

Tag Clouds: Data Analysis Tool or Social Signaller?

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Abstract

We examine the recent information visualization phenomenon known as tag clouds, which are an interesting combination of data visualization, web design element, and social marker. Using qualitative methods, we find evidence that those who use tag clouds do so primarily because they are perceived as having an inherently social or personal component, in that they suggest what a person or a group of people is doing or is interested in, and to some degree how that changes over time; they are visually dynamic and thus suggest activity; they are a compact alternative to a long list; they signal that a site has tags; and they are perceived as being fun, popular, and/or hip. The primary reasons people object to tag clouds are their visual aesthetics, their questionable usability, their popularity among certain design circles, and what is perceived as a bias towards popular ideas and the downgrading of alternative views.

1 Introduction

Tag clouds are visual representations of social tags, displayed in paragraph-style layout, usually in alphabetical order, where the relative size and weight of the font for each tag corresponds to the relative frequency of its use (see Figure 1). Tag clouds are becoming increasingly popular as visualizations on personal and commercial web pages, blogs, and social information sharing sites such as flickr and del.icio.us.¹ The data used as input to tag clouds are usually social tags (the unstructured annotation of information by authors or readers of that

information, using short textual labels known as “tags”) [8], although search engine query terms, word frequencies within documents, and pre-existing category labels are also currently visualized in this manner.

On the web, tag clouds are increasingly popular, but their exact purpose is unclear, especially since their ability to accurately convey information is debatable. This paper examines the question: what are designers’ intentions in creating or using tag clouds, and how do they expect their readers to interpret them? To address this question, we performed a qualitative assessment of the current use and perceived advantages and drawbacks of tag clouds.

2 Visual Considerations

Some interface design components are generally non-controversial, such as the use of navigation bars in websites. Other visual design elements are generally criticized for their lack of utility. For example, adding 3D to pie charts and bar charts is frequently disparaged as a poor choice from a usability perspective [5, 20], but this technique is nevertheless often used by authors because it “jazzes up” a presentation.

Tag clouds are intriguing in part because they contain what a data visualization expert would consider both good and bad design elements, in comparison with a simple list of tags. On the positive side, the representation is compact, and draws the eye towards the largest, and presumably most important items, and three dimensions are represented simultaneously (the words themselves, their relative importance, and alphabetical order).

On the negative side, tag clouds have several drawbacks from a perceptual perspective. First, it is difficult to compare all of the tags with a similar size. Visualization experts such as Tufte [20] warn against the dangers of making visual comparisons difficult in data analysis.

¹ As of June 2007, Google estimates more than 15M hits for the query “tag cloud”.



Figure 1: Tag cloud in standard (alphabetical) order, showing most popular tags from the bookmark sharing website, del.icio.us.

Related to this, indicating a word’s importance by size causes problems. The length of the word is conflated with its size, thus making its importance seem to be a function in part of the number of characters it contains. Figure 2 shows the same data as in Figure 1, but with the tags ordered by their frequency or importance (represented by their size). When showing tags in this order, it is not clear if varying the font size poses any advantages over simply listing the terms in order of importance. Perhaps for this reason, tag clouds ordered by size are rarely used.

Another problem with the typical tag cloud layout is that items with similar meaning may lie far apart, and so meaningful associates may be missed. Worse, the reader may make false assumptions about what data is available based on which items happen to be visually adjacent. For example, in Figure 1, the tags *mac* and *linux* are adjacent and of somewhat similar size and weight, and so it is easy to see this co-occurrence and compare their relative sizes. However, the viewer may think these are the only operating systems mentioned, and so may miss the smaller and distant references to *windows* and *osx* (and the latter tag suggests that *mac* may be referring to the computer, not the OS, but it’s adjacency to *linux* may bias the reader). Similarly, it is difficult to pick out all the programming languages or all the country names.

Additionally, there is no natural visual “flow” through

the display; the irregularity of the view probably causes the eye to dart around erratically (although eye tracking studies have yet to be published). However, this irregularity may be part of the appeal of the design, and may give the viewer a feeling of exploration. In a study of visualization of images, Rodden et al. [18] showed that a clustering algorithm that grouped images by general visual similarity seemed to cause the images to visually “merge” and made it harder for participants to select images compared to a *random* layout. (They note, however, that a semantically-motivated organization was preferred over the other two.)

These drawbacks suggest that the best use of tag clouds is probably not as a navigational tool nor as a tool for understanding abstract information. The qualitative study described below attempts to determine if the designers who use tag clouds intend them to be used as navigation aids, and if not, then what their primary purposes seem to be. The following excerpts give a taste of the data, showing that in some cases, authors are of two minds about tag clouds:

“Whether you call them tag clouds, heat maps, or just eclectic ransom notes, I think visual presentations of content via oddly-sized labels are fun to look at. They may even be usable. But let’s not worry about that yet.”²

² pencoyd.com/clock/2005/06/

design blog software webdesign tools web2.0 programming
reference linux music web video art photography css
javascript blogs news howto free tutorial inspiration flash java
development mac travel business education shopping games security
imported research technology opensource tips ajax google windows search books
politics firefox internet food rails photoshop toread science osx library community
portfolio apple health photos mobile graphics resources php ruby python photo funny
productivity ubuntu home fun cool youtube marketing media freeware illustration humor tv
history wordpress online download work webdev finance .net hardware lifehacks fashion maps
audio culture computer recipes article seo videos interesting advertising html diy microsoft secondlife
jobs social tutorials movies gtd gallery magazine tech typography flickr writing images network usability
gps government game english mp3 email rss baby architecture wiki environment tool networking learning
economics cms patterns sga podcast radio fic database statistics management

Figure 2: Tag cloud in frequency order, from the bookmark sharing site, del.icio.us.

“Tag Clouds can simplify the navigation or confuse the visitors. Used effectively, they can provide help and emphasize the main topics and themes being tackled in a blog. However, sometimes they simply don’t fit and make both readability and usability more difficult.”³

3 Related Work

Although some work has been published on how tags are assigned [14, 1, 2, 19], on how tag assignment converges [6, 16, 3], and how interface design can effect tag assignments [16], there is little published research on the usability of tag *clouds*.

Two papers have appeared that compare the usability of tag clouds to more standard list views for information processing tasks. Rivadeneira et al. [17] conducted two studies. In the first they compared tag layout along three dimensions: tag size, tag proximity to a tag with a large font, and position of tag within the display when broken into quadrants. The study included 13 participants whose task was to recall if a tag was seen after viewing a distractor task. They found effects for tag size and quadrant location (those in the upper left were recalled better, as were those displayed with larger tags).

Rivadeneira et al. [17] used these results to inform a second study with 11 participants, in which they com-

pared the following four views (descriptions reworded from the original to improve clarity):

1. A paragraph-style tag cloud with varying font size, tags shown in alphabetical order.
2. A paragraph-style tag cloud with varying font size, tags shown in descending frequency order.
3. A variation on standard tag clouds with a specialized layout that is more cloud-like and spatial (there was no fixed baseline for the tags, which differs from standard paragraph-style tag clouds), but still using varying font sizes and still somewhat alphabetically ordered.
4. A vertical single column list with no font size variation, shown in frequency order rather than alphabetical.

Note that this study does not include the case of a simple alphabetical list with no font size variation.

The 11 participants were asked to perform a gisting task. For each of 12 trials, they were shown 40 words drawn from 4 categories (out of 44 categories possible) for 30 seconds, and afterwards were asked to name the four target categories. Participants performed significantly better at gisting using the simple vertical list with no font size variation. The authors also asked participants to do a word recognition task, but the experimental method was not described in detail. The authors reported that recognition of words with larger font size

³ www.smashingmagazine.com/category/trends/

was significantly higher than words with smaller font size, but did not find a difference based on layout.

In another study by Halvey and Keane [7], 62 participants were asked to perform a selection task (find a given country name out of a list of 10 countries). They were tested on 6 different visual variations:

1. Horizontal list, only one font size, order not specified.
2. Horizontal list, only one font size, alphabetical.
3. Vertical list, only one font size, order not specified.
4. Vertical list, only one font size, alphabetical.
5. Spatial layout, three different font sizes used, order not specified.
6. Spatial layout, three different font sizes used, order alphabetical.

The assignment of font size to country name was determined randomly. The spatial layout was not described in detail but was said to typically span three lines of the display. Alphabetical listings were fastest in all cases, and lists were faster than spatial organization in all cases. (There is a possibility that the relative font size choices effected the results, as some participants said they could not “see” the answers when they were in tags with very large font).

Thus, although the experimental work is limited, the results trend towards the conclusion that spatial tag clouds are a poor layout compared to lists for information recognition and recall tasks. Unfortunately, these studies did not record subjective reactions to the different layouts.

In a different kind of comparison, Kuo et al. [15] compared a tag cloud representation of search results to a standard listing of search results: the PubMed system for bioscience literature search. The tags were words automatically extracted from the retrieved abstracts. The font size was used to indicate term frequency and font color used to indicate recency (computed as average publication date for the documents containing the word). Only the most frequent words were shown as tags, and these were hyperlinked to the articles containing those words. In the usability study, 20 people each ran two queries with only one of the interfaces (between participants design). The quality of participants’ answers were higher on a descriptive task with the tag cloud interface, but less accurate on a relational task (e.g., name three genes involved in process P). Overall, the participants were slower with the tag cloud view. Participants rated the tag clouds as less “helpful” but with higher “satisfaction” than the PubMed interface.

Some research has been done on alternative tag cloud layouts. For example, Hassan-Montero &

Herrero-Solana [9] propose clustering tags based on co-occurrence similarity, and then showing the tags from each cluster along a centered line. They do not evaluate this variation. Kaser & Lemire [13] describe algorithms for many variations of tag cloud layout.

There is considerable related work in the visualization of the meanings of documents and document collections [10]. Those visualizations primarily attempt to show relationships among documents’ topics or between query terms and retrieval results. Some show a summary of a collection in terms of the words in the collection, but their visual presentation differs from that of tag clouds.

4 Interviews

4.1 Method

To gain insight on what web designers think about tag clouds and why they use them, the first author conducted in-person interviews of 20 people who are active in either web design or information visualization research. The first 15 interviews were conducted at a conference on topics related to Web 2.0 and technology. Three more interviews were done at a usability group at a major technology company, and the final two were of researchers at or visiting our university. Eight participants were female.

Interviewees were first asked a general question about what they thought of tag clouds, and then asked detailed follow-up questions. The interviewees were not viewing tag clouds nor looking at a computer screen during the interview. This clearly is not a scientifically selected sample of people; the outcomes of these interviews should be seen only as opinions and anecdotes.

4.2 Results

One of the most surprising results was that a significant proportion of interviewees did not realize that tag clouds are regularly organized into alphabetical order. Eighteen interviewees were asked if they knew what order the tags are typically shown in; of these, 7 acknowledged that they had not realized that most clouds are shown alphabetically.⁴ Two of these people had had programmers build the tag clouds for their own prominent web sites and had used the tags to explore their sites.

For those who had not realized the default was alphabetical ordering, they were asked what order they thought the tags were organized in. Their (slightly paraphrased) responses were: had not thought about it (4), don’t read tag clouds in that way (1), thought they were

⁴ This question was not asked of the first two interviewees, since the surprising phenomenon did not arise until the third interviewee.

in random order (1), and thought they were organized according to a semantic closeness metric (1).

Two interviewees thought tag clouds are useful for navigation, but two others thought they are poor for this. One interviewee commented on how he liked seeing the relationships among the tags in the clouds. Two interviewees explicitly mentioned that tag clouds are better than lists, one of these saying this is because they are “easier to take in holistically.”

Three people stated that tag clouds are useful for showing trends. Two interviewees said they were useful for showing dynamic or changing information. One interviewee discussed monitoring the tag cloud for a friend’s photos, and noted that acquisition of what appeared to be a new love interest by the new appearance and increase in size of a person’s name in the tags.

One interviewee suggested that one of the main purposes of tag clouds is the signaling of the availability of tags on the website. In a related point, two interviewees thought that tag clouds are a good way to get the gist of the site. One of these people thought they were useful for showing what kinds of information are appropriate for a site, and another said they “express the interests of the community”. Three people mentioned tag clouds are a “playful,” “fun,” or “inviting” way to get people interacting with the site.

One interviewee noted that a tag cloud showing one’s own tags can be evocative, as a good summary of what one is reading and thinking about, and useful for personal self-reflection. This person said that when associated with an individual, tag clouds allowed for comparison of that person’s tags with one’s own interests, to see what is shared and what diverges. This person noted that the clouds are useful for personal self-reflection as well as for showing other people what one is thinking about.

Three interviewees explicitly mentioned liking the fact that larger tags implied more popular kinds of information. One participant strongly disliked the focus on the popular and the marginalizing of the less popular implied by the visualization.

Finally, two interviewees pointed out that tag clouds are easy to code, suggesting that might be one reason for their popularity.

5 Web Page Analysis

5.1 Method

Informed by the results of the interviews, both authors searched for, read, and coded web pages that discussed tag clouds. An individual web page may contain several discussions of tag clouds; in those cases we divided them into separate units for labeling. After an initial pass over about 140 discussions, we developed a set of

28	Existence of (a) tag cloud(s) / definition
25	Popularity/Faddishness of the phenomenon
25	Issues surrounding implementation
11	Indicates community behavior / shows tags available
9	Cool or good idea
9	Circumstances in which useful
8	Options for presentation (color, alpha sorting)
7	Not easier to navigate/search
6	Time/trend/frequency comparison of tags
5	Easier to navigate/search
5	Not cool or bad idea
5	Issues surrounding certain tags being bigger and thus more popular
4	Someone showing off
3	The fun factor
3	Relationship to personal content
3	Not discussing tag clouds
3	Negative visual aspects
3	Tagclouds as a metaphor
2	Positive visual aspects
1	Issues surrounding aesthetics

Table 1: Frequencies of coding labels assigned to comments found on the web about tag clouds. There are in total 165 labels for 118 comments drawn from 85 postings.

20 codes for the content of the discussions (see Table 1). In an attempt to get more systematic coverage of the discussions, we then retrieved and coded another 85 discussions of tag clouds using the following method. We devised several web queries (“tag clouds” usability, “tag clouds” trends, “tag clouds” navigation), issued the query to the search engine (Google), and sampled every 10th url from the results. Of these pages, 61% were drawn from personal blogs, 13% from commercial blogs, 12% from commercial web pages, and the rest from group blogs and discussion lists. Table 1 shows the frequency with which each category was assigned to a comment. On average, we extracted 1.4 comments per posting, and assigned 1.9 categories per posting.

Selecting web pages on the basis of search engine query hits cannot be claimed to be an unbiased or representative set of views about a given phenomenon. More general surveys with scientific sampling methods must be issued to get a representative view, in part because it is of course important to find out what people who do *not* write about a phenomenon think about it. Nevertheless, a summary of what *is* being written publicly is useful for those interested in the phenomenon.

Below we show a sample excerpt, which was assigned the labels *Not cool or bad idea*, *Negative visual aspects*, and *Tagclouds as metaphor*.

“Why I hate tag clouds

The hows and whys of tag clouds are actually very cool. Drumroll please for the Tag Cloud Heroes: Now starring in Flickr, Technorati, del.icio.us et al. Thanks to Douglas Coupland for the concept, to author Jim Flanagan for the zeitcode and to TagCloud for a weekend project that has made Web 2.0 what it is today. Full Folksonomy ahead!

But hell, tag clouds can be fugly. Well what do you expect? I’m a gal, I like pretty things. When I hear cloud I expect to see something ethereal and evocative of Apollo, Athena, Zeus. I expect the billowing cumulus, feathery cirrus, arrow-straight contrails that grace big, open skies. At the very least, give me some scalloped edges and a glimpse of a silver lining. Is this too much to ask?

Instead, tag clouds are rendered as bulge-ugly squares of busy words behaving in an alphabetically correct manner and dressed in different font sizes to reflect tag popularity. It’s so very weighted list.”⁵

5.2 Results

Twenty-eight of the comments that we coded simply mentioned or defined tag clouds, or pointed the reader to existing designs. Twenty-five described implementation details or ideas, or described alternative methods of presentation (e.g., suggestions about varying the colors of the tags, discussions of how to make the size scaling look better, suggestions of alternatives such as heat maps or ordering by some metric other than alphabetical). For the purposes of this discussion, we are interested in those comments that discussed what was perceived as being good or bad about tag clouds, and what they are useful for, or not useful for. These results are summarized in the following subsections.

5.2.1 Popularity and Faddishness

There was considerable discussion of the popularity of tag clouds. Twenty-five postings commented on the impression that tag clouds are trendy, a fad, popular, and/or signal “Web 2.0” affiliation. However, their popularity has been questioned in a particularly well-known blog post titled “Tag clouds are the new mullets” which appeared at Zeldman.com in April 2005⁶. This post seems to have cemented one viewpoint that tag clouds should be derided for their faddishness. Two

⁵ www.frb2u.com/2006/09/06/tag-clouds.html

⁶ www.zeldman.com/daily/0405d.shtml

authors self-consciously referred to this post when justifying their affinity for tag clouds. Two other designers justified the use of tag clouds because of their popularity, stating that their customers or clients (will) like them because they are fashionable. There was little consensus on if they are simply a fad or will have lasting value.

In a related vein, three posts praised the fact that the visualization emphasizes the most popular (largest) tags.

“Prioritizing popular categories with larger fonts allows readers to quickly determine how much content to expect in various categories before clicking.”⁷

“Tag-Clouds and other tag visualizations: How could we discuss finding information in tagging systems and not mention tag-clouds. Its the classic visualization related to tags (if anything related to tags could be called classic!). And it serves a very important purpose. It lets important stuff (as defined by frequently used) bubble to the top. While there are a lot of criticisms of tag-clouds, overall I kind of like them. However, I do believe that both from a cloud-content and visualization perspective, much can be done to improve them.”⁸

But two posts found this to be the most objectionable aspect of the visualization, feeling that it marginalizes less popular topics, and promotes conformity. One of this posts, and an additional one, mentioned the “long-tail” missed opportunities of focusing on the popular:

“Tag Clouds are a result of public tagging. Tag Clouds are interesting in that it shows what words are most often used to describe content. But what if you have a similar piece of content, and you wish to tag it to get the most visibility? You would have to conform to everybody else’s standard. As specific tags become more popular (gain more prominence in the cloud), the less popular tags begin to recede and disappear. Alternate classifications get squashed in favour of the more popular way of thinking. It’s like being in secondary school all over again.”⁹

“First, they’re yet another example of the Power Law at work. You might think that being told what items are the most popular is a

⁷ www.technologyevangelist.com/2006/03/switching_from_categ.html

⁸ www.rashmisinha.com/archives/06_07/tag-findability.html

⁹ blocklevel.com/weblog/information_architecture/tag_youre_it/

good idea. But the Long Tail has the effect of minimizing the importance of the road not taken. Chat up the popular kids at school and you're likely to miss out on the really interesting conversations with the geeks, the smokers, and the weirdos in the A/V club.

Second, you're at the mercy of the tagger(s) to use a consistent set of tags. If people tag their data as 'house', 'home', 'apartment', 'condo', or 'domicile', tag clouds aren't going to give as useful an aggregation. Defenders of the folksonomy concept (and man I hate that word) suggest that free-wheeling tagging is powerful, but it can also lead to chaos."¹⁰

One additional post mentioned that when shown to novice users, they did not understand what the font size corresponded to.

5.2.2 The Role of Navigation

Opinions varied as to the usefulness of tag clouds for navigation. Five authors simply stated they are useful for this purpose but did not elaborate as to why or defend the claim. Seven noted that the compactness of the representation relative to that of a vertical list makes navigation easier (although for the most part these authors do not address if and why the varying font size and weights contribute or detract from the navigability).

Seven authors objected to the representation for navigation on the grounds that the varying size of the tags emphasizes those that are most popular, making it difficult to view other options, and also making it difficult to visually scan the tags. Two objected to the lack of meaningful organization, arguing for a faceted [11] organization of tags. An example of a stated reason for navigation problems (after selecting a tag, other tags are usually not shown) is shown below:

"It is quite convenient to search in a tag cloud with a couple of hundred items. A drawback of the cloud, though is that one can only search for one tag at a time. When the search hits are shown, a list of related tags is shown that share at least one item with the chosen tag. The user can then proceed to view the items attached to one of these tags, but the first tag is subsequently forgotten."¹¹

Three examples of people arguing in favor of tag clouds for navigation follow:

¹⁰ www.web2.0television.com/blog/2006/07/21/tag-clouds-suck-sometimes/

¹¹ blog.thinkphp.de/plugin/tag/bookmarks

"Tag clouds are a visual display of the use of tags throughout a site. The more common a tag is used, the larger the word will be shown. Using a cloud, a user is able to quickly browse through a large set of words to find the more popular and possibly appealing articles to view."¹²

"The cloud is good for showing you which terms I applied most frequently, while the hierarchical list excels at being exhaustive and supporting skimming for known items."¹³

"Why use a tag cloud rather than a list of categories? ...

1. The list of categories eventually grows to an unmanageable size, running on and on down one column of the site. 2. Many categories have few posts, so visitors clicking into those categories will likely be disappointed with the limited content on a subject that interests them. ...

How does a tag cloud address the category problem? 1. By moving the categories to a separate page, then publishing them consecutively rather than in a long bulleted list, readers can survey all of the site's categories without scrolling. ..."¹⁴

As mentioned above, the interviews suggested that some people do not consciously notice that most tag clouds have an alphabetical organization. This suggests that the potential advantage they have from providing this third dimension of organization is not realized for many viewers. In alignment with this, although ten commentators mentioned alphabetical ordering as typical of tag cloud layout, none explicitly commented on this being a useful aspect of tag clouds and two implied that the alphabetical ordering specifically is not helpful.

5.2.3 Impact on and Reception by New Users

There was disagreement about the emotional or aesthetic appeal of tag clouds, especially for lay users. In our initial pool of postings we found references to tag clouds' look as being a "mess," "strange," and even like a "ransom note." Three posts in the study sample indicated that new users do not react well to tag clouds; two are shown below:

¹² blog.jphantom.com/

¹³ urlgreyhot.com/personal/subjects/classification_0

¹⁴ www.technologyevangelist.com/2006/03/switching_from_cat.html

“I have seen beginning users try to use tag clouds and the confusion I have observed was that people who were not tech savvy did not guess why the differences in size. Instead, they thought that there was something wrong with the service.”¹⁵

“Some days ago I had a speech at the uDay IV about ‘Folksonomy – can tagging refine information and do user understand the related navigation element Tag Cloud?’ The findings of my usability testing regarding Tag Clouds is deflating. You better don’t use them if usability matters. On the other hand the results of our analysis show clearly that Tagging (Folksonomy) is a technique that should already be applied today.”¹⁶

A counterpoint was provided by one author:

“I’ve had a number of UI traditionalists cast skepticism at the weighted list, but in experience with users, they get it and it’s at a minimum trendy if not actually more fun than the average UI.”¹⁷

One author predicted that they will become more familiar to novices over time.¹⁸ Published detailed studies are very much lacking and are needed to verify this point.

5.2.4 Trends

In the interviews, one of the main benefits seen in tag clouds is in their ability to show trends of tag use. In information visualization, the term “trend” is typically used to mean patterns of change over time, whereas the tag cloud visualization requires a considerable memory burden on the part of the viewer who wants to recognize change over time.

In the web page analysis, six postings talked about tag clouds as allowing for time or trend comparisons, but four of these mentioned alternative displays to better show trends, e.g.: “There are tag cloud animations that show you how the tag popularity increases over a period of time.”¹⁹ “Others are focused on dimensions of time in clouds, where interesting representations of velocity may force new variations on tag cloud display.”²⁰

The other two talked about how tag clouds as currently designed can show trends:

¹⁵ lists.whatwg.org/pipermail/discuss-interactiondesigners.com/2006-March/009181.html

¹⁶ blog.namics.com/2006/07/folksonomy_and_1.html

¹⁷ www.surfmind.com/muzings/?p=83

¹⁸ www.joelamantia.com/blog/archives/ideas/second_generation_tag_clouds.html

¹⁹ dorai.wordpress.com/tag/web-data-mining/

²⁰ www.surfmind.com/muzings/?p=83

“Think of how cool it would be as a merchant to watch those tag clouds evolve over time. Tracking the memes and themes that emerge from your site users’ site visits and behaviors could be a tremendously powerful and predictive tool for merchandising and product development.”²¹

“Watch for changes in tag clouds on social bookmarking sites. See one here. The size of the tag suggests what’s popular. Use it to detect trends. If you look sideways, you might even find some interesting clues for innovations in your markets.”²²

This may explain the value of having a few large-font tags: if a tag cloud viewer only notices the large tags, but therefore notices when a new large tag appears, perhaps the trends of interest are only which concepts are rising and falling as the most popular. There is another dictionary definition of the word “trend,” which is “A general tendency or inclination.” It may also be this sense that people intend when discussing tag clouds; they may help suggest the main tendencies of a person or a site in terms of what subject matter they discuss.

5.2.5 Tag Cloud Data as Social Data

One of the more striking points that came out of this analysis was the notion that tag clouds are to be applied to data representing human behavior, whether that of an individual or a group. One blogger noted the incongruity of the idea of an online library using frequencies of subject descriptors to represent the librarian’s conception of the importance of a concept, rather than have it represent actual patron’s usage of the contents of the library:

“Someone at work pointed out this discussion of OPAC as tag clouds on The Gordian Knot. OPAC stands for Online Public Access Catalog, the database you would use in a library to search for titles and manage your transactions.

The exploration of different methods for displaying terms is interesting, but what I point out is that a tag cloud serves a different purpose than a vertically arranged list – usually to display frequency of use of user-supplied keywords (freetags). That’s why it’s called a TAG cloud not a SUBJECT HEADING cloud, the difference being that tags are created and applied when the item being tagged is examined whereas the application of a subject heading

²¹ www.wildlyappropriate.com/category/Online-Commerce/

²² weblog.znetlady.com/2005/09/index.html

involves the selection of a term from an authorized list that's already been developed and is thus usually more or less static."²³

In an example taken from our initial analysis of web pages, one designer noted that the sizes of the tags did not change over time on an ecommerce site, and so assumed that the sites' designers were controlling the depiction of the cloud, hence invalidating it:

"On closer examination, I'm not buying that this is a user-generated tag cloud. These terms look like they have been written by the site's editors. I mean, who's really going to be using the phrases 'back talk' or 'gear & products' to search for things?

So, either these terms were created by the site's editors based on user search data, or they just made them up. I'm beginning believe the latter.

I even wonder if the relative importance given to the different terms is based on any actual user data."²⁴

Others expressed this idea of tag clouds as social information in terms of how the tag cloud shows the topics of interest to a community:

"You'll notice that ContentRobot's blog topic cloud reveals that business blogging and blogging basics are among the biggest areas that we write about."²⁵

"Visitors can also get a feel for our site's personality by analyzing our site's cloud structure. Clearly, we've shown a passion for certain categories more than others."²⁶

A related point is the use of tags to reflect one's own personality, as commented on in three posts, one of which was:

"Tag your existing web content at social bookmarking sites with appropriate tags. If a tag doesn't exist, just create one. Don't forget to subscribe to it, so you will know what others are tagging with the same tag. And, do look periodically at how the related 'cloud' is developing around your tags."²⁷

²³ urlgreyhot.com/personal/subjects/classification_0

²⁴ www.smileycat.com/miaow/archives/000256.php

²⁵ www.contentrobot.com/add-a-tag-cloud-to-your-blog-its-easy

²⁶ www.technologyevangelist.com/2006/03/switching_from_categ.html

²⁷ weblog.znetlady.com/2005/09/index.html

6 Discussion

If one accepts the premise that tag clouds are used specifically for portraying human mental activity, either of an individual or of a group of people, then what might be considered design flaws from a data visualization perspective make sense in terms of what information is intended to be conveyed. As noted by interviewees and designers' writings, a large part of the appeal of the visual appearance of tag clouds are its fun, non-conformist view, and the feeling that it evokes of human activity.

Donath [4], studying visualization of online conversations and other social interactions, anticipates this argument several years before the appearance of tag clouds, writing:

"Traditional data visualization focuses on making abstract numbers and relationships into concrete, spatialized images; the goal is to highlight important patterns while also representing the data accurately. This is a fine approach for social scientists studying the dynamics of online interactions. Yet for our purpose it is also important that the visualization evoke an appropriate intuitive response representing the feel of the conversation as well as depicting its dynamics ... [O]ne argument for deliberately designing evocative visualizations for online social environments is the existing default textual interfaces are themselves evocative, they simply evoke an aura of business-like monotony rather than the lively social scene that actually exists."

We have concluded that tag clouds are primarily a visualization used to signal the existence of tags and collaborative human activity, as opposed to a visualization used for data analysis. The flipside of this idea is the use of data analysis visualizations as settings for social activity. The Name Voyager baby names visualization tool by Wattenberg yielded surprisingly social behavior in its use [22]. This work has inspired the new area of social data exploration, much of which uses information visualization, as exemplified by the Many Eyes system [21] and the experiments with census data exploration of Heer et al. [12].

7 Conclusions

We have attempted to characterize the current writings and thinking of web designers and information visualization experts about the tag cloud visual representation. The limited research on the usefulness of tag clouds for understanding information and for other information processing tasks suggests that they are (unsurprisingly)

inferior to a more standard alphabetical listing. This could perhaps be remedied by adjusting white space, font, and other parameters, or by more fundamentally changing the layout.

That said, it seems that the main value of this visualization is as a signal or marker of individual or social interaction with the contents of an information collection, and functions more as a suggestive device than as a precise depiction of the underlying phenomenon. Designers who like them praise their fun, informal, and dynamic appearance, thinking they help characterize trends and invite exploration of and participation in the tagging community. Various authors have proposed alternative visualizations to compensate for some of its deficiencies, such as better depiction of change over time, but it may be the case that such changes, if implemented, will deprive the visualization of its appeal.

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References

- [1] M. Ames and M. Naaman. Why We Tag: Motivations for Annotation in Mobile and Online Media. *Proceedings of CHI'07*, 2007.
- [2] J. Bar-Ilan, S. Shoham, A. Idan, Y. Miller, and A. Shachak. Structured vs. unstructured tagging—A case study. *Proceedings of the WWW 2006 Collaborative Web Tagging Workshop*, 2006.
- [3] C.H. Brooks and N. Montanez. Improved annotation of the blogosphere via autotagging and hierarchical clustering. *Proceedings of the 15th international conference on World Wide Web*, pages 625–632, 2006.
- [4] J. Donath. A semantic approach to visualizing online conversations. *Communications of the ACM*, 45(4):45–49, 2002.
- [5] S. Few. *Show Me the Numbers*. Analytics Press, 2004.
- [6] S. Golder and B.A. Huberman. The Structure of Collaborative Tagging Systems. *Arxiv preprint cs.DL/0508082*, 2005.
- [7] M.J. Halvey and M.T. Keane. An assessment of tag presentation techniques. *Proceedings of the 16th international conference on World Wide Web*, pages 1313–1314, 2007.
- [8] T. Hammond, T. Hannay, B. Lund, and J. Scott. Social bookmarking tools (I). *D-Lib Magazine*, 11(4):1082–9873, 2005.
- [9] Y. Hassan-Montero and V. Herrero-Solana. Improving Tag-Clouds as Visual Information Retrieval Interfaces. *Merida, InSciT2006 conference*, 2006.
- [10] M. A. Hearst. User interfaces and visualization. In Ricardo Baeza-Yates and Berthier Ribeiro-Neto, editors, *Modern Information Retrieval*, pages 257–323. Addison Wesley, ACM Computing Series, 1999.
- [11] M. A. Hearst, J. English, R. Sinha, K. Swearingen, and K.-P. Yee. Finding the flow in web site search. *Communications of the ACM*, 45(9), September 2002.
- [12] J. Heer, F.B. Viégas, and M. Wattenberg. Voyagers and voyeurs: supporting asynchronous collaborative information visualization. *Proceedings of the CHI'07*, 2007.
- [13] O. Kaser and D. Lemire. Tag-Cloud Drawing: Algorithms for Cloud Visualization. In *WWW'07 Workshop on Taggings and Metadata for Social Information Organization*, 2007.
- [14] M.E.I. Kipp and D.G. Campbell. Patterns and Inconsistencies in Collaborative Tagging Systems: An Examination of Tagging Practices. *Proceedings of the ASIST 2006*, 2006.
- [15] B.Y.L. Kuo, T. Hentrich, B.M. Good, and M.D. Wilkinson. Tag clouds for summarizing web search results. *Poster paper in the Proceedings of the 16th international conference on World Wide Web*, pages 1203–1204, 2007.
- [16] D.R. Millen, J. Feinberg, and B. Kerr. Dogear: Social bookmarking in the enterprise. *Proceedings of CHI'06*, pages 111–120, 2006.
- [17] AW Rivadeneira, D.M. Gruen, M.J. Muller, and D.R. Millen. Getting our head in the clouds: toward evaluation studies of tagclouds. *Proceedings of the CHI'07*, 2007.
- [18] K. Rodden, W. Basalaj, D. Sinclair, and K. Wood. Does organisation by similarity assist image browsing? *Proceedings of the CHI'01*, pages 190–197, 2001.
- [19] J. Trant and B. Wyman. Investigating social tagging and folksonomy in art museums with steve. museum. *Collaborative Web Tagging Workshop at WWW2006, Edinburgh, Scotland, May*, 2006.
- [20] E.R. Tufte. *Visual explanations*. Graphics Press Cheshire, Conn, 1997.
- [21] F. B. Viegas, M. Wattenberg, F. v. Ham, J. Kriss, and M. McKeon. Many eyes: A site for visualization at internet scale. *Proceedings of Infovis*, 2007.
- [22] M. Wattenberg and J. Kriss. Designing for Social Data Analysis. *IEEE Transactions on Visualization and Computer Graphics*, 12(4):549–557, 2006.