



# Social Tagging, Online Communication, and Peircean Semiotics: *A Conceptual Framework*

Andrea Wei-Ching Huang and Tyng-Ruey Chuang<sup>1</sup>

*Institute of Information Science, Academia Sinica, Taipei, Taiwan*

## Abstract

One of the recent Web developments has focused on the opportunities it presents for social tagging through user participation and collaboration. As a result, social tagging has changed the traditional online communication process. The interpretation of tagging between humans and machines may create new problems if essential questions about how social tagging corresponds to online communications, what objects the tags refer to, who the interpreters are, and why they are engaged are not explored systematically. Since all reasoning is an interpretation of social tagging among humans, tags, and machines, it is a complex issue that calls for deep reflection. In this paper, we investigate the relevance of the potential problems raised by social tagging through the framework of C. S. Peirce's semiotics. We find that general phenomena of social tagging can be well classified by Peirce's ten classes of signs for reasoning. This suggests that regarding social tagging as a sign and systematically analyzing the interpretation are positively associated with the ten classes of signs. Peircean semiotics can be used to examine the dynamics and determinants of tagging; hence, the various uses of this categorization schema may have implications for the design and development of information systems and Web applications.

Keywords: categorization; C.S. Peirce; interpretation; online communication; semiotics; social tagging; ten classes of signs; triadic sign; users

## 1. Introduction

Online communications are changing because of the nature of the collaborative and participatory Web. Several "Web 2.0" phenomena are indicative of this trend, as the lines between system designers and online users, as well as between information creators and receivers, become blurred. People can collaborate through their writings via wiki, participate in discussions with blogs, and exchange and remix multimedia contents through multiple web services. These developments highlight a significant feature of the Web, namely: users act like lightweight system designers in the new online communication process.

Among these developments, social tagging, as a "medium of communication" with its emphasis on sociability and usability, exemplifies the unique characteristics of online communications. However, problems may arise if

<sup>1</sup> Correspondence to: Tyng-Ruey Chuang, Institute of Information Science, Academia Sinica, 128 Academia Road, Section 2, Nangang, Taipei 115, Taiwan. Email: [trc@iis.sinica.edu.tw](mailto:trc@iis.sinica.edu.tw)

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participants in this new online communication process do not share the same framework of understanding. Thus, a clear picture of social tagging and the other above mentioned user-generated Web phenomena need to be developed. Once social tagging is comprehensible, effective implementations and new directions can be further identified. In this study, we consider social tagging in the context of triadic sign theory (Representation, Object, Interpretant). To ensure that we observe the emerging tagging phenomena in a systematic perspective, we explore social tagging by using the semiotic theory of Charles Sanders Peirce (1839-1914) as an analytical framework. Here we regard social tagging as a sign based on its triadic relation, that is: Representation (social tagging), Object (online communication), and Interpretation (Peircean semiotics). In other words, social tagging as a sign refers to the object online communication, and is interpreted in our study by Peircean semiotics as a theoretical framework.

First, we describe some problems related to social tagging, and then discuss the feasibility of using Peircean semiotics as a sign categorization scheme for social tagging. While most studies only consider a single user or user community on which to base their interpretations, we identify three levels of tag actors, namely: the user community (tag readers; people who use tags to help navigate their reading), tag writers (who add tags to their own or others' resources), and tagging system designers. We adopt Peirce's ten classes of signs to clarify what the tag refers to, whom the tag is connected with, why the tag is being used, and how the tag is applied for online communication. The objective of this paper is to develop a more unified and interpretative framework of social tagging than those proposed in previous tagging studies.

## 2. Problems of Social Tagging

Millions of people employ user-defined tags online<sup>2</sup>. Tags are used to denote different Web objects and resources, such as bookmarks in *del.icio.us*, photos in Flickr, videos in YouTube, books in Amazon, or things in MyThings.com. Even people can be categorized by tags in Spock.com, and locations can be labelled on Yahoo Maps or Google Maps. Tags represent the objects to which they refer, and they are interpreted by a community of interpreters according to their different understandings and purposes. However, common tag words (like "web") and specific tags (like "ACIA") may only make sense, or be interpreted differently, among their respective communities of users. Thus, we ask the following questions: What are people going to do with these tags? With whom are people going to communicate through these tags? How do tags express the communication between people? What is the relation between one tag and other tags? Recent studies of social tagging can be classified into three categories: (1) tag mining techniques for improving online search and exploration; (2) semantics and ontology technologies that deal with the meanings of tags in the context of natural languages and linguistic forms; and (3) analyses of user behavior patterns or social networks in collaborative tagging. Among the above studies, several tripartite models have been applied to social tagging analysis without, or at least not directly, referencing Peircean semiotics which are based on a triadic sign structure [1] [2] [3]. Hence, there remain aspects and possibilities of social tagging phenomena that we would like to explore in an integrated and systematic manner, through the logical lens of Peircean Semiotics.

Confusion in social tagging, seen from the perspective of online communication, occurs because of different interpretations of what tags are meant to represent. More specifically, the difficulty lies in the interpretation along technical and social dimensions. User-generated tags can be used freely to link different Web resources. Tags, as a form of descriptive and visible metadata [4] [5], need a conceptual framework so that they can be constructed, presented, and processed systematically. Since human factors are deeply involved in tagging, interpreting the tagging process is a complex issue. Thus, an integrated approach that combines human and machine interpretations of social tagging is required.

In the following, we present an analytical approach that combines semiotics and social tagging. First, we define a sign in terms of its triadic relations. Next, we apply the principle of Peirce's three universal categories,

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<sup>2</sup> L. Rainie, *Why Tagging Matters: An Interview with David Weinberger*, Available at <http://pewresearch.org/pubs/402/tagging-play> (publish online 31, January 2007; last accessed 9, September 2008).

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and Morris's three dimensions of signs (namely, the syntactical, semantic and pragmatic dimensions)<sup>3</sup>, to social tagging. Then, in Section 5, we use Peirce's ten classes of signs to describe the ten classes of social tagging.

### 3. The Triadic Sign in Tagging

#### 3.1 The Triadic Sign

This paper is primarily concerned with the semiotics rooted in Peirce's theory of triadic signs: Representation (representamen), Object, and Interpretant (interpretation). According to Peirce, a sign "is something, *A*, which brings something, *B*, its *interpretant* sign determined or created by it, into the same sort of correspondence with something, *C*, its *object*, as that in which itself stands to *C*."<sup>4</sup> [6: NEM] Most importantly, only the coexistence of the three components {Representation, Object, Interpretant} constitutes a sign in Peirce's definition. When Web resources are annotated with user-defined tags, we apply the meaning of a sign defined in Peirce's model; that is: anything can be a sign if people interpret it as such. Thus, a sign does not need to have a physical presence; it can be a phenomenon or just a thought [6: CP 2.303-2.308]. Figure 1 shows the three components of a sign in Peirce's concept. Divided into three parts, the differences and relations between the {Representation, Object, Interpretant} are subtle. We discuss them briefly below.

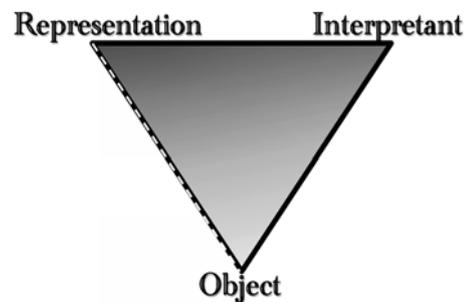


Figure 1: Peirce's Triadic Sign

- The Representation is a representation of the sign itself, and is the form that the sign takes. Other likely terms are "sign vehicle" or, simply, "sign." In tagging, the Representation is the short text, or catch word, employed to label a resource to be used by oneself or others.
- The Object is the entity to which the sign points, refers or applies. In tagging, it is the specific digital object that the tagger refers to.
- The Interpretant of a sign is the sense or interpretation that is made of the sign. In tagging, it is the interpretation of the keyword, the description or annotation about the tag, together with the tagger's thoughts about the sign.

These three components are not necessarily closely related at all times. This point is highlighted in Figure 1 by the dashed line between Representation and Object. It indicates that there is no essential direct relationship between the two components [7]. As an example, on the Web there are often broken links, where the object has been removed, but there are still links pointing to it.

In Peircean semiotics, the formal condition of a sign must contain three parts, {Representation, Object, Interpretant}, to be considered a complete sign. In our analysis of the various aspects of social tagging, we transform tags into signs. Thus, the classification of signs, which contains ten possible combinations by Peirce that

<sup>3</sup> A comprehensive introduction to the theories of Peirce and Morris in relation to information science can be found in W. Lenski - Towards a Theory of Information, in W. Lenski, (ed.) *Logic versus Approximation, Lecture Notes in Computer Science*, vol. 3075 (Springer-Verlag, Berlin Heidelberg, 2004), pp. 77-105.

<sup>4</sup> Peirce had many different descriptions for the definition of sign. The most cited definition is that "A sign, or representamen, is something which stands to somebody for something in some respect or capacity." Here, we employ the specific definition of a sign in Peirce's accounts on logic. The reason is that Peirce defines logic as formal semiotic, and this definition does not limit the sign to human thought. More definitions of Peirce's signs are accessible at R. Marty, *76 Definitions of The Sign* by C. S. Peirce, available at <http://www.cspeirce.com/menu/library/rsources/76defs/76defs.htm> (last accessed 25 May, 2008).

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we will adapt, not only provides us with a general principle for categorizing different types of social tagging, but also reveals the complexity of interpreting social tagging phenomena.

### 3.2 Interpretant of Social Tagging

Relative to Peircean semiotics, Charles William Morris (1901/03-1979) is known for proposing three semiotic dimensions of signs, namely the syntactic, semantic, and pragmatic dimensions. According to Morris's definition, semiotics provides "a basis for understanding the main forms of human activity and their interrelationship, since all these human activities and their relations are reflected in the signs which mediate the activities". Implicit in Morris's view of signs is the idea that a sign is capable of voluntary use for communication [8]. In this paper, to systematically explore communicative activity in social tagging, we use Morris's concept of "interpreter" as sign actors who operate the interpretant of the Sign. This combination is still in accord with the general meaning of Peirce's Interpretant component [9].

In addition, as online communications need not be symmetric or even synchronous, one should differentiate at least two contexts when interpreting information as sign: one for authorship and the other for readership [10]. Online authors are defined as users who set the constitutive rule of communication. In this online structure, authors not only guarantee the relevance of the resources they compile and/or annotate, but also reveal their personal preferences when inviting online readers to interpret their works [11]. Although both sign actors (readers/users and authors/writers) have been well identified in the literature, the third actors, i.e., system designers, must also be described in detail. We are dealing, with semiotic engineering, a subject inspired by semiotics from the perspective of Human-Computer Interaction (HCI). The meta-communication messages sent or displayed by HCI systems are signs conveyed from the designers to users (including authors and readers). The interpretation of these signs is based on the designers' formal rationale and their understanding of human users [7].

Based on previous observations, in this study, we wish to provide traditional communication and information scholars with a different means of classifying online communication actors<sup>5</sup>. To this end, we consider social tagging is changing the online communication process. Specifically, we identify three levels of actors as sign interpreters, as shown in Figure 2.

- **The user community:** the information receivers and readers/users who consume the information within their diverse contexts of interpretation. The user community includes the other two actors mentioned below, but not vice versa. Empirically, it is possible to compile user profiles through social tagging, and to identify or differentiate users by their community of interest [12] [13]. Likewise, usage patterns of communities are predictable and stable in collaborative tagging systems. In addition, topic-specific trends

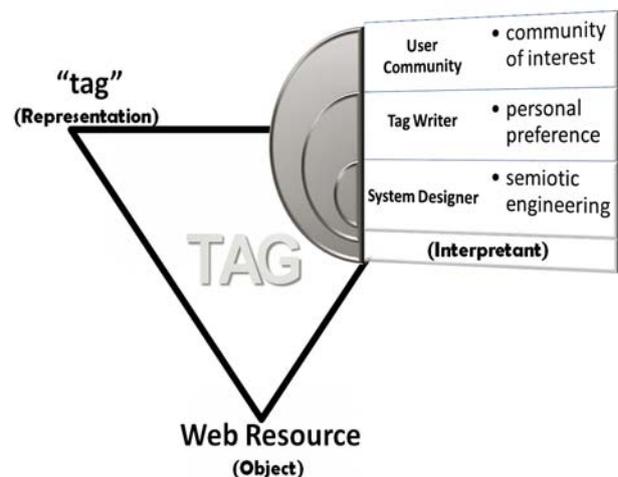


Figure 2: Three interpreters in a Triadic Sign

<sup>5</sup> Adam Mathes [4] also identified three creators of metadata, namely: professionals (library and information scientists), content creators (the Dublin Core Community), and users (user citations, PageRank, recommendation systems, and collaborative filtering, blogs, and customer reviews).

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can also be found in the structure and development of communities [14] [15]. Thus, we suggest here that the interpretation of user communities should be based on their specific community of interest.

- **The tag writer:** the actor that attaches tags to his/her own content or that of others. This user takes the lead role in online communications in order to express personal preferences. For the most part, tag writers are general tag users who create tags, but sometimes they are designers who set constitutive rules for the acts of tagging. For tag writers, the interpretations of tagging help them organize and manage personal and/or web resources. A user's tags represent his/her interests, which can be identified after differentiating individual users by their tags in groupings of the user community [16].
- **The system designer:** the actor who interprets signs as rules from (and for) users and systems. This interpretation is presented in a formal way that machines (software systems) can understand. A system designer's interpretation of social tagging is based primarily on the designer-to-user messages he uses in the system design. This interpretation is related to semiotic engineering which, according to de Souza, is communication about the how, when and why to communicate with or through systems [7].

The research problems raised by social tagging in online communications are complex and difficult in the "interpretation". Thus, we view the logic of semiotics as a proper method for analyzing the problems, and answering questions of how social tagging corresponds to online communications, what objects the tags refer to, who the interpreters are, and why they are engaged. To the best of our knowledge, this view has not been fully explored. In an attempt to fill this research gap, we characterize tagging phenomena from the perspective of the semiotic paradigm. Under this approach, complex problems can be formulated in a more abstract and systematic manner. With this process of clarification, the analysis of social tagging phenomena will be more concrete in Peirce's ten classes of signs (Section 5), and the "interpretation" problems will be much more solvable in Peirce's three universal categories (*Firstness*, *Secondness*, and *Thirdness*) (Section 4).

#### 4. Three Universal Categories and Sign Typology

Peirce's basic principle of ten classes of signs should be understood in terms of his categories of phenomenology, namely *Firstness*, *Secondness*, and *Thirdness*. These three levels are the keys to understanding the sign typology, which explores different types of signs according to Representation, Object and Interpretant. A complete analysis of the three levels of phenomenology is beyond the scope of this paper. Below we provide a simplification of the complex concepts involved by only highlighting their major characteristics. We summarize the rules for the three levels as follows:

- (1) *Firstness*: logical possibility, likeness or the quality of appearance;
- (2) *Secondness*: actual facts, existence or existential relations;
- (3) *Thirdness*: general laws, rules, habits, certainty or reasoning.

Based on Peirce's definition, the nature of categorization, as described by the three levels, can also be understood by subset relations. The rules can then be rephrased as: *Thirdness* is a subset of *Secondness*; and *Secondness* is a subset of *Firstness*. For instance, in Peirce's own illustration, "Red" (*Thirdness*) is a type of "Color" (*Secondness*), and "Color" exists in "Space" (*Firstness*). Thus, "Space" is not limited to "Color"; and "Color" does not mean "Red" only [6: CP 1.300-1.353]. We may say that *Thirdness* is more specific than *Secondness*, and *Secondness* is more specific than *Firstness*, in their inclusion of phenomena.

To explain the role of Representation, Object and Interpretant in the three levels more clearly, the nine elements of sign typology are defined in detail by Peirce [6: CP 2.243-2.253; see the Appendix for a summary]. First, a simple way to classify Representation in three levels (*Firstness*, *Secondness*, and *Thirdness*) is to replace the terms in italics: *Mark*, *Token*, and *Type*, respectively. Second, we adopt *Symbol*, *Index*, and *Icon* from Peirce's own terms for the division of Object. Third, for the Interpretant division, we have revised the terms from different semiotic works [17] to broaden our analysis in the context of social tagging and online communication. We use the phrases *Open*, *Informational*, and *Formal* in preference to the *Firstness*, *Secondness*, and *Thirdness* principles.

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Therefore, together with the three tagging actors we have already identified, we propose the hypothesis that social tagging treats tags as signs of communication. This occurs universally from the actions of tag writers to the system rules devised by system designers, and of user communities in different levels. It is certainly reasonable to expect social tagging phenomena to be grounded in the framework of the ten sign classes, as the sign classification categorizes all possible combinations of sign typology in a systematic manner; and since nothing is a sign unless it is interpreted as a sign [6: CP 2.308].

By making finer distinctions between certain social tagging phenomena, we can discuss the different levels of tags by viewing them as signs. We also employ the methodology used in Morris’s subordinate branches of signs as *Syntactics* (i.e., the formal relations of signs to one another) to answer the question of *how* social tagging corresponds to online communications; *Semantics* (i.e., the relations of a sign to its object) to answer the question of *what* objects the tags refer to; and *Pragmatics* (i.e., the relation of signs to interpreters) to answer *who* the interpreters are and *why* they are engaged. Other questions related to when or where tags occur are not considered in the present study. Table 1 shows all possible divisions of social tagging signs.

In a triadic sign (Representation, Object, and Interpretant), each component can belong to one of the three

Table 1: Divisions of Social Tagging Phenomena

Characters of Triadic Relations	Representation	Sign Relation to Object	Sign Relation to Interpretant		
			Interpretant	Interpreter	Interpretation
1 <sup>ness</sup> Possibility	Mark	Icon	Open	User Community	Community of Interest
2 <sup>ness</sup> Existence	Token	Index	Informational	Tag Writer	Personal Preference
3 <sup>ness</sup> Laws, Rules	Type	Symbol	Formal	System Designer	Semiotic Engineering
	<i>HOW</i> (syntactics)	<i>WHAT</i> (semantics)	<i>WHO &amp; WHY</i> (pragmatics)		

universal categories (Firstness, Secondness, and Thirdness). However, in Peirce’s theory of 10 sign classes, certain combinations of the three categories allocated to the three components are excluded because, when a more specific category (say, Secondness) is used in the Object, the less specific category (say, Firstness) cannot be used as its Representation. Likewise, a less specific Object cannot impose a more specific Interpretant. This excludes the case where one has a Secondness Object but demands a Thirdness Interpretant.

As such, Icon as an Object can only be understood by its Open Interpretant. At the same time, Representation for an Iconic Object can be Mark, Token, and Type. We call the three iconic signs {*Open Iconic Mark*}, {*Open Iconic Token*}, and {*Open Iconic Type*}. Similarly, Index as an Object is in the Secondness level because of its existential relation. The interpretation of an Indexical Object cannot be reduced to the symbolic meaning of the Thirdness general law. Thus, its Interpretant is either Open or Informational, while its Representation choices are limited to either Token or Type. As a result, four indexical signs can be identified: {*Open Indexical Token*}, {*Open Indexical Type*}, {*Informational Indexical Token*}, and {*Informational Indexical Type*}. The same rule is applied to a Symbol Object and results in the three signs {*Open Symbolic Type*}, {*Informational Symbolic Type*}, and {*Formal Symbolic Type*}.

By this kind of analysis, Peirce derives the 10 classes of signs. Figure 3 shows the ten classes, which are revised from Peirce’s triangular table [6: CP 2.264] using the modern terms. The categorization schema forms our framework for observing and analyzing social tagging phenomena.

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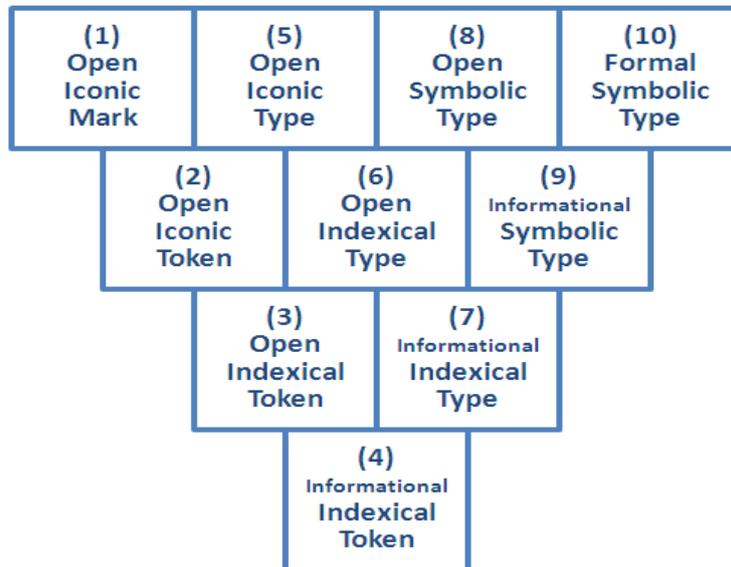


Figure 3: Ten classes of Signs (revised from Peirce's diagram [6])

## 5. Ten Classes of Signs

A synthesis of Table 1 and Figure 3 yields the ten classes of signs for social tagging classification. To classify the three levels indicative of tagging, we identify several social tagging phenomena based on the different criteria in their respective classes. In the following, we provide an analysis of tagging phenomena after defining each sign. Questions about *what* the tag refers to, whom the tag is connected with, *why* the tag is used, and *how* the tag is applied for communication are combined with the characteristics in each sign class (c.f. Table 1). Overall, the answers to the above questions are based on the {Representation, Object, Interpretant} of each sign, particularly in Signs (1), (2), and (3). The same logic is applied to the other classes of signs without repeating the individual questions. Some works in the literature are also discussed from the perspective of semiotics and for their social tagging implications.

▼ **Sign (1) – {Open-Iconic-Mark}**: The sign deals with the possibility of the first observation in order to determine possible evidence for future acts. For Peirce, the first sign is “a mere logical possibility” like “a feeling of red.” Thus, it can only be interpreted as a sign of essence [6: CP 2.254].

In social tagging, we find that the possibility of the first observation is the sign for user-contributed tagging phenomena. Terms like social tagging, folksonomy or tagsonomy are signs that convey possible feelings about tagging concepts. One of the reasons is that sense making and social factors provide an initial understanding of relations between tagging and taxonomy [14].

Since Sign (1) is a feeling, no determined Representation should represent it (*how*). With regard to the question of *what* the tag means, the icon sign refers to some characters or the likeness of the tagging Objects,

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irrespective of whether any such Object exists. The sign is largely interpreted by the user community (*who*) in terms of their community of interests, which are based on their past experiences (*why*).

▼ **Sign (2) – {Open-Iconic-Token}**: This iconic sign is any object of experience, and some of its qualities determine the idea of an object. For Peirce, the second sign is something like “an individual diagram” because, being an Icon, it is a sign of likeness; hence it can be only interpreted as a sign of essence. Sign (2) embodies sign (1). In other words, Sign (2) is the actual existence of Sign (1) [6: CP 2.255].

In semiotics, there can be several tokens of a single type. In social tagging, tag clouds demonstrate the likeness of characters and indicate what the tags mean. Moreover, the actual form of the cloud diagram provides a visualization of the most frequently used tags. The cloud as a token comprises many copies of single tags. A large-scale contextual idea of tags that refer to resources in one or more systems can be represented, for example, by a paragraph-style layout as a tag cloud. Therefore, the iconic tag cloud is a “visual summary of contents” and also serves as a broad and general categorization of information [18].

Since Sign (2) is an actual existence, the tag cloud is represented based on the visual form of the cloud (*how*). With regard to the question of *what* the tag cloud means, the iconic Object is similar to Sign (1), which remains in some characters of the likeness. The sign is also interpreted by the user community (*who*) in terms of their community of interests (*why*).

One recent qualitative assessment of tag clouds suggested that their significance lies in their usability as “social signallers,” rather than in data analysis [19]. Specifically, the social or personal components of a tag cloud [19] reflect the implication of Sign (2) in its Firstness and Secondness. Some people are suspicious of the use of tag clouds as they may not be practical for representing tag relations, nor effective in terms of information accuracy. The answer can be found in the semiotic analysis. Sign (2) is a sign of an individual diagram, which allows several copies of a single tag; however, it only determines the idea or feeling of an object, irrespective of whether any such object exists. From this perspective, tag clouds are not meant to be, and are not noted for, their information accuracy.

▼ **Sign (3) – {Open-Indexical-Token}**: In theory, this sign is any object of direct experience, connection or existential relation because it directs attention to the Object responsible for its presence or existence. The sign deals with possible evidence that some relations have been connected, and thus indicates some previous state of affairs. It draws attention to a particular object without actually describing it. Sign (3) inevitably involves a Sign (2) of a peculiar kind; however the sign is quite different from Sign (2) as it focuses the interpreter’s attention on the denoted Object [6: CP 2.256].

A tag list, which shows the frequency of the tags used, indicates the past state of tagging statistically. In other words, the Representation of this sign is based on the visual numeration of the tag list. Since Sign (3) is an indexical object represented in a token, it signifies the existential relation of the tagged object to its tag representation. With regard to the question of *what* the tag list means, in Sign (3), the tag list represents a tag cloud of a particular kind. They are similar to Sign (2) and are also interpreted by the user community (*who*) in terms of their community of interests (*why*).

Tag lists have also been used to make groupings based on similarities or patterns. Clustering of tags, for instance, relates tags in such a way that similar terms are grouped together, and/or individual terms are disambiguated. This method is used in “Flickr clustering” to make the relations between photos and their tags clearer, and direct the interpreters’ attention to different communities more precisely.

However, critiques of tag clustering have raised a number of issues, such as: lack of predictability about the ordering of the tags; vagueness in meaning because the clusters are compiled along various dimensions; difficulties in labelling tag groups; and contradictory hierarchies among the clusters [20]. From a semiotic perspective, we may understand that, although some relations are embedded in the Object and Representation of Sign (3), they are still not as certain as the law-like sign in Thirdness. Specifically, the Interpretant is still at Firstness for possible open interpretation.

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▼ **Sign (4) – {Informational-Indexical-Token}**: The sign is any object of direct experience, connection or existential relation. It provides information about its Object, but the only information Sign (4) can be interpreted is of actual fact. Here, Sign (4) must involve a Sign (2) to present the information, and a Sign (3) to indicate the Object to which the information refers [6: CP 2.257].

In social tagging, the difference between Sign (4) and Sign (3) is that the former depends primarily on the tag writers themselves, rather than on the interpretation of user communities. For example, Sign (4) can only deliver information about the tag writer's preference for indexical objects. It cannot convey information about certainty because the Indexical Token can only be interpreted by personal choices. Here we use personomy as an illustration, since its definition is identical to the character of Sign (4), which is an actual existence, an individual or particular copy of a Type sign. Personomy may use a tag cloud/Sign (2) to represent the information, and may also employ a tag list/Sign (3) as the Indexical Object.

In this paper, we take a view different from the common description of personomy which would classify it as in Sign (7). We agree with one of W3C's social tagging proposals that personomy should be regarded as a concept scheme that can be reused across various systems. Tags are used by an individual to express his/her knowledge, interests and language; thus, personomy should not be limited to the definition of the collection of all personal tagging in one system [21]. Examples of personomy as Sign (4) can be found in TagsAhoy,<sup>6</sup> which allows individual users to search all their own tags across different sites. Blogging sites, such as Personomies.com,<sup>7</sup> also help users aggregate their personal tags from different services.

Similarly, tag feeds are a kind of personomy application. Several tagging services now provide users with tag feed subscriptions (e.g., *del.icio.us*, Amazon.com, and YouTube). Figure 4 shows the formats of tag subscriptions at *del.icio.us*. Users subscribe to tags according to their own interests (e.g., “bananas”). The tag acts as an indexical token that finds web resources related to the token (“bananas”) in various web services. Users can also subscribe to tags of specific users (e.g., “science” from the user Julian; “music” and “dance” from the user Alan).

- A tag - [del.icio.us/rss/tag/bananas](http://del.icio.us/rss/tag/bananas)
- A tag from one user - [del.icio.us/rss/julian/science](http://del.icio.us/rss/julian/science)
- Both of these tags from one user - [del.icio.us/rss/alan/music+dance](http://del.icio.us/rss/alan/music+dance)

Figure 4: Formats of tag subscriptions at *del.icio.us*

All the sign classes analyzed so far are in either the Firstness or Secondness level in terms of their specific triadic relations. In the following, Sign Classes (5), (6), and (7), the Representation is set in the Thirdness level as a general law or type; however, when it is coupled with the Object and Interpretant, it is set in either the Firstness or Secondness level.

▼ **Sign (5) – {Open-Iconic-Type}**: This sign deals with the process whereby Representation creates or discovers a possible rule. In theory, it is like a diagram separated from its factual individuality. The Representation is any general law or type that refers to an iconic object and is interpreted by a specific likeness. The mode of being of Sign (5) is that of governing single Replicas, each of which will be a Sign (2) of a peculiar kind [6: CP 2.258].

Sign (5) may also lead to a new understanding of possible rules. The tag cloud associated with a specific tag in SWik.net is an example of Sign (5). It is the result of relating other tags to a given tag. This tag cloud of one special tag, via its Representation, creates a possible understanding of the given tag through an iconic diagram<sup>8</sup>. Another example can be found in Wordie Tag<sup>9</sup>, which is known for its “all tags, no content” design, where tags of one specific tag are just iconic objects that are interpreted by their specific likeness. Similarly, in Yahoo TagLines<sup>10</sup>, tags (with Flickr images) are represented in a dynamic timeline to create new understandings of tagging behaviour over time. These cases offer us a new perspective on tag rules in their interpretations through a

<sup>6</sup> <http://www.tagsahoy.com/>

<sup>7</sup> <http://personomies.com/>

<sup>8</sup> See “community” Tag Cloud at <http://swik.net/community?tagCloud>

<sup>9</sup> <http://wordie.org/tags>

<sup>10</sup> <http://www.research.yahoo.com/taglines/>

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general Representation that refers to an Iconic object. In other words, Sign (5) is similar to Sign (2) in terms of its Open Iconic characters, but the Representation of the sign is used to make sense of the sign's rules for reference.

▼ **Sign (6) – {Open-Indexical-Type}**: This sign is any general law or type that requires each instance of it to be strongly influenced by its indexical Object. Each Replica of Sign (6) will be a Sign (3) of a peculiar kind. In addition, the Interpretant of a Sign (6) is a possible open rule with existential relations to its indexical object [6: CP 2.259].

In social tagging, we may find tags with specific forms that are not in the vocabulary, e.g., "DSC-R1". Each of these non-vocabulary tags is used by a group of users as a means of communication. The tag is a general type or rule of a sign defined by a specific user community. The sign requires that each instance of it should be strongly influenced by its indexical Object so that the attention of the community is drawn to the Object. For instance, the term "DSC-R1" in Flickr.com refers to the Sony DSC-R1 camera. Fans of the camera use the term to help find one another's photos. A tag with a specific form may belong to a number of communities that are not related. The abbreviation "ACIA", for example, refers to an event in Taiwan, but also to a community concerned about climate change. It is used by the two groups of people to tag their photos.

Empirical evidence suggests three directions in tagging, when viewed as Sign (6). First, the association between social tagging and community knowledge can be explored by using "event tags" and "place tags". The indexical characters of objects and rule-type representations are evident in such usage, and are directly related to the tags' temporal or spatial contexts. They have proved to be expressive in exploring community knowledge [22].

Second, deliberately using non-vocabulary tags in a community (e.g., DSC-R1 or ACIA) to prevent public understanding and provide identification for specific events is the result of community privacy concerns and a sign of social signalling [23, 24]. Third, social tagging can be used as a tool to express or promote a community's campaigns or interests. For example, the Free Software Foundation mobilized communities in its fight against digital rights management products by tagging such products as "defectivebydesign" [5]. Therefore, in semiotics, community indexical tags, like Sign (6) are interpreted by a possible open rule, but with an existential relation to its indexical object.

▼ **Sign (7) – {Informational Indexical Type}**: This sign is any general type or law. It requires each case of the sign to be really affected by its Object and provide definite information about the Object. Sign (7) must involve Sign (5) to present the information. It must also involve Sign (6) to indicate the subject of the information. Each Replica of Sign (7) will be a Sign (4) of a peculiar kind [6: CP 2.260].

In the domain of social tagging, personal indexical tagging for individual categorization has received the most attention thus far, but it has often been confused with personomy, i.e., Sign (4) in our categorization [15, 16]. In particular, when tagging is viewed as Sign (7), the tags are issued by individual tag writers and are only used to categorize preferred objects in one system (e.g., personal tags in Flickr or del.icio.us). An indexical object implies an existential relation or direct link because it draws the actor's attention to a particular object. Personal indexical tagging requires that each tag should be strongly influenced by the tagged Object, and it should provide specific personal information about the Object.

One recent application like GroupMe!<sup>11</sup> allows a user to combine web resources in one system based on his/her preferences. The indexical objects (groupings of resources) are categorized with tag writers' needs. In GroupMe!, we find that the same tag is used by different users to group resources differently; hence, each grouping is unique to a single user. For instance, the term "semantic web" appears several times on the group browsing interface. Furthermore, as Sign (7) is regarded as personal indexical tagging, its replica is the personomy, Sign (4), of a peculiar kind.

In the remaining classes of signs (8), (9), (10), both the Representation and Object will be in the Thirdness level, and they are related to the Interpretant in either the Firstness, Secondness, or Thirdness level.

<sup>11</sup> <http://groupme.org/GroupMe/>

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▼ **Sign (8) – {Open Symbolic Type}**: This sign is connected with its Object by any connection of general ideas. The sign deals with a formal possible open rule, which forms a general explanation of the sign. Peirce used “a common noun” or a “general term” as examples of Sign (8). Although the rule for Object and Representation is established, the Interpretant of Sign (8) sometimes represents the sign as Sign (6) and sometimes as Sign (5) because it shares a little of the nature of both signs. The Replica of Sign (8) is Sign (3) of a peculiar kind. Note that Sign (8) is different from Sign (6) in that their respective Replicas in Sign (3) may not be of the same kind [6: CP 2.261].

Common word tagging is similar to Peirce’s ideal of Sign (8) because common words are usually embedded with conventional rules for linguistic meanings, but without any specific explanation in practice. One empirical survey [25] found that popular tags, which account for half the tags in use, are general rather than specific. In addition, compared to keyword approaches, social tagging methods not only match content better, but also provide additional information that is not in the documents themselves. The formal open rule in Sign (8) is illustrated through the manifestation of common word tagging.

In [15], it is suggested that common tags are less representative than non-vocabulary tags or community-defined tags in identifying community structure. From a semiotic perspective, we see that the interpretation of a Sign (8) is associated with the resource it refers to. However, information contained in a common tag, Sign (8), may not be as specific as the information in community-defined tags or community indexical tags, Sign (6). This is because Sign (8) shares the nature of both Signs (5) and (6). Common tags are also different from community indexical tags in that their respective Replicas in Sign (3) (e.g., tag lists) may not be the same.

▼ **Sign (9) – {Informational Symbolic Type}**: Sign (9) is a sign connected with its Object by any association of conventional ideas. The sign acts like Sign (8), but its intended Interpretant represents Sign (9) as an existential relation that must be connected with the indicated Object. Although Sign (9) shares some of the nature of Sign (7), its symbolic Object is different, as its Representation is mostly seen as a statement of fact. The Replica of Sign (9) is a Sign (4) of a peculiar kind. It is easy to recognize a Sign (4) as a Replica of Sign (9) because the information conveyed by the sign is of an actual fact or an existential relation [6: CP 2.262].

According to Thomas Vander Wal’s definition of folksonomy, tagging is generally for personal use<sup>12</sup>. Tags like “myBook”, “James photo”, “toRead” are examples of personal references, expressions, and statements. Sharing information, communicating, and influencing others to participate are not significant objectives in these cases. Empirical studies, [14] [26], support the argument that tagging is for personal purposes, e.g., search and retrieval for self-organization, personal memory, and context (such as location, events, or friends) for self-communication.

Sign (9), which is regarded as personal tagging, can also be observed in tags’ linguistic forms of non-nominal representations (e.g., verbs and adjectives). Such forms are regarded as supplements of categories that take their meanings from the categories’ descriptions [27]. Personal tagging shares some of the characteristics of personal indexical tagging, i.e., Sign (7); however, the symbolic Object of Sign (9) makes its Representation mostly a statement of fact. If Sign (9) is seen as personal tagging, its Replica is also a personomy, Sign (4), of a special kind.

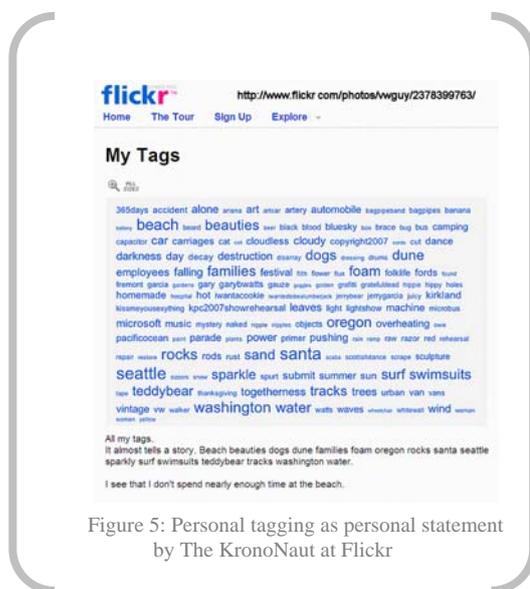


Figure 5: Personal tagging as personal statement by The KronoNaut at Flickr

<sup>12</sup> <http://www.vanderwal.net/folksonomy.html>

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▼ **Sign (10) – {Formal Symbolic Type}**: The Interpretant of this sign represents its Object as a hidden sign through a rule or law. The symbolic object must be general. This is the most complex sign restricted by rules (Representation, Object, and Interpretant are all in the Thirdness level). The Replica of Sign (10) is a Sign (4) [6: CP 2.263].

Since this is the most complex sign in the context of social tagging, we find that system designers are often concerned about methods of classification, such as social classification, collaborative categorization, mob indexing, and ethno-classification [28]. Seen as a system, the function of social tagging is restricted to the logical reasoning process as set up by its designers. The interpretations of designers are the results of formal rules generalized from the interpretations of user communities, tag writers, and the system designers themselves. The Interpretant of Sign (10) signifies that its Object is a hidden sign through a rule that only developers can define. Some view social tagging as people creating new web namespaces in semi-structured databases.<sup>13</sup> If we accept de Souza’s view of semiotic engineering [7], the explanation of why general social taggers act like light-weight system designers is clearly mirrored in the semiotic analysis of meta-communication between machines, users and designers.

Nowadays, Web systems integrate inputs from active participants with auto-suggested mechanisms. Many systems use “machine tags,” a convention for writing tags that can be understood or even generated by computers, to incorporate metadata contributed by participants. In Flickr, for example, a user can use “triple tagging” such as “upcoming:event=434483” to tag photos taken at the event identified as “434483” in the “upcoming” namespace, so that all such photos are self-identified and linked to the Object of the event.

Efforts have also been made to devise new automatic geo-tagging mechanisms. For example, Flickr integrates the Yahoo Map interface with geo-tagged user photos<sup>14</sup>, while in Google’s photo album service, Picassa, supports geo-tagging through Google Earth<sup>15</sup>. These can be viewed as complex tags restricted by certain geospatial rules, and they are typical of Sign (10).

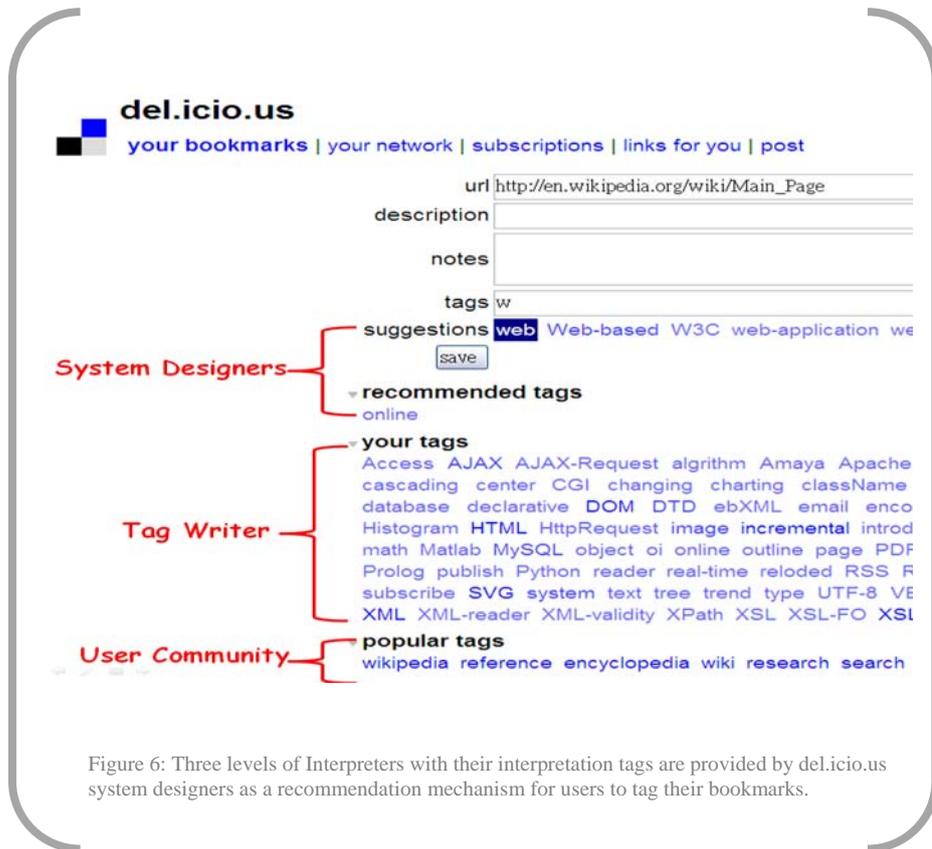


Figure 6: Three levels of Interpretants with their interpretation tags are provided by del.icio.us system designers as a recommendation mechanism for users to tag their bookmarks.

There are examples of tag recommendation mechanisms other than machine tags in Sign (10). Many collaborative tagging designs reflect three Interpretant levels (i.e. community, writer, and designer) in one meta-communication interface. Del.icio.us, has often proved to be the most articulate in presenting the issues of the

<sup>13</sup> <http://jonudell.net/talks/cusec/cusec.html> ; <http://blog.jonudell.net/2008/05/19/semi-structured-database-records-for-social-tagging/>

<sup>14</sup> A general introduction is available at <http://www.flickr.com/help/screencasts/vol1/>.

<sup>15</sup> A sample gallery is available at <http://picasaweb.google.com/picasateam/VegasWeekend/photo#map>.

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collaborative tagging. It provides tag auto-recommendations through “popular tags” (mostly frequently used by communities), “your tags” (by tag writers’), as well as recommended and suggested tags (based on popular tags, your tags and some other algorithms) [5], as shown in Figure 6. Thus, suggested tags are signs of communication ranging from the actions of tag communities and writers to system rules developed by designers. The Replica of a suggested tag, Sign (10), should be a personomy, Sign (4), in theory. In this del.icio.us case, the tag suggested should be improved if it is generated from the tag writer’s tags across various systems.

In summary, when considering *how* social tagging corresponds to online communications, we have six Types in Signs (5), (6), (7), (8), (9), and (10), which provide general tagging rules for online communications; three Tokens in Signs (2), (3), and (4), which represent the actual existence of tagging related to social communication; and one Mark in Sign (1), which signifies the possible concept of social tagging in online communication process. Likewise, with regard to *what* Object the tags refer to, we rely on an analysis of the following components: three Icons in Signs (1), (2), and (5) to determine the characteristic likeness or similarity of the Objects that the tags refer to; four Indexes in Signs (3), (4), (6), and (7), which relate to the existence of the indicated Objects and the communication uses; and three Symbols in Signs (8), (9), and (10), which are used for certain laws or rules. Similarly, for questions about *who* the main interpreters are and *why* they engage in tagging, the answers fall into the Interpretant category of the signs. The six Open Signs, (1), (2), (3), (5), (6), and (8), reveal that user communities act in their own interests. In the three Informational Signs, (4), (7), and (9), tag writers express personal preferences; and in the Formal Sign (10), system designers develop rules for logical reasoning and meta-communication.

Our use of the ten classes of signs establishes a correlation between the triadic relation of signs and the framework for social tagging. This is especially useful in analyzing the various actors and the different levels of objects and representation, as shown in Figure 7.

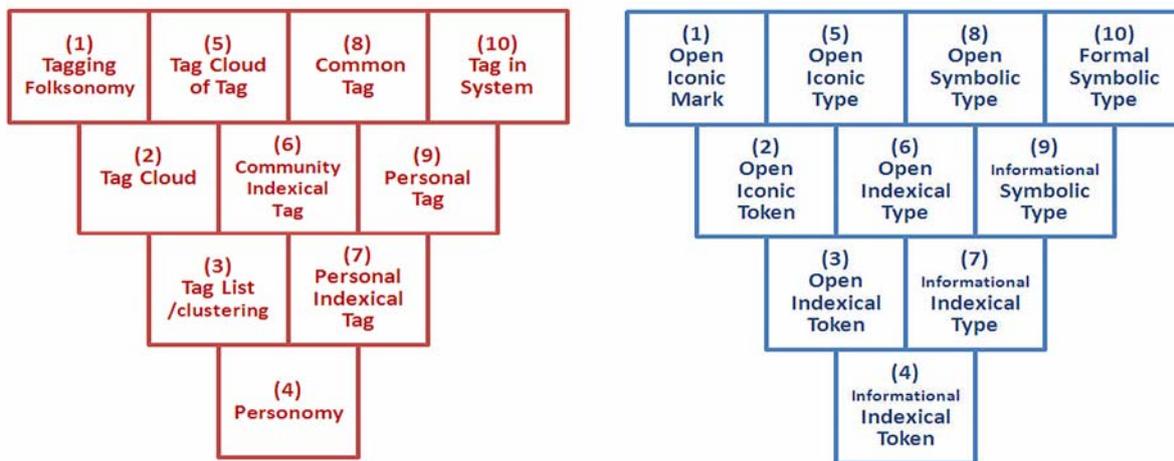


Figure 7: Social Tagging Phenomena as Ten Classes

## 6. Discussions and Implications

We have presented the interrelationships between social tagging, online communication, and the concepts of Peircean semiotics. By now, social tagging, as a term and as a concept, is best understood as a triadic sign with social tagging as Representation, online communication as Object, and Peircean semiotics as Interpretation (see Figure 8). The representations of social tagging are in three basic forms (Mark, Token and Type), which refer to online communication on three different levels (Icon, Index, and Symbol). The social tagging phenomenon as a sign is interpreted here through Peircean semiotics, and as a result there are ten classes of categorizations.

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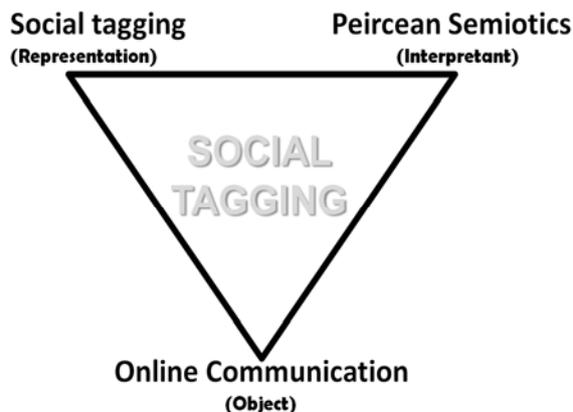


Figure 8: Social Tagging defined as a Sign

As social tagging is still relatively new, in this study we have mainly focused on the conceptual framework. It is not our goal to develop specific design guidelines in incorporating social tagging into online communication systems. Additional investigation and experimentation are needed in order to develop a full set of detailed implementation guidelines and rules for system designers on using social tagging techniques. This remains an area of intensive research and application development. Nevertheless, our conceptual framework gives out a direction in which individual application scenarios can be interpreted or derived. In the following we discuss several specific application scenarios where our conceptual framework is applicable to system design. We begin by first review and discuss several tagging techniques in view of the framework of Peirce's ten classes of sign. We then describe the framework's

implications for user-community designs.

Here are some implications we can derive from categorizing tagging techniques by the framework of ten classes of signs. From the point of view of system designers, techniques of tag clustering, as previously discussed in Sign (3), are used to implement Indexical Tokens, hence are methods to direct community users' interests. Tag RSS, being also for Indexical Token, however is used to direct personal preference hence better serves as a method in Sign (4). Here is another implication. The designs of triple tagging, geo tagging, or tag recommendations are in Sign (10), and, by the same reasoning, are methods to facilitate user participation and collaboration. As they are rules made by designers, so are highly applicable to computer-mediated communications. In particular, since the Replica of a suggested tag (Sign (10)), is a personomy (Sign (4)), a tag suggesting mechanism could be better designed if it is based on individual writer's tag vocabulary across various systems. We view these concepts from semiotic engineering and their differentiations as particularly useful in human computer interaction design.

In Section 3.2, we have analyzed social tagging using three levels of tagging actors, here we further elaborate some implications for user-community designs taking examples from relevant social tagging use cases. In the case of Tag Cloud (Sign 2), it has been suggested this design is better for community use, e.g. for "social signal", but not for the purpose of information accuracy. Moreover, if a system is designed for community use, the designers should not forget that each instance of user's tags is required to be strongly influenced by its indexical Object for online communication. Such as in the case of Sign (6), we have presented two community-defined words "DSC-R1" and "ACIA" as examples of specific community use; there are other temporal and spatial contexts where tags are applied to be associated with community knowledge. In particular, the Replica relation of Sign (3), (6) and (8) is a clarification and analysis of different Objects and Representations for community use in different categories (Tag List, Community Indexical Tag, Common Tag). In contrast, for personal tag use, the Replica relation of Sign (4), (7) and (9) is a clarification and analysis of different Objects and Representations in different categories (Personomy, Personal Indexical Tag, and Personal Tag).

Applications of this new concept for system designers rely mainly on the specific purpose of the social tagging systems which the designer wants to design. Take the tag list as an example. This design, if considered in a context of general social tagging phenomena, the designer may need to pay special attentions to the direct relation between Sign (3), Sign (6) and Sign (8). The reason is that the three signs have replica relations, and this relation may assist the designer in considering the technology use and in categorizing the target users in different levels. However, if the focus of the system designer is only on the tag list, then the system designer may regard the tag list as a sign. Hence, the designer can derive the ten classes of the tag list based on Peircean Semiotics. The schema of the ten classes for the tag list design can be set in a systematic manner.

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When adding other functionalities to systems that already support tagging, the understanding gained from the ten classes of signs can also be useful. For instance, when considering the use of tag terms as search terms in order to retrieve additional information (which may or may not have already been tagged), this would lead to a review of the categorization of the tagging being used in the system. One would imagine a scenario where keywords that have been indexed for an external archive are re-casted as auto-recommendation tags, i.e., as Sign (10) which is of formal symbolic type. Users are then recommended to use these keywords as tags, as they can lead to efficient search. Likewise, in a system where the search terms can be pre-classified to be of personal preferences, i.e., Signs (4), (7), and (9), then the scope of search can well be limited to resources under an individual's collections.

We believe that there are incentives in developing social tagging systems using innovative technologies; this is significant especially when diverse users are collaborating and participating. The ten classes of sign and three universal categories are based on a logical and abstract foundation, and can be adaptable to dynamic situations and different contexts.

## 7. Conclusion

Borrowing from Heinz Zemanek (1965), the emergence of online communication systems can be understood as a sign within “a communication of programs between computers, from man to computers, from man to man, as well as from man to himself” [29]. In our view, this justifies the combination of semiotics, humans and computers in the study of information science.

While most conventional interpretations of tagging phenomena focus on information retrieval and some social dimensions, we regard tagging as sign that conveys human and machine meanings in the online communication process. It is now well established that Peircean semiotics can be utilized as an analytical framework for complex composition. The same argument may be made about the online communication process, which is a dynamic integration of human participation and collaboration.

As a result, in this paper, we look to semiotics for the concepts and general principles that are relevant and significant, and identify ten classes of social tagging to offer a semiotic solution to the vagueness and ambiguity of tagging in the online communication process. The interrelationships between social tagging, online communication and the concepts of Peircean semiotics, as well as the practical implications for user-community designs and the use of tagging technologies are presented here in a systematic manner.

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## Appendix: Divisions of Signs

### Classification of Representation:

- **A Mark**, a quality of appearance, is the quality of the sign.
- **A Token**, in itself is an actual existence, which is an individual or particular copy of a type sign. In theory, there can be lots of tokens of a single type.
- **A Type**, in itself is a general rule, and is an entity, form, or function that can be copied indefinitely. In particular, a Type is usually established by men.

### Classification of Object:

- **An Icon** has some characters in itself, whether any such Object exists or not, and it is a similarity or a likeness such as found in diagrams.
- **An Index** refers to the Object not so much because of any similarity, but because it is affected by the Object; and it is an actual modification of the Object. An Index signifies existential relation or a direct physical connection. It draws the user's attention to a particular object without actually describing it.
- **A Symbol** refers to the Object, indicates by virtue of a general law or universal rule, and is typically involved with general and conventional ideas.

### Classification of Interpretant:

- **Open** is a sign of qualitative possibility. It does not provide information about the objects to which the sign refers, and it cannot be defined with certainty because Open is a quality of feeling.
- **Informational**, it is a sign of a fact, an experience of an effort, and it also provides information about the object a sign refers to.
- **Formal** is a sign of reason, of argument, which distinctly represents the Interpretant by rules or laws.