

Collaborative Tagging for Collective Intelligence

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Kwan Yi

Eastern Kentucky University, USA

INTRODUCTION: CONCEPTS, SERVICES, AND APPLICATIONS OF 2.0

A new wave of so-called 2.0 has arisen over the past decade. The new idea of 2.0 has been evolved during a series of O'Reilly meetings and conferences, and, as a result, Web 2.0, a new version of the Web has been formed (O'Reilly, 2005). Timothy O'Reilly, who coined the term Web 2.0, emphasized at the Web 2.0 Summit that: "Web 2.0 is all about harnessing collective intelligence." (O'Reilly & Battelle, 2009). Tim O'Reilly (2006) explained his reasoning in his commencement speech at UC Berkeley:

A true Web 2.0 application is one that gets better the more people use it. Google gets smarter every time someone makes a link on the web. Google gets smarter every time someone makes a search. It gets smarter every time someone clicks on an ad. And it immediately acts on that information to improve the experience for everyone else. It's for this reason that I argue that the real heart of Web 2.0 is harnessing collective intelligence.

Since the introduction of Web 2.0, numerous attempts have been made to adopt the 2.0 as a new paradigm or approach, and applied it to resolve the issues and problems in various disciplines and fields: Enterprise 2.0 (McAfee, 2006), E-business 2.0 (Kalakota & Robinson, 2001), E-Government 2.0 (Nam, 2012), health/medicine/healthcare 2.0 (Hughes, Joshi, & Wareham, 2008), e-learning 2.0 (Ebner, 2007), Library 2.0 (Casey & Savastinuk, 2007), to name only a few.

The Web has been perceived as a collection of information, but in the 2.0, the Web is served as a platform supporting applications and services that run on the Web (O'Reilly, 2005). Web 2.0 goes beyond the emergence of new technologies and services. It is often recognized as a revolution or new paradigm in information production process (Bernal, 2009; Bleicher, 2006; Ebner, Holzinger, & Maurer, 2007; Lin, 2007), as in that the boundaries between traditional information providers and consumers become blurred as information consumers (i.e., information users) more actively participate in the process of creating, providing, and sharing new information through tagging, reviewing, etc. in Web 2.0 applications. There is no clear distinction between the two parties, information providers and consumers under the new paradigm of 2.0.

A key idea of the 2.0 lies in the participatory collaboration from a crowd of people and the formation of the 'collective' knowledge into which the collaborative efforts have evolved. Such 'collective' knowledge is popularly known as the 'wisdom of crowds' that is the best collective decisions formed by a group of people who are diverse in opinions, independent, and decentralized (Surowiecki, 2004). Major characteristics underlying the 2.0 include user participation, openness, and network effect (O'Reilly, 2006). First, *user participation*. An architecture of user participation is an essential component of promoting voluntary collaboration in 2.0 applications or services. Second, *openness*. This is a working environment in an open fashion, such as using open source software and freely available data, etc. Third, *network effect*. This is the effect that any participant of 2.0 products or services has on the value of that product to other users. A comprehensive coverage on the characteristics can be found at the article by Anderson (2006).

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The key principle and a number of characteristics of 2.0 are common to 2.0 services, applications, and products. For a better and deeper understanding of 2.0, it will be beneficial to explore the idea of 2.0 at both service and application levels.

First, 2.0 at service level: A Web 2.0 service categorization model is proposed (Shang, Li, Wu, & Hou, 2011) and comprised of four platforms each of which a service falls on: Exchanger, Aggregator, Collaborator, and Liberator. The *Exchanger* is a platform used for the exchange of shared information or experiences via online communication tools such as Skype and MSN. The *Aggregator* is a platform for publishing and sharing various contents by individuals such as Twitter and Facebook. The *Collaborator* is a platform for producing knowledge in various ways such as review, edit, revise, and creation under specific standards. Its examples can be found at Wikipedia, bookmarking/tagging, and Q&A websites such as Yahoo! Answers. The *Liberator* is similar to the Collaborator but more open under free restriction. Open source is the primary community for the Liberator, where community general users share experience, access open source codes, and contribute with a new application or alternative solutions. OpenOffice.com – open-source office suite and Linux are among the examples.

Second, 2.0 at application level: Web 2.0 applications can be divided into five categories (Constantinides & Fountain, 2008): blogs, social networks, communities, forums, and content collectors. *Blogs*, as the most known type of application, are personal online journals that are primarily to publish user-generated contents such as thoughts, ideas, suggestions, and comments, along with communication with any participants; *Social networks* allow people to communicate with others in various ways such as sending online messages or sharing information of various formats such as text, image, video, and so forth; *Communities* are online places for storing and sharing particular types of contents such as images at <http://images.google.com> or <http://www.flickr.com>, video clips at <http://www.youtube.com>, and web contents at <http://digg.com> and <https://delicious.com>. *Forums* are websites for publishing and exchanging ideas and information regarding special interests, such as product reviews at <http://www.epinions.com> and a subject in computer programming at <http://www.pytho.org>. *Content collectors* are a type of application that allows users to customize the content accessible from an application of this type, such as <http://my.yahoo.com> and <http://www.google.com/ig>.

Under the new wave of 2.0, a new approach, if not paradigm, for collaboratively organizing and indexing online resources, has gained attention with the recent popularity of social bookmarking applications such as StumbleUpon (<http://www.stumbleupon.com>), Reddit (<http://www.reddit.com>), and Digg (<http://digg.com>). This new approach, called by many different terms such as collaborative tagging, social tagging, social bookmarking, or social indexing, uses keywords or terms (referred to as tags) in the collaborative tagging. The primary principle underlying the collaborative tagging approach is that any volunteers (called taggers) can participate in assigning tags to target Web resources for any variety of selfish or altruistic reasons including searching, sharing, navigating, etc. Thus, the collaborative tagging falls on the category of *Collaborator* in service nature and *Communities* in application type.

UNDERSTANDING COLLABORATIVE TAGGING FOR HARNESSING COLLECTIVE INTELLIGENCE: CHARACTERISTICS AND TAG GENERATION

As described above, the notion of collective intelligence (CI) has become a key idea of 2.0. Intelligence is defined as the ability of reasonable thinking and purposeful action in order to deal with the environment (Wechsler, 1964). CI is described as “It is a form of *universally distributed intelligence*, constantly

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