009b; Chen et al. 2010; Clements et al. 2010; De Meo et al. 2009; Han and Yan 2009; Yeung et al. 2009a); and studies applying the critical approach to analysis of folksonomies (e.g., Fox and Reese 2013; Keilty 2012; Mai 2011).

In his highly cited paper, Shirky (2005) argues that user-generated vocabularies comprised of tags assigned by multiple users offer the potential for "alternate organizational systems, systems that, like the Web itself, do a better job of letting individuals create value for one another" (Conclusions section, para. 1). The response has been an avalanche of studies advocating the application of user-generated vocabularies as either an alternative to or a complement for traditional systems of knowledge representation and organization (e.g., Dolog et al. 2009; Golder and Huberman 2006; Gruber 2005; Hammond et al. 2005; Munk and Mork 2007a; Noruzi 2006; Panke and Gaiser 2009; Peterson, 2006). In particular, LIS studies have investigated both the functionality and subject representativeness of user-generated vocabularies (e.g., Munk and Mork 2007a; Munk and Mork 2007b; Kipp, 2006) and the level of agreement in tagging vocabularies generated by multiple users (e.g., Kipp and Campbell 2006), often comparing user-generated vocabularies to traditional systems of information representation and organization (e.g., Bruce 2008; Kipp 2006; Noruzi 2006; Yi and Chan 2009).

The basic questions underlying these studies are whether a user-generated vocabulary facilitates the sharing of resources and whether such a vocabulary actually constitutes an indexing language that can be used to represent the intellectual content of resources (Jacob and Shaw 1998). The research on user-generated vocabularies reflects the significant role of language in knowledge representation that had been described by Blair (1990), who drew on Wittgenstein's theory of language use and the manifestation of meaning in forms of life (Wittgenstein 1953/1963) to argue that representation is "primarily a problem of language and meaning" (Blair, 1990, 123).

Representation of a resource's subject content using descriptors from a pre-existing vocabulary raises questions regarding the relationship between controlled vocabularies and natural language (e.g., Buckland 1999; Lancaster 1977). Because a controlled vocabulary strives to ensure consistent semantic representation of resources by normalizing the indexing vocabulary (e.g., by identifying synonyms and homographs and defining preferred terms), Lancaster (1977) characterizes controlled vocabulary as an "artificial language…in which the terms…have assumed special meaning by the way they have been used in indexing" (p. 23). In contrast to natural language, a controlled vocabulary frequently lacks both the currency of natural language and the specificity of a domain language (Lancaster 1977). However, studies of user-generated tagging vocabularies consisting of natural language terms have found inconsistency, instability, and ambiguity as well as homographs, acronyms, and synonyms (e.g., Monk and Mork 2007b); and a number of studies have observed a significant use of temporal, task-oriented and affective personal tags, such as toread and cool that do not represent the actual content of a resource (e.g., Golder and Huberman 2006; Kipp 2006; Kipp and Campbell 2006; Kipp 2007; Munk and Mork 2007a).

Several studies of tagging vocabularies have referenced Rosch's theory of basic level categories (Rosch et al. 1976) to explain what has been identified as a tendency among users to assign basic level terms as tags (e.g., Golder and Huberman 2006; Munk and Mork 2007a; Munk and Mork 2007b; Noruzi 2006). Rosch et al. (1976) propose that there is a basic level of conceptual abstraction at which categories are most cognitively efficient; these observations of the predominance of basic level terms evolved into Rosch's theories of prototypes and basic level categories. In an extended study of categories ranging from colors to physical objects, Rosch and Mervis (1975, 574) demonstrated that the internal structure of categories was com-

prised of prototypes or "clearest cases [and] best examples of the category." Rosch's notion of category prototypes is closely aligned to Wittgenstein's notion of family resemblance. Indeed, Rosch and Mervis (1975) argue that prototypes provide "empirical confirmation of Wittgenstein's (1953/1963, 603) argument that formal criteria are neither a logical nor psychological necessity; the categorical relationship in categories which do not appear to possess criterial attributes…can be understood in terms of the principle of family resemblance." In other words, Rosch argues that a category is not governed by definitions but rather by a "complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail" (Wittgenstein, 1953/1963, 32).

Golder and Huberman (2006) contend that "earlier tags in a bookmark represent basic levels, because they are not only widespread in agreement, but are also the first terms that users thought of when tagging the URLs in question" (202). Taking into consideration that basic level terms may vary across users, Lakoff (1986, 51) argues that basic level categories are "human-sized" and depend on how people interact with the objects represented by a category label: the way people perceive these objects and organize information about them. Although Golder and Huberman (2006) do not explicitly acknowledge that basic level terms can vary across users, they do concede that, in tagging systems, "conflicting basic levels can prove disastrous, as documents tagged perl and javascript may be too specific for some users, while a document tagged programming may be too general for others" (200). However, Golder and Huberman's hypothesis regarding the use of basic level terms as tags is based on little more than assumptions drawn from earlier experimental studies (e.g., Tanaka and Taylor 1991) rather than the empirical investigation of tagging behaviors.

A number of studies have suggested that user assignment of tags to specific resources demonstrates what has been called the power-law distribution, which stabilizes over time (e.g., Capocci et al. 2009; Ding et al. 2009; Munk and Mork 2007a; Oldenberg, 2009). Golder and Huberman (2006) offer two reasons for these observations of stabilization: imitation and shared knowledge. The Delicious interface facilitates imitation by providing a list of the most popular tags that have already been assigned to a given resource; but Golder and Huberman contend that shared knowledge, such as the strong IT background of Delicious users, is also be an important factor contributing to stabilization. If Golder and Huberman's argument regarding the "widespread" (204) use of basic level tags can be supported empirically, it is possible that the use of basic level terms may also be a primary contributor to the stabilization of tags.

Many of the tagging studies that reference Rosch's theory of basic level categories fail to define what a basic level term is. The failure to operationalize the basic level terms can be addressed by reference to Heidegger (1953/1996, 65), who offers a framework for understanding the relational nature of basic level categories (Hajibayova and Jacob 2012; Hajibayova 2013). Heidegger's notion of *handiness* represents the "ontological categorical definition of beings as they are 'in themselves'" (67): useful things that are handy on "the basis of what is objectively present" (67). Following Heidegger, basic level categories can be expected to vary across individuals and cultures because of variations in "innerworldly beings" and their relations to or understandings of of objects. Based on the notion of *handiness*, then, a term at the basic level of categorization reflects individual's contextualized experience of using objects (Hajibayova and Jacob 2012; Hajibayova 2013).

This study investigates whether the intellectual content of resources may affect the level of abstraction of tags in user-generated tagging vocabulary. Based on the theory of basic level categories (Rosch et al. 1976) and Heidegger's (1953/1996) notion of handiness, it explores the variations of the levels of abstraction in user-generated tagging vocabularies.

2.0 Research Questions and Hypotheses

A one-shot exploratory study was conducted to investigate whether intellectual content (i.e., content category) affects a user's tagging vocabulary. Because prior suggestions that basic level terms are predominate in folksonomies (e.g., Golder and Huberman 2006; Munk and Mork, 2007b) were based on tagging vocabularies generated by users of the Delicious bookmarking application, who were assumed to share a strong interest in information technology (IT), this study was designed to investigate levels of abstraction in tagging vocabularies generated by a potentially more diverse population.

The research investigated the broad question "Is a particular level of abstraction dominant in user-generated tags?" More specifically, the following research questions was investigated:

– Does the level of abstraction of tags vary based on the content category of the resources being tagged?

To determine if the category of a resource's intellectual content influences selection of tags by users, the following null hypothesis was tested:

– The frequency of occurrence of superordinate, subordinate and basic level tags assigned to resources representing one category of content is the same, both

within and across subjects, as the frequency of occurrence of superordinate, subordinate and basic level tags assigned to resources representing other categories of content.

3.0 Method

3.1. Subjects

A group of 40 native speakers of English was recruited from the student population at Indiana University Bloomington (IUB). Of the 40 subjects who participated in the study, 25 (63%) were female and 15 (38%) were male. Two subjects (5%) were between 17 and 20 years old, 20 (50%) were between 21 and 25, and nine (23%) were between 26 and 30. The other nine subjects were between 31 and 45. With respect to the highest level of education completed, 15 subjects (38%) held an advanced degree, 19 (48%) had completed a bachelor's degree, four (10%) held some college education, one (3%) held an associate's degree and one (3%) had completed high school.

A majority of participants identified library and information science (LIS) as their main area of study (18, 46%). Six participants indicated a dual degree combining LIS with another area of study: African studies (1), art history (2), East Asian studies (1), Russian and East European studies (1), and musicology (1). Another 15 (38%) participants represented a relatively wide range of domains in the social science and humanities. One participant did not indicate an area of study.

3.2. Materials

Google searches were performed to identify a preliminary set of 15 resources to be used in the study. A set of preliminary 15 resources were identified for each of six non-biological object categories used in Rosch et al.'s (1976) study: MUSICAL INSTRUMENT, TOOL, CLOTHING, FURNITURE, VEHICLE, and FRUIT. The category FRUIT was considered a non-biological category based on previous research of Berlin (1978), Rosch et al. (1976), and Tversky and Hemenway (1984), who had suggested FRUIT is a non-biological "object category" because it is a "human-defined part of a tree, engineered, packaged, and marketed much like a manufactured object" (Tversky and Hemenway 1984, 172).

For each of the six content categories, the preliminary set of resources included 15 resources, for a total of 90 resources. Selection of the set of online resources to be used in the study was based on an evaluation of how well each of the 90 preliminary resources represented the category with which it had been identified. To evaluate the representativeness of the resources, five judges were recruited from the LIS faculty and doctoral students at IUB. Judges were asked to rate the appropriateness of the content of each resource for its assigned category using a Likert scale from 1 to 5, where 1 indicated "Not appropriate" and 5 indicated "Highly appropriate." To collect judges' ratings Qualtrics software was used: Judges were provided with an anonymous link to the Qualtrics site, which provided them with access to the 90 preliminary resources, and the Qualtrics software recorded the judges' ratings for the appropriateness of category content.

Judges' ratings for the category appropriateness of resource content were summed to provide a rating score for each of the 90 resources. The rating scores for all resources representing a single content category were then summed to generate a rating score for each of the six non-biological content categories used by Rosch et al. (1976). The four content categories with the highest rating scores for content category appropriateness were then selected for use in the study: TOOL, CLOTHING, FRUIT, VEHICLE. For resources associated with each of the content categories selected for the study, judges' ratings for content category appropriateness were summed and an overall rating score was computed as an average of appropriateness. The result of this process was a final set of 36 online resources to be used in the study.

3.3. Procedure

The study was conducted in the Indiana University Bloomington Information and Library Science Department's computer lab over a period of two months. Qualtrics (http://www.qualtrics.com) a platform for collecting and analyzing data, was utilized to instruct subjects to read/scan each resource and then assign to the resource as many tags as they thought were appropriate for retrieval of the resource at some point in the future. Subjects were not given any premade tags and could not see any tags assigned by other study participants. The study page provided access to the actual web links of the resources. Subjects were also asked to respond to a set of demographic questions, including gender, approximate age, area of study or expertise, and highest level of education completed. All responses were anonymous.

4.0 Results and Analysis

4.1. Tagging Vocabulary

A total of 7617 tags were assigned to the 36 online resources for an average of 212 tags per resource. Of the 7617 tags, 6201 tags (81%) consisted of a single term and 1416 (19%) were phrases. The distribution of tags across the four content categories was relatively even: 1989 tags

(26.1%) were assigned to resources in the CLOTHING category; 1896 tags (24.9%) were assigned to resources in the FRUIT category; 1894 tags (24.9%) were assigned to resources in the TOOL category; and 1838 tags (24%) were assigned to resources in the VEHICLE category.

On average, each participant assigned 190 tags to the 36 resources. The highest number of tags assigned by a single participant was 383, or 10.6 tags per resource, and the lowest was 89 tags, or 2.2 tags per resource. The largest number of tags assigned to a single resource (281 tags) was for a resource from the CLOTHING category and the smallest number of tags assigned to a single resource (164) was for a resource from the VEHICLE category. Of the 40 participants in the study, 14 assigned over 200 tags. Most of these "heavy taggers" were in the 21-25 age group (n=10), had completed a bachelor's degree (n=9), and were female (n=10).

Analysis of the tagging vocabulary generated by study participants identified the eight categories of tags (see Table 1): content related tags (Content); non-content related personal tags (Non-Content/Personal); tags specifying the genre of the resource (Genre); tags specifying the manufacturer or brand (Manufacturer/Brand); tags representing the source of the resource (Source); tags specifying a geographical location (Geographical Location) or date (Date); and tags identifying an individual responsible for the intellectual content of the resource (Author).

In line with previous studies of folksonomies (e.g., Munk and Mork 2007b; Heckner et al. 2008a), content-related tags dominated with 5120 tags, which accounted for 67.2% of the total vocabulary generated by participants (see Table 1). Content-related tags were comprised of tags that represented the subject of the resource (e.g., tool, ice-cream truck, Satsuma orange, denim shirt) or described characteristics of the subject or the resource itself (e.g., easy to use, convenient, growing, luxury). As Table 2 demonstrates, more content tags were assigned to the resources in the FRUIT content category (1495, or 29.2%) than to resources in the TOOL (1326, or 25.9%), CLOTHING (1306, or 25.5%), or VEHICLE (993, or 19.4%) content categories.

Interestingly, participants assigned a total of only 28 Non-Content/Personal tags, or 0.37% of the total tagging vocabulary to indicate the tagger's opinion of or affective response to a resource (e.g., mom's stuff, ridiculous) (see Table 1). Assessment of the tagging vocabulary in relation to the functions of tags identified by Golder and Huberman (2006) and Munk and Mork (2007b) revealed that participants had not assigned tags indicating a resource's relation to the tagger, tags organizing tasks, or tags representing egocentric markers. Possible explanations for this finding could be the controlled nature of the current study, the lack of personal relevance of resources for individual participants, or the instruction to participants to tag the resource for future retrieval.

The set of tags generated by participants was analyzed to identify variant forms of individual tags: plural and singular forms (e.g., tool – tools); different spellings (e.g., sanguinelli – saguinelli), numeric versus letter representations (e.g., half inch drill – 0.5 inch drill); order of terms in a phrase tags (e.g., acura mdx – mdx acura); and abbreviations (e.g., do it yourself - diy). Based on this analysis, the tagging vocabulary was normalized and 1219 of the tags assigned by participants, or 16% of the original set of 7617 tags, were identified as unique tags or tag phrases.

Of the 1219 unique tags, 262 tags drawn primarily from the subject-related tags of the content tag category were identified with one of three levels of abstraction: superordinate, subordinate or basic. Based on Rosch and colleagues' (1976) conceptualization of level of abstraction, a superordinate category was defined as a category in a hierarchy that subsumes other, lower-level categories

Categories	TOOL	CLOTHING	FRUIT	VEHICLE	Total
Content	1326 (17.4%)	1306 (17.1%)	1495 (19.6%)	993 (13.0%)	5120 (67.2%)
Non content/Personal	2 (0.03%)	3 (0.04%)	3 (0.04%)	20 (0.26%)	28 (0.37%)
Genre	201 (2.6%)	290 (3.8%)	215 (2.8%)	215 (2.8%)	921 (12.1%)
Manufacturer/Brand	193 (2.5%)	222 (2.9%)	0 (0%)	400 (5.3%)	815 (10.7%)
Source	132 (1.7%)	106 (1.4%)	87 (1.1%)	82 (1.1%)	407 (5.3%)
Geographical Location	8 (0.1%)	12 (0.2%)	61 (0.8%)	57 (0.7)	138 (1.8%)
Date	24 (0.3%)	12 (0.2%)	12 (0.2)	59 (0.8%)	107 (1.4%)
Author	8 (0.1%)	21 (0.3%)	23 (0.3%)	29 (0.4%)	81 (1.1%)
Total	1894 (24.9%)	1972 (25.9%)	1896 (24.9%)	1855 (24.4%)	7617 (100%)

Table 1. Distribution of Tags for Four Content Categories as a Percentage of Total Tags (n=7617)

Categories	TOOL	CLOTHING	FRUIT	VEHICLE	Total
Subject-related tags	711 (13.9%)	451 (8.8%)	831 (16.2%)	400 (7.8%)	2393 (46.7%)
Descriptive tags	615 (12.0%)	855 (16.7%)	664 (13.0%)	593 (11.6%)	2727 (53.3%)
Total content tags	1326 (25.9%)	1306 (25.5%)	1495 (29.2%)	993 (19.4%)	5120

Table 2. Distribution of Content Related Tags for Four Content Categories as a Percentage of Total Content Tags (n=5120)

rather than specific entities; and a subordinate category was defined as a category that subsumes entities and is subsumed by and thus subordinate to another category. A panel of five judges from the IUB LIS faculty and doctoral students evaluated the appropriateness of the level of abstraction proposed for each unique tag. Using Qualtrics, judges were given a list of the 262 unique tags for which a level of abstraction that had been identified by the researcher. For each tag, judges were presented with the normalized tag, the content category for which it had been generated by participants, the proposed level of abstraction of the tag, and a Likert scale from 1 to 5, where 1 was equal to "Not at all appropriate" and 5 was equal to "Highly appropriate." For example, the content category and proposed level of abstraction of the tags clothing, pants and dress pants were as follows:

Tag	Category	Super-ordinate	Basic	Sub-ordinate
pants	CLOTHING		PANTS	
clothing	CLOTHING	CLOTHING		
dress pants	CLOTHING			DRESS PANTS

Judges were asked to indicate how appropriate the proposed level of abstraction was for each tag; ratings of appropriateness were averaged across judges to provide an appropriateness score for each of the 262 unique tags.

Cohen's (1960) kappa inter-rater agreement coefficient (k) was used to assess agreement on the ratings of level of abstraction assigned to each of the 262 tags by the five judges and the researcher. The overall kappa coefficient for inter-rater agreement on levels of abstraction was substantial (k= 0.75), with the kappa coefficient ranging from 0.47 to 1 across the four content categories: agreement on the FRUIT category was outstanding (k= 1); agreement on the TOOL and CLOTHING categories was substantial (k= 0.68 for each); and agreement for the VEHICLE category was moderate (k= 0.45).

There were 31 tags with an average appropriateness score less than 2.5; these tags were excluded from the analysis of levels of abstraction. This left a total of 231 (20% of the 1219 unique tags) which had been identified as superordinate level terms (e.g., tool, clothing, fruit), basic level terms (e.g., orange, car, hammer), or subordinate level terms (e.g., ice-cream truck, Satsuma orange, denim shirt).

As shown in Table 3, more of the unique tags identified with one of the three levels of abstraction were assigned to resources in the TOOL content category (93, or 40.3%) than to resources in the CLOTHING content category (50, or 21.6%), the VEHICLE content category (45, or 19.5%), or the FRUIT content category (43, or 18.6%). Overall, unique tags representing the subordinate level were more numerous across all four content categories and accounted for just over two-thirds (156 tags, or 67.5%) of the unique tags identified with one of the three levels of abstraction.

Analyzing all assignments of the unique tags provides a different picture. Participants assigned the 231 unique tags a total of 2393 times. Of these 2393 tags, basic level tags were assigned more frequently than either subordinate or superordinate tags: participants assigned 898 basic level tags, which accounted for 37.5% of all tags identified with a level of abstraction; 785 subordinate level tags, which accounted for 32.8%; and 710 superordinate level tags, which accounted for 30%. As Table 4 demonstrates, more tags identified with a level of abstraction were assigned to resources in the FRUIT content category (831, or 34.7% of all tags identified with a level of abstraction) than to re-

Category/Level of abstraction	Superordinate	Basic	Subordinate	Total
TOOL	9 (3.9%)	13 (5.6%)	71 (30.7%)	93 (40.3%)
CLOTHING	16 (6.9%)	12 (5.2%)	22 (9.5%)	50 (21.6%)
VEHICLE	5 (2.2%)	4 (1.7%)	36 (15.6%)	45 (19.5%)
FRUIT	7 (3.0%)	9 (3.9%)	27 (11.7%)	43 (18.6%)
Total	37(16%)	38 (16.5%)	156 (67.5%)	231

Table 3. Distribution of Unique Tags Representing the Superordinate, Basic and Subordinate Levels of Abstraction as Percent of 231 Unique Tags

Category/Level of abstraction	Superordinate	Basic	Subordinate	Total
TOOL	266 (11.1%)	255 (10.7%)	190 (7.9%)	711 (29.7%)
CLOTHING	259 (10.8%)	113 (4.7%)	79 (3.3%)	451 (18.8%)
VEHICLE	9 (0.4%)	178 (7.4%)	213 (8.9%)	400 (16.7%)
FRUIT	176 (7.4%)	352 (14.7%)	303 (12.7%)	831 (34.7%)
Total	710 (29.7%)	898 (37.5%)	785 (32.8%)	2393

Table 4. Distribution of All Tags Representing Superordinate, Basic and Subordinate Levels of Abstraction Assigned to Four Content Categories (n=2393)

sources in the TOOL content category (711, or 29.7%), the CLOTHING content category (451, or 18.8%), or the VEHICLE category (400, or 16.7%).

4.2. Hypotheses Testing

Hypothesis testing: H1

To determine if the category of a resource's intellectual content influenced the assignment of superordinate, subordinate and basic level tags by participants, the following null hypothesis was tested:

> H1. The frequency of occurrence of superordinate, subordinate and basic level tags assigned to resources representing one category of content is the same, both within and across subjects, as the frequency of occurrence of superordinate, subordinate and basic level tags assigned to resources representing other categories of content.

Results of repeated measures of ANOVA between- and within-subjects demonstrated statistically significant differences in the frequency of occurrence of superordinate, subordinate and basic levels tags across TOOL, FRUIT, and CLOTHING content categories. The frequency of occurrence of superordinate, subordinate and basic level tags for the TOOL content category was significant at p = .05, F (df=2, 117) = 3.020; for the CLOTHING content category at p = .000, F (df=2, 115) = 32.946; and for the FRUIT content category at p = .000, F (df=2, 117) = 14.647.

A post-hoc pairwise comparison of the means for frequency of occurrence of superordinate, subordinate and basic tags representing in the TOOL, FRUIT and CLOTHING content categories. Tukey's HSD test indicated that tags in the TOOL content category did not differ significantly. However, Tukey's HSD test showed that the frequency of occurrence in the FRUIT content category was significant for both basic level tags and subordinate level tags at p = .00. Tukey's HSD also showed that frequency of occurrence in the CLOTHING content category was significant for both superordinate level tags and basic level tags at p = .00. The zero-inflated negative binomial (ZINB) regression model, used to model data collected for the VEHICLE category, did not demonstrate a significant relationship between the superordinate, basic and subordinate level tags assigned to resources in the VEHICLE content category.

Because analysis showed significant statistical differences in the frequency of occurrence of basic level tags when compared to superordinate and subordinate level tags in the TOOL, FRUIT and CLOTHING categories, null hypothesis H2 was rejected.

5.0 Discussion

In line with previous studies of folksonomies (e.g., Heckner et al. 2008b), this study observed prevalence of content-related tags (5120 tags, or 67.2% of the total of 7617 tags) in the user-generated vocabulary. Out of 5120 content-related tags, 2393 tags (or 46.7%) were subject-related and 2727 (or 53.3%) were descriptive. Subject-related tags predominated in the FRUIT content category (831 tags, or 16.2% of the total of 2393 subject-related tags) and descriptive tags in the CLOTHING content category (855, or 16.7% of the total of 2727 descriptive tags).

In contrast to a pretest for this study (Hajibayova and Jacob 2014), which did not find overall significance in the assignment of subject related tags at the superordinate, subordinate and basic levels of abstraction, this full study found significant differences in the frequency of assignment of superordinate, subordinate and basic level tags (p = .00; p = .05, and p = .002, respectively) across four content categories. Post-hoc analysis revealed statistically significant variances in the frequency of assignment of superordinate, p = .00, and basic level tags, p = .00, for resources in the CLOTHING content category and in the frequency of assignment of basic level, p = .00, and subordinate levels of tags, p = .00 for resources in the FRUIT content category. However, no significant variances were found for tags assigned to resources in the TOOL and VEHICLE content categories.

Although assignments of the 231 unique tags demonstrated prevalence of basic level tags (i.e., 898 basic level tags or 37.5% of the 2393 tags identified with one of the three levels of abstraction), unique tags were comprised mainly of subordinate level tags across the four content categories (156 tags, or 67.5% of the 231 unique tags identified with one of the three levels of abstraction). Overall, these findings do not support the suggestions of previous research (e.g., Golder and Huberman 2006; Munk and Mork 2007b) that basic level categories are the primary source of the perceived agreement on user-generated tags.

The findings of this study also raise questions regarding Green's (2006) operationalization of basic level categories based on WordNet's hierarchical structure: Because the study found that predominant levels of abstraction in tags varied across content categories, operationalizing the basic level of categories (i.e., tags) based on a structure that fails to establish a term's exact semantic level and ignores varying context in which it may be used is problematic.

Although the theory of basic level categories proposes that categories at the basic level of conceptual abstraction are more cognitively efficient and therefore more accessible to users, the contextual nature of basic level categories

leads to problems in applying the theory across individuals, situations and cultures. In contrast to Rosch's (Rosch et al. 1976) study of basic level categories, which was based on naming and sorting of images and listing of concrete objects, this study attempted to simulate a real-world tagging experience using links to actual resources representing four content categories (TOOL, CLOTHING, FRUIT, VEHICLE). Thus, observed variances in the assignment of superordinate, subordinate and basic level tags across the four content categories suggest that the use of "things" (Heidegger 1953/1996) is directly related to the individual's perception and understanding of those things: that "things" do not have an independent meaning that exists outside the individual's understanding (Hajibayova 2013). Thus, how individuals will represent a "thing" is influenced by not only what "we are now conscious of" but also the "dispositions we consciously use in understanding what now happens" (Hajibayova and Jacob 2012).

The process of identifying levels of abstraction for tags also revealed that the meanings ascribed to terms and level of abstraction ascribed to a particular term are contingent upon their use in the forms of life (Wittgenstein 1953/1963) and interwoven with an individual's specific point of view and experience. For example, in contrast to Rosch et al.'s (1976) study, judges did not agree on defining the tag Levi's as a subordinate level of abstraction in the category CLOTHING even though use of the manufacturer's name is routinely used to represent a distinctive type of clothing. Similarly, brand names for cars (e.g., Honda, Chevrolet) were not recognized as subordinate level tags in the VEHICLE category even though they figured in Battig and Montague's (1969) findings for items belonging to the category VEHICLE that were commonly generated by participants in their study.

Based on the statistically significant variations observed in the tagging vocabulary generated by participants, this study suggests that the content of resources may affect the composition of user-generated tagging vocabularies. More importantly, the study results suggest that assumptions linking agreement on tags in a user-generated vocabulary to the basic level of conceptual abstraction may not be appropriate.

5.1 Limitations

Several factors may have affected the results of this study, such as representativeness of study participants, knowledge domain, and age as well as the limited number of content categories. It is also possible that a more nuanced analysis might produce different results in summarizing the judges' assessments of the appropriateness. However, this exploratory study provided a venue for detailed and accurate analysis of the generated tagging vocabulary. This study provides a foundation for future studies of user-generated tagging vocabularies to compare different populations with respect to differences in tags due to resource content as well as levels of abstraction in tags.

6.0 Conclusion

One of the underlying findings of this study is captured in by the title of Roger Brown's article published in 1958: How shall a thing be called? Categories and the hierarchical relationships among them vary across individuals and cultures because of differences in the everyday experiences and activities of individuals as well as cultural norms and expectations. This study suggests that user-generated vocabularies can be quite dynamic and multifaceted and will generally be comprised of terms at multiple levels of abstraction, thereby controverting suggestions that the basic level of tags are predominant and "widespread in agreement" (Golder and Huberman 2006, 202).

Although taggers employed tags that were categorized as genre, manufacturer/brand, or even date, among others, a majority of tags were identified as content related – as representing the intellectual content of resources. Within the framework provided by Heidegger's (1953/1996) notion of handiness, variation in the concepts represented and in the level of abstraction of content related tags is both natural and phenomenological in that perception and understanding – and thus the meaning of "things" – arise out of the individual's contextualized experiences of engaging with objects (Hajibayova 2013). Although this study focuses on the tagging vocabulary generated by a small group of participants, its controlled focus on a limited number of content categories underscores the heterogeneity of representation that characterizes user-generated tagging vocabularies.

Before accepting the utility of representations at the basic level of abstraction, future studies should analyze the use of superordinate, subordinate and basic level representations across a wide range of language groups and domains. Studies of user-generated vocabularies will further this effort and could facilitate the development of user-centered systems of knowledge representation and organization, potentially providing more "organic" integration of controlled or "artificial" (Lancaster 1977, 23) and user-generated vocabularies and improve the "findability" (Morville 2005) and effective use of the knowledge resources.

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