

# The Ontology of Tags

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## ABSTRACT

Social bookmarking sites such as Flickr, del.icio.us, and CiteULike have adopted folksonomic systems where users tag entities with keywords. These tagging systems replace traditional taxonomic systems that employ hierarchical categorization schemes. While there are some differences in how these tagging systems are constructed, e.g., as broad or narrow folksonomies, there has been confusion as to whether tagging constitutes a collaborative activity or a collective one. The distinction between collaborative and collective influences the theoretical assumptions upon which research is conducted. Researchers have adopted a semiotic theoretical perspective as an avenue for discerning emergent semantics of folksonomies. If tagging systems are to be useful to social media or semantic technologies, if we are to indeed discern the semantics emergent from folksonomies, then we need to understand the ontology of tags. This paper examines some of the fundamental ontological assumptions regarding tagging and folksonomies.

## Categories and Subject Descriptors

H.1.1 [Information Systems]: Models and Principles—Systems and Information Theory (Value of information); H.3.1 [Information Storage and Retrieval]: Content Analysis and Indexing Methods; H.3.5 [Online Information Services]: Data sharing

## General Terms

Theory, Design

## Keywords

Folksonomies, tags, tagging, cultural, schemas, ontology, semantics, Heidegger

## 1 TAGS IN FOLKSONOMIES

Folksonomies is a term coined by Vander Wal [39] to refer to the "result of personal free tagging of information and objects for one's own retrieval." Tagging happens in a social environment and is done by individuals consuming information. Folksonomies are similar to taxonomies in that both use keywords to describe information or objects within a domain. The term, folksonomies,

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is a combination of folk and taxonomy, which is a bit of a misnomer since folksonomies lack the one critical characteristic of all taxonomies—hierarchy. Vander Wal considers folksonomies to be complements to taxonomies rather than replacements for them. Shirky [30] makes the case for the use of folksonomies rather than rigidly structured categorization schemes. He raises the issue of the "information explosion" as a primary force in the shift from standard classification schemes, such as librarians use, to tagging and folksonomies that are non-hierarchical user-developed classification systems.

Tags are generated by individuals for their personal use, to be able to retrieve information and/or objects quickly and in a way that conforms to their understanding of the entity. Social bookmarking sites as Flickr, del.icio.us, and CiteULike have incorporated the use of tags as way for users to retrieve photos, URLs, and citations in a way that is personally meaningful and which doesn't require learning taxonomies constructed by professionals. Users employ their own vocabulary, which has meaning specific to them. It is these meaningful associations expressed as tags that enable faster and more direct recall of the object because they act as representations for the way we think [14].

However, when researchers study the folksonomies of del.icio.us, for example, they group together all of the tags created by all users for a particular resource as if it was representative of a single perspective. They do not attempt to make any distinctions between users, often because they have no identifiable or discrete information about them. This approach is problematic insofar as a single individual can effortlessly switch their perspectives based on their identity and create tags for the same phenomenon based in different, sometimes conflicting, identities. For example, we can imagine that a person who is a hunter might tag a geographic area within a GIS as "exciting" or a web page about weapons as "essential resource." That same individual using his identity as a father might also tag the same geographic area and web page as "dangerous" and "prohibited," respectively. The relative simplicity of the tagging concept is transformed into a problem of greater complexity when we begin aggregating tags into tagclouds and broad folksonomies [38] associated with particular perspectives—cultural identities and schemas. Compounding this complexity is the fact that many perspectives exist as part of an individual's cognition, and that the same perspective can be used as an identity for many individuals.

Tags in isolation are not very semantic. A word isolated from the entity it was intended to describe and from the person who created it can mean or refer to many things, and many people may interpret the same tag differently based on their personal histories. In order to make sense of a semantic tag, it is important to understand the perspective from which it is offered. Tags are

ontic signs that serve as indicators to the rich ontological conceptualizations we hold in cognition. Because each individual has a different experiential history, we would expect that their ontological conceptualizations to be unique. Individuals are also members of cultures, and as cultural beings they share many common experiences and articulate them using language. We learn the languages of our parents and communities as children, and share a vocabulary that enables us to express meaning regarding our experiences. Language may be simply words vocalized or written, but intonation, demeanor, time, context, etc. all play into the semantics of the expressed language and facilitate our understanding of others.

The following sections address the issues of shared vocabulary and the semiotic tri-concept relationship between user, tag and entity. The analysis and argument offered towards understanding the issue of emergent semantics of tags will draw upon cultural theory and Heideggerian phenomenology to articulate their ontology.

## 2 THE CULTURAL NATURE OF TAGS

While folksonomies do not explicitly state the relationships that exist in a conceptualization, the use of tags by users with similar interests tends to converge to a shared vocabulary [1, 7, 19, 25, 40]. Vocabulary convergence is treated as a collaborative activity by researchers, but there is some confusion as to whether sets of tags constitute a *collaborative* activity or a *collective* one [39]. This confusion has implications for how researchers understand folksonomies and their approach to analyzing them. They describe folksonomies as products of collaborative tagging, which is a common characterization in semantic web research [2, 4-6, 19-21, 27, 29]. However, collaborative implies working together towards some goal—that there is active, focused, and agreed upon intent among a group of persons to achieve a specific goal or set of goals [18, 22, 26, 41]. A group agreeing to tag a particular set of resources using an agreed upon vocabulary would be an example of collaborative tagging. Folksonomies are not collaborative in the sense that there are articulated goals towards which the persons creating tags are driving, sans any prior agreement. They are created through a *collective* tagging process, not a collaborative one [39]. Assuming collaboration situates a folksonomy within the confines of a single culture. However, most folksonomies are not so confined. They are open to individuals who have many cultural affiliations and identities, many nationalities and ethnicities, many research domains and spheres of interest [36]. In other words, many cultures, and we can never be certain that the collective set of tags reflect the cultural conceptualization of a particular group.

Culture, as described here, is an emergent phenomenon arising through the interplay of patterns within cognition with patterns extant in the world we inhabit [8, 35]. Schemas, as complex cognitive associations, are *intrapersonal* structures. The objects or events that are manifest outside individual cognition, the entities in the external world, are *extrapersonal* structures. Culture consists of the interplay between the intrapersonal cognitive structures and extrapersonal structures such as systems of signs, infrastructure, environment, social interaction, and so on. The intrapersonal and the extrapersonal are different and distinct, but closely interconnected. They are not isolated from one another, rather separated by a permeable boundary. Culture encompasses both intrapersonal and extrapersonal structures and emerges from the interplay between them. It is through this interplay that we

can see that some of the intrapersonal cognitive structures called schemas are shared with others, making them cultural schemas.

The notion of identity and multiplicity of perspectives is important in our understanding how cultural schemas manifest. Individuals can manage multiple identities in the same or multiple contexts. We can shift our perspective effortlessly between national, familial, peer and other identities to make sense of particular phenomena (i.e., frame it in relation to ourselves). The same context, for example, that would be considered "exciting" to "the hunter" might also be "dangerous" to "the parent." Fauconnier and Turner [10] claim that "frames structure our conceptual and social life and, in their most generic and schematic forms, create a basis for grammatical construction." Words are themselves viewed as constructions, and lexical meaning is an intricate web of connected frames. They also claim that although cognitive framing is reflected and guided by language, it is not inherently linguistic—people manipulate many more frames than for which they have words and constructions. It is the individual's salient, contextualized identity in relation to the phenomena that allows for sense making of the phenomena. When making meaning of a particular phenomenon, individuals will rely upon the cognitive and cultural schemas that are integral parts of their salient, contextualized identities.

The collective nature of folksonomies is indicative of culture only in a very broad sense (e.g., Western culture, English-speaking culture). We should not mistake the tag representation for the underlying ontological conceptualization. A tag is ontic, not ontological, and as such it "*functions both as this definite equipment and as something indicative of the ontological structure of readiness-to-hand, of referential totalities, and of worldhood*" (*Being and Time*, p. 114; H. 83).<sup>1</sup> As an instance of the ontic, it represents an extrapersonal structure. In order for a tag to be considered as part of a cultural phenomenon, it must interact with an intrapersonal schema. Tags will evoke schemas as the individual interacts with them, and it is through this interaction that meaning will emerge. By itself a tag is meaningless and indicative of no particular culture or cultural perspective, per se. When researchers treat tags as if they are ontological, or representative of a single culture's ontological conceptualization with only minimally recognizable variation, they mistake the collective for the cultural, which is the context where semantics emerge. The assumption is that the conceptualizations brought forth in creating the tag are the same (or only minimally different) for all users who create them.

It is easy to make such an assumption when looking at folksonomies, because they adhere so closely to power law distributions and seem to be remarkably stable. In social bookmarking sites, as entities and phenomena receive more tags, the set of tags as well as the frequency of each tag's use within that set, represents the combined description of that entity by many users [3, 13]. Rather than foster chaotic patterns, the aggregated tags give rise to stable patterns in which the proportions of each tag are nearly fixed. In studying this phenomenon, Golder & Huberman [13] found that after the first

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<sup>1</sup> A more thorough explanation of the Heideggerian concepts of *present-at-hand* and *ready-to-hand* is beyond the scope of this brief paper. See (Cerbone 2008) and (Crowell & Malpas 2007) for a more thorough treatment of fundamental concepts in Heidegger's philosophy.

100 or so bookmarks, each tag's frequency is in nearly fixed proportion of the total frequency of all tags used. They speculate that this stabilization might occur because of imitation and shared knowledge (i.e., a cultural process).

Cultural understanding is expressed through language, and a shared vocabulary is one means by which members of a culture share their understanding of an entity or phenomenon. The shared vocabulary is negotiated over time and evokes shared cultural schemas within an individual's cognition. A shared vocabulary has meaning to the cultural group because the semantics emerge through the evocation of the ontological (i.e., schemas) via the ontic (i.e., tags). The stabilization of tag patterns over time [13] is analogous to the stabilization of cognitive schemas as cultural schemas.

The mere mention of a word is often sufficient to evoke any number of cognitive schemas. As extrapersonal structures, words and language (i.e., tags) serve as social representations that help us identify relationships between images, ideas, objects, and phenomena we encounter in the world [11, 24]. They form the entry points into our complex intrapersonal schemas and rich ontological understanding of experience. What intrapersonal schemas a tag will evoke is dependent upon the cultural context in which it is being experienced [32].

The collective tags of a folksonomy will certainly reflect the dominant cultural schemas of a broad population, but the assumption that collective tags represent a shared conceptualization, interferes with discerning minority cultures, whose schemas may overlap with but are not necessarily entirely consistent with those of the dominant cultural group. In the absence of perspective and cultural identity information about users, folksonomies can be considered as reflections of cultural schemas only for dominant cultural groups and only in the broadest possible sense of "cultural group."

### 3 THE TRI-CONCEPT RELATIONSHIP

Tagging entities is fundamentally about making sense of that entity. Our experience with those entities allows us to create meaningful conceptual associations for them. Tags may reflect descriptive associations or categorizations of those entities, through which meaning emerges. Semantic web researchers have a strong interest in the semantic dimensions of folksonomies comprised of tags insofar as tags can help structure the information and knowledge available in the vast infosphere of the Web.

Researchers examining the dynamics of tagging systems [6, 12, 13, 20, 31] have settled on a semiotic perspective where tagging is viewed as a tri-concept in which users, resources, and tags are linked. Tags are associated with users who create them and resources to which they refer. A folksonomy is the entirety of a tri-concept tag set—all the tags created by all the users for all resources. Structuring the user-tag-resource relationship as a tri-concept facilitates the analysis of tags with respect to information systems by enabling the application of data mining algorithms to folksonomies [17]. Some researchers focus on identifying the semantic dimensions of folksonomies [1, 4, 5, 34], or understanding their emergent semantics based on this tri-concept model [28] and creating ontologies from folksonomies (or "folsologies" as some researchers put it [23, 33]).

When dealing with the semantic dimensions of tags, issues of polysemy and synonymy reveal themselves [13]. How does one disambiguate among polysemous or synonymous tags? One solution for disambiguating tags is to add a specification to OWL (Web Ontology Language) such that "<tag> owl: DifferentFrom <tag>", where the tag is the same lexical unit (e.g., apple) but has different meaning (e.g., fruit vs. computer company) [23]. A complementary suggestion includes the use of "owl: SameAs" to merge tags with the same meaning (e.g., *semweb* and *semantic web*). This approach, such as it is, looks promising, but it doesn't easily account for the evolution of the collective lexicon. Also, it would put a burden upon the tagger to specify the "owl: Relationship" in a tagging system or it would shift the burden to the ontology revision process, which has its own set of associated problems.

Tags are created at basic, superordinate, and subordinate levels and are related to an individual's interactions with them [37]. There is systematic variation across individuals in what constitutes a basic level, and expertise plays a role in defining the specificity of the level an individual treats as basic:

*The underlying factor behind this variation may be that basic levels vary in specificity to the degree that such specificity makes a difference in the lives of the individual.... Like variations in expertise, variations in other social or cultural categories likely yield variations in basic levels.[13]*

Tags do need to include the perspective of the tagger in order for semantics to emerge, but recreating the category problem by specifying DifferentFrom and SameAs relationships only addresses the ontic side of the equation. In order to address the ontological, our understanding of the user as part of the tri-concept relationship must not neglect his cultural perspectives and identities when trying to discern the semantics of particular tag sets. We must consider meaning-making, which is a cultural activity, as a multifaceted process, where semantics emerge through a process of interaction, construction and communication [34]. Interaction involves tasks and activities that generate the need for new meanings based on our being-in-the-world. Construction involves the imposition of "new categories" that are not so-called natural categories in the Aristotelian sense but rather, categories that are based on features that guide retrieval. Communication is negotiated through an alignment of "external tokens" (ontic tags) associated with categories (ontological conceptualizations). There are no "pregiven conventions" or constraints to the communication of categories. "Communication is crucial, because it is the motor for testing the concepts' adequacy and for pushing the development of new concepts when there are misunderstandings of task failures" [34].

Interpretation results from the mutual adjustment of the explicit and implicit content of an utterance. An exhaustive, one-to-one mapping between concepts and words is quite implausible. An interpretation that does not match exactly the intent is not a failure of communication, rather "an illusion of the code theory that communication aims at the duplication of meanings" [32]. Communication succeeds despite semantic discrepancies because the words used in a given situation points the hearer in the direction intended by the speaker. It does not matter whether or not a word linguistically encodes a full-fledged concept, and, if so, whether it encodes the same concept for both speaker and

hearer. Words are used as pointers to contextually intended senses; utterances are merely pieces of evidence of the speaker's intention. We need to know who the speaker is, their identity, in order to interpret the perspective from which the tag originates. The fact that the interpretation of tags is not exact reflects the real-world experience of communication and knowledge sharing and the need for an interactive, hermeneutic discourse to achieve understanding.

Meaning making is a hermeneutic process. If research on the emergent semantics of folksonomies is to be successful, it must incorporate the hermeneutic process of meaning making as part of the tri-concept relationship. The hermeneutic process with respect to the creation and analysis of tags is a process of understanding whereby tags are generated as ontic signs that point to ontological conceptualizations.

This ontic-ontological distinction offered here derives from Heidegger [15]. For Heidegger, meaning cannot be uncovered in the structure of a thing, however complex. The semantic content does not exist in the thing. Meaning-structure is, rather, latent in experience. In other words, meaning emerges from one's interaction with it, emerges alongside our experiences with it:

“..meaningful objects...among which we live are not a model of the world stored in our mind or brain; they are the world itself.” [9]

For Heidegger, language was a primal dimension of his ontological pursuit of Being, for words, as translucent bearers of meaning, point to something beyond themselves [16]. Tags, being ontic entities, can only serve as entry points into the complex networks of conceptual associations within our cognition, that is, our ontologies.

#### 4 THE ONTOLOGY OF TAGS

From a Heideggerian perspective tags would be signs. What is the being of signs? “Being-a-sign-for can be formalized as a universal kind of relation, so that the sign-structure itself provides an ontological clue for ‘characterizing’ any entity whatsoever” (Being and Time, p. 107-108; H. 77). Tags, as signs, are items of equipment whose specific character consists in showing or indicating. Indicating is a referring, but not all referring is indicating. Tags are not references, per se, but rather indicators for the cognitive schemas that are activated upon encountering the tag. When we encounter a tag, as when we encounter a sign, our activated schemas make salient parts of the environment in which it is embedded, and the encounter orients us in a particular way, making us ready to engage ‘what is coming.’ Tags indicate where one’s concern dwells, what sort of involvement one has with something. Tags form entry points into our complex of cognitive and cultural schemas that shape our ontological commitments to the world in which we are immersed.

In terms of creating tags, when we use them for personal recall, we are identifying the salient qualities and dimensions of our experience with the phenomenon or entity being tagged. From the ontological, we create the ontic sign—the tag. They are meaningful to us because they are created based on how we understand the phenomenon, which is in turn based on our personal historical context. Tags become an indicator of that salient experience. They allow us to reactivate our ontological understanding (i.e., activate our schemas) in later encounters with the tags that we create.

We are not only creators of tags, but also consumers of them. The lexical quality of a tag makes it present-at-hand, that which is the focus of our attention—what we are thinking about without all of the background also coming into focus. Tags are indicators of what Heidegger calls ready-to-hand, that which is ready to be used without theorizing about it—the ever-ready emergent evocation of our ontological conceptualizations and commitments. It is the readiness-to-hand quality of tags that evoke the cognitive and cultural schemas that connect us with the tag and to that which it indicates and provides the space where the semantics of a set of tags can be discerned.

If folksonomies are to serve as supplements or complements to formal ontologies, we must be able to disaggregate the sets of tags into cultural identity perspectives, each of which entails the ontological commitments of the culture. But in doing so, we must not mistake the ontic tag representation for the ontological cognitive conceptualization, the extrapersonal lexical structural unit for the intrapersonal schemas it may evoke. Eventually, we want to be able to utilize tag sets in information systems in order to facilitate intercultural understanding, so we must remain aware of the need for interaction, construction and communication mentioned earlier.

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