

TAXONOMY TO FOLKSONOMY IN DIGITAL ENVIRONMENT SYSTEM: A STUDY

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Abstract: This paper has mainly focused on the concept of taxonomy and folksonomy. Both taxonomy and folksonomy are used to increase the efficiency of information retrieval in digital environment system. The taxonomy is developed by experts or professionals followed by a controlled vocabulary or standard subject heading list whereas folksonomy is an uncontrolled vocabulary and enriched by users' collaborative tags / users' warrants. In this paper a study has been made on properties, scope, functions of folksonomy and differences with taxonomy.

Keywords: Taxonomy, Folksonomy, Digital Library System, Tagging, Automated Library System.

1. INTRODUCTION

In fact, developers have found numerous ways of utilizing Web2.0 to increase the efficiency of information retrieval systems. Social tagging systems enable users to annotate web content with freely chosen keywords (tags), share these tags with other users of the applications, and profit from the tagging activity of the entire user community by discovering or retrieving relevant web content during browsing, or as answers to search queries. The tagging activities are modelled in a folksonomy: taxonomy, which evolves overtime when users tag resources (Abel, Henze and Krause, 2008).

A folksonomy can hence be described as a set of users' tags resource binding (tag assignment). "del.icio.us" (<https://delicious.com/>) is a folksonomy-based tagging system which allows users to organize, share and link web resources within a group. This collaborative tagging system increases the efficiency of retrieving relevant web contents/resources. The term "folksonomy" is coined by Thomas Vander Wal. It derives from "folk" and "taxonomy." (Smith, 2004) to describe system in which people (not professional indexer) assign natural language descriptors/keywords to resources/web content. Folksonomy is related to, but different from taxonomy. Taxonomy follows a particular scheme or standard of classification. It is created by classification or subject experts, whereas folksonomy follows the collaborative tagging system which are contributed by users. This chapter reveals the concept of folksonomy and its related ideas like tagging, collaborative tagging, properties of folksonomy, differences between folksonomy and taxonomy. This chapter is devoted to the explanation of substantive concepts associated with the subject access system in digital environment with particular reference to the journey from taxonomy to folksonomy. This chapter puts this research study into the appropriate context of scientific perspective.

2. TAXONOMY

According to Wikipedia (Wikipedia, 2014a), the term "taxonomy" is the practice and science of classification. It is a particular classification and derived from the Greek term "taxis" (meaning "order", "arrangement"), and "nomos" (meaning "law"). Originally taxonomy referred only to the classifying of organisms or a particular classification of organisms. In general sense it may refer to classification of things or concepts as well as to the principles underlying such a classification.

In digital environment systems, taxonomy is widely used to classify and to navigate resources in knowledge repositories. However, the taxonomy does not reflect user vocabulary as it is defined by the taxonomist or professional experts or subject experts of the domain. On the other hand, the terms of the taxonomy become superannuated very riotous which in term constraint the efficiency and effectiveness of knowledge classification and navigation. The maintenance of the taxonomy is time-consuming (Kiu, 2011).

The other definition of the word is specifically in the context of the web, e.g.--web resources and contents are usually indexed by a taxonomy to support knowledge navigation. Such a taxonomy is designed or created by owning authorities, specialists (taxonomists), or derived from the authors of the web resources (Spiteri, 2007).

3. FOLKSONOMY

The term “folksonomy” is derived by Thomas Vander Wal from “folk” and “taxonomy” (Smith, 2004) to describe systems in which users assign keywords to resources. A folksonomy is a system of classification derived from the practice and method of collaboratively creating and managing tags to annotate and categorize contents; this practice is also known as collaborative tagging, social classification, social indexing and social tagging (Wikipedia, 2014). Folksonomies appear in many current web applications, most famously in the “social bookmarking” service, del.icio.us (<https://delicious.com/>), in which users bookmark and tag webpages, the photo sharing site Flickr (<https://www.flickr.com/>), where users can upload and tag photographs other images. Folksonomies have also began to appear in more “scholarly” services, such as–Connotea (<http://www.connotea.org/>) (discontinued from 12th March, 2013) and CiteULike (<http://www.citeulike.org/>), which are similiar to del.icio.us, but oriented towards aricle citation. Folksonomies are also being applied to books, in the University of Pennsylvania's library catalogue [PennTags (<https://pennlabs.library.upenn.edu/bookmarklets/>)], and in LibraryThing (<https://www.librarything.com/>), a social site for cataloguing personal libraries. These examples are especially interesting, since the resources involved (articles, books) are already indexed using controlled vocabularies, providing a fertile ground for exploring the similarities and differences in the functions of folksonomies and controlled vocabularies (Kroski, 2005).

Today, users are adding metadata and using tags to organize their own digital collections, categorize the content of others and build bottom-up classification systems. The wisdom of crowds, the hive mind, and the collective intelligence are doing what heretofore only expert cataloguers, information architects and website authors have done. They are categorizing and organizing the Internet and determining the user experience, and it’s working. No longer do the experts have the monopoly on this domain; in this new age users have been empowered to determine their own cataloguing needs. Metadata is now in the realm of the Everyman (Kroski, 2005).

4. DEFINITIONAL ANALYSIS

According to Vander Wal (2005), the term “folksonomy” is the result of personal free tagging of information and objects (anything with a URL) for one’s own retrieval. The tagging is done in a social environment (shared and open to others). The act of tagging is done by the person consuming the information.” The value in this external tagging is derived from people using their own vocabulary and adding explicit meaning, which may come from inferred understanding of the information/object. The people are not so much categorizing as providing a means to connect items and to provide their meaning in their own understanding. There are three important components of folksonomy–i) the users; ii) the resources being described, with a unique identifier such as a URL or ISBN, and; iii) the descriptors or “tags” used to describe the information resources.

According to Wikipedia (2014), “A folksonomy is a system in which users apply public tags to online items, typically to aid them in re-finding those items. This can give rise to a classification system based on those tags and their frequencies, in contrast to a taxonomic classification specified by the owners of the content when it is published. This practice is also known as collaborative tagging, social classification, social indexing, and social tagging.”

According to Dictionary.com (2015), folksonomy is “a classification system derived from user generated electronic tags or keywords that annotate and describe online content.”

According to Techopedia (2015), “Folksonomy is the process of using digital content tags for categorization or

User Based Tagging And Folksonomy

Social-networking sites such as LinkedIn, Friendster concentrate on developing relationship, but social sites such as Delicious, Flickr, LibraryThing, Connotea, CiteULike focus their attention on organising data. Users organise their own or others' data in the public domain and the social, or community, aspects arise from there as users share and seek out like-minded individuals. Tagging is not a new concept, especially to librarians, indexers and classification professionals. The tagging is being done by everyone, no longer only by a small group of experts, and the tags are being made public and shared. The development of the Internet and the web, and of search engines, led to users doing their own searching. In the folksonomy based environment users are now also doing their own content creation and information management. Usually the tags refer-i) are meaningful to users, ii) can be added to already tag resources, iii) can be public or private iv) can be grouped, shared, displayed, published and managed, v) are often displayed in a "tag cloud."

Tagging is used in a range of sites for many different type of resources. Tagging is done somewhat differently at different websites, but the following all use some form of user tagging:

Delicious is a social bookmarking site. In Delicious, users can save a Webpage link as bookmarking for future use instead of saving the link in "Favourites" (Internet Explorer) or "Bookmarks" (Firefox) folder. The benefit being that they can then access the links from any computer since they are no longer only stored locally. As we add each page to del.icio.us, we are given the opportunity to add descriptive keywords, or tags to the link. This organizes our data by category or tag. We can look for what others have linked to and described by a particular tag or just browse others' collections of links (<https://delicious.com/>).

Flickr is a website for storing and managing digital images and photographs. It is a place for us to organize all of our photographs into albums, tag them with descriptive keywords, and view others' images. Flickr allows navigation by tag or user as the previous two sites, as well as by group. Groups are places for users who share similar interests to post their images such as the "Cats in Sinks" or the "Dogs Eating Potato Chips" groups (<https://www.flickr.com/>).

LibraryThing is a website that allows users to catalogue their personal collection of books, and importing bibliographic data from amazon.com, Library of Congress, British Library and from other libraries. Users can categorize books using tags and discovers other users with similar books and interests (<https://www.librarything.com/>).

CiteULike is a website that allows users a free service to store, organise, and share the scholarly papers and citations. It allows its users to add their academic reference library to their online profile on the CiteULike website (<http://www.citeulike.org/>). Articles can be stored with their metadata in various formats, abstracts, and links to the papers at the publishers' websites. Users can also add reading priorities, personal comments, and tags to their papers. CiteULike also offers the possibility of users setting up and joining groups that connect users sharing academic or topical interests. These group pages report on recent activity, and offer the possibility of maintaining discussion blogs. The full text of articles is not accessible from CiteULike, although links to online articles can be added (Bogers and Bosch, 2008).

Properties Of Folksonomy

Folksonomy uses an uncontrolled vocabulary, so it has much in common with any other system using natural language for keywords/terms/descriptors. However, it also employs a social system absent from other systems of indexing that sets it apart.

Folksonomy As Uncontrolled Vocabulary

In information retrieval systems (IRS), the vocabulary used to organize content may be based upon the choices of the authors of the materials, the designer of the IRS, or the designer of the controlled vocabulary in place.

As uncontrolled vocabularies, folksonomies are riddled with many difficulties, such as ambiguity in the meaning of and differences between terms, a proliferation of synonyms, varying levels of specificity, and lack of guidance on syntax and slight variations of spelling and phrasing (Mathes, 2004).

Syntax is also system-dependent: while some systems allow spaces in tags or differentiate between capital and lowercase letters, others do not (Mathes, 2004). Additionally, indexer error may be higher in folksonomies because of incorrect usage; Spiteri (2005) observes the application of "archaeology" as a tag to materials about dinosaurs and prehistoric

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microbes. Moreover, while controlled vocabularies are used by professional indexers with some claim to objectivity, the interests of the user of the folksonomy are explicitly subjective. Uncontrolled vocabularies do have several significant advantages over controlled vocabularies: the barriers to entry in terms of effort, time, and cognitive burden are much lower than in employing a controlled vocabulary (Mathes, 2004). This property allows much more widespread adoption of tagging systems.

Folksonomies As Inclusive

The top-down taxonomies use a controlled vocabulary which is exclusionary by nature; folksonomies include everyone's vocabulary and reflect everyone's needs without cultural, social, or political bias.

Folksonomies As Current

In folksonomies, users create tags as quickly as they create content and they are immediately added to the ontology. This flexibility allows swift responses to changes in terminology and to world events. A large taxonomy such as the LCSH (Library of Congress classification scheme), in which it could take years to add a date of death to an author's authority record, simply cannot compete with this rate of adaptability. In creating traditional classification schemes, the cataloguer is put in the position of fortune teller, in that he/she must predict permanent categories in advance. The problem with this model is that things change; countries change names, computer technology expands, and sometimes groups of people change the way they refer to themselves.

Folksonomies As Discovery

Taxonomies are designed for searching specific information whereas folksonomies are designed to discover unknown and unexpected information. These systems allow to explore related topics, tags and other users.. These systems also allow discovering and locating new resources that they might not ever have come across through searching. Oftentimes the user doesn't know exactly what resources that they are looking for at the start of their research. Discovery systems help users to uncover alternative paths and related resources on their information journey.

Folksonomies As Non Binary

In a standard subject device system, a controlled vocabulary follows enumerated subject device, which implies that every category term has its own position. It also determines for future category terms, whether they are fitted into a particular category or not. In a folksonomy system, an item can be fitted into multiple categories in a multi-faceted scheme (Shirky, 2004).

Folksonomies As Democratic And Self-Moderating

In folksonomy systems, everyone contributes to the whole. These are self-moderating. It allows the choosing of tags that appropriately describe items, which in turn helps to remember them in the future. When tagging new items, users are guided with the most popular tags used for that resource (Mercado, 2005).

Folksonomies As User Friendly Tool

Folksonomies provide users a chance to observe how users tag their own resources as well as what kind of untraditional categories have surfaced. Among the new categorization types are functional tags such as "to_read" and "to_watch." Both of these are temporary tags which are reflective of the adaptive nature of these bottom-up taxonomies. Although they are very subjective descriptors, they are also both useful tags to others who may want to view what others have on their reading lists.

Folksonomies As A Low Cost Alternative

To create a traditional, hierarchical taxonomy with a controlled vocabulary is quite expensive. Expert cataloguers or information architects are needed to determine the scheme as well as classify individual entities. User-based tagging provides a low cost alternative for cataloguing web resources.

Folksonomies As Usability Navigational Aid

To understand top-down classification schemes requires a trained or skilled user group. On the web, such expertise isn't

always possible as levels of user expertise and interest vary greatly. Folksonomies have a very small learning curve and are exceedingly comprehensible to the user.

Folksonomies As No-Synonym Control Mechanism

In user-based tagging systems, there is no controlled vocabulary and therefore one authoritative term does not exist to describe a concept or entity. This is considered a shortcoming when different users describe assets using many different terms to presumably describe the same thing, i.e. cats, kittens, felines, etc. Because of the characteristic lack of control, there is also no way to regulate the use of plurals vs. singular, acronyms, etc.

6. TAXONOMY TO FOLKSONOMY

Taxonomies have been widely adopted for classifying and categorizing, but knowledge seekers continue to suffer from poor knowledge navigation and ineffective information retrieval. Trant (2006) has revealed that more than 70% of terms tagged by the users were not listed in museums' documentation. This means that content classifiers often have conceptual definitions that are different from those by users. This is a common problem with informal taxonomies which, because of the differences are unable to take into account the full nomenclature and cultural nuances of the users. The reason is that taxonomies are usually designed by a small group of experts who often have a different view point and navigational behaviour from the general users. Mitchell (2005), has concluded that taxonomies became outdated very quickly, whereas new concepts may emerge but they are not yet included in the taxonomy; in contrast, folksonomies accommodate new concepts easily. Thus content navigation, searching and browsing through a taxonomy can be constrained and fail to facilitate collaborative contributions and opportunities (Barbosa, 2008). The major limitations of taxonomies are described below:

- i) The construction of additional law of classification is an expensive solution in terms of content. It postulates intensive, collaborative processes, the role of which is to define and legitimate the classification categories, protocol and tools to be used.
- ii) The use of a new taxonomy requires the existence of some kind of control committee and training processes for the future users in order to ensure the consistency of this classification.
- iii) Taxonomy is a time consuming process.

To facing these difficulties, a set of “new” classification methods were created and implemented at large scale through many distinct initiatives. These methods became known as “folksonomies.” Folksonomies emerged through new classification techniques and technologies supporting collective contributions, collective referencing and categorizing. They are replacing top-down approaches (taxonomies) by bottom-up approaches in which the classification categories are built directly by and for the users (Glassey, 2007).

Taxonomy Vs. Folksonomy

Taxonomy follows a classification usually arranged in a hierarchical structure. It provides top-down approaches. Taxonomies are designed by specialized staff. They are accurate, precise, and at the same time rigid schemes which may produce ontological definitions. On the other hand, folksonomy is a collection of tags built up by the action of user tagging, effectively a user generated taxonomy as opposed to an authoritative hierarchical taxonomy like–LCSH or a specific thesaurus. A folksonomy provides a bottom-up approach. A key feature of folksonomy is that tags may be reused many times, providing information about the popularity of the tags themselves as well as information about emerging areas of interest.

| Taxonomy | Vs. | Folksonomy |
|------------------------------------|------------|-----------------------|
| Central control | | Democratic creation |
| Top-down | | Bottom-up |
| Meaning to the author | | Meaning to the reader |
| Tedious process for making changes | | Just do it |
| Accurate | | Good enough |

| | | |
|--------------------|--|---------------------|
| Navigation | | Discovery |
| Restrictive | | Expansive |
| Defined vocabulary | | Personal vocabulary |

Figure-3: Taxonomy vs Folksonomy

Combination Of Taxonomy And Folksonomy Approaches

An innovative approach combining the two system (taxonomy and folksonomy) is explored by taking into account the potential. Some main categories are top-down defined (taxonomy) and successively bottom-up improved through collaborative tagging. The hybrid method merges the freedom of social tagging with some control coming from the top-down classification. This approach is considered a very promising method of improving web access, and is currently implemented in real contexts/systems.

An example of integration of top-down and bottom-up classification is provided by the “Tags for Citizens” project, applied to the Turin municipality website (<http://www.comune.torino.it>). The taxonomy is based on the British standard IPSV (Integrated Public Sector Vocabulary), while the bottom-up classification comes from a social tagging system (Carcillo & Rosati, 2007). The folksonomy layer has two purposes here:

- i) to allow users to label pages of interest through tags and save them in a reserved area;
- ii) to allow users to use tags created by others as a complementary browsing tool to the taxonomy and search engine.

Figure-4: Home page of “Tags for Citizen” Project: (<http://www.comune.torino.it>)

In this system the folksonomy layer is integrated into the existing taxonomy. When users insert a new tag, they are asked to link it to the taxonomy categories creating a link between the two layers.

Another experience of integration of bottom-up and top-down classification is FaceTag (Quintarelli, Resmini and Rosati, 2007) (<http://www.facetag.org/>), “a working prototype of a semantic collaborative tagging tool conceived for bookmarking information architecture resources.” The combination of the flat tag space created by users and a richer faceted classification scheme helps to disambiguate and contextualize tags, may help solve the linguistic issue of folksonomies (i.e. polysemy, homonymy and base level variations, etc.), and improve the system information architecture.



Figure-5: Home page of Facetag: <http://www.facetag.org>

Another site, where the need for a hybrid approach has been recognized, is the BBC web site (Loasby, 2006). The proposed solution, known as “Metadata Threshold,” allows user tags to be added to control vocabularies when enough content is tagged with that term.

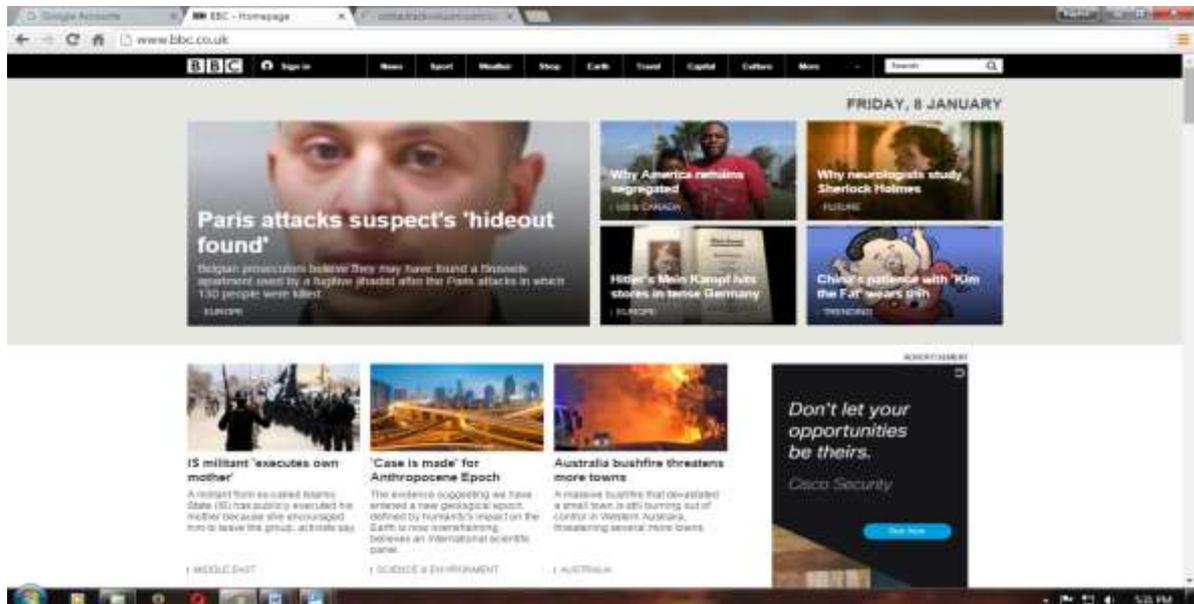


Figure-6: Home Page of BBC: bbc.co.uk

In their paper, Sommaruga, Rota and Catenazzi (2011) discuss the advantages and problems of taxonomies and folksonomies, and propose a hybrid approach which combines benefits to adaptively improve access to a web site. This approach has been tested in a real scenario by developing the Easy Access system (<http://www3.ti.ch/>). This practical experience introduces the “tagsonomy” mechanism, i.e. the combination of a top-down classification defined by the web site content manager, and a bottom-up classification defined by users. The peculiar feature is that the folksonomy is automatically generated on the basis of the user interaction with the system, and not as the result of an explicit tagging process.

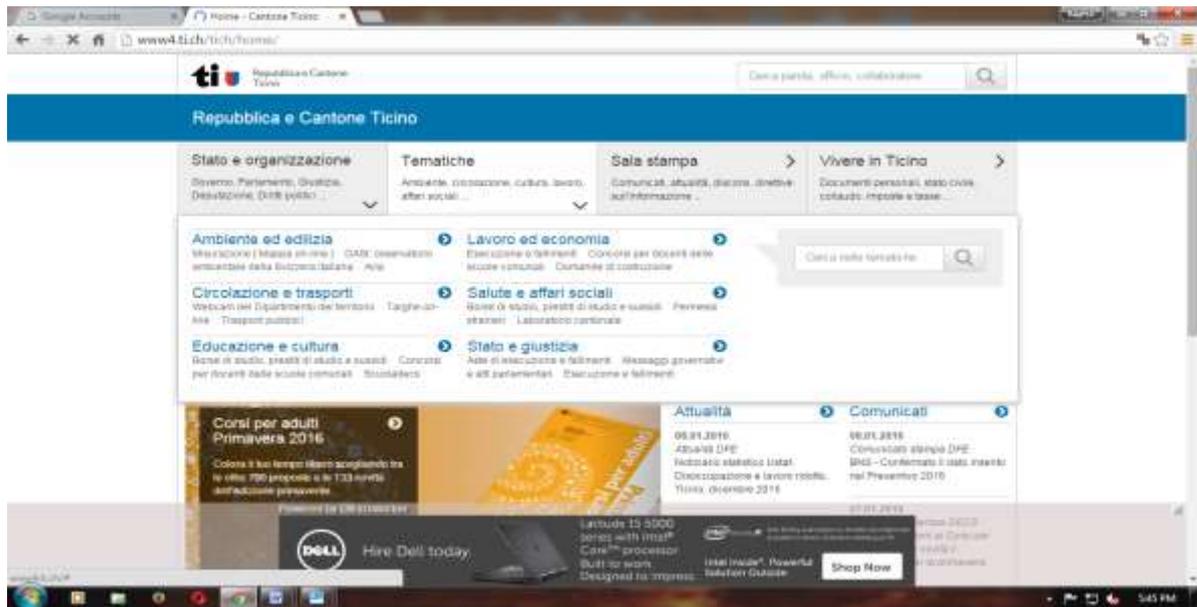


Figure-7: Home Page of Easy Access System: <http://www3.ti.ch>

Kiu & Tsui (2011) have presented a paper on hybrid taxonomy and folksonomy approaches. Taxonomists or professional experts of a domain which often do not reflect user vocabulary. Folksonomic structures are defined by the users. In addition, the terms of the taxonomy become outdated very fast which in turn compromises the efficiency and effectiveness of knowledge classification and navigation. On the other hand, maintenance of the taxonomy is tedious. Kiu and Tsui also present a taxonomy and folksonomy integration algorithm, namely TaxoFolk (Kiu and Tsui, 2011) to integrate the folksonomy into a taxonomy to enhance knowledge classification and navigation. The output is a hybrid taxonomy-folksonomy structure. Three different taxonomy domains and its folksonomy are used to set up the experiments to identify and to evaluate the threshold values for filtering infrequent tags and invalid tags to automate the TaxoFolk algorithm to integrate a filtered folksonomy with a pre-defined taxonomy for enhancing knowledge navigation. The conducted experiments have ascertained the most appropriate thresholds values for effective building of TaxoFolk structure.

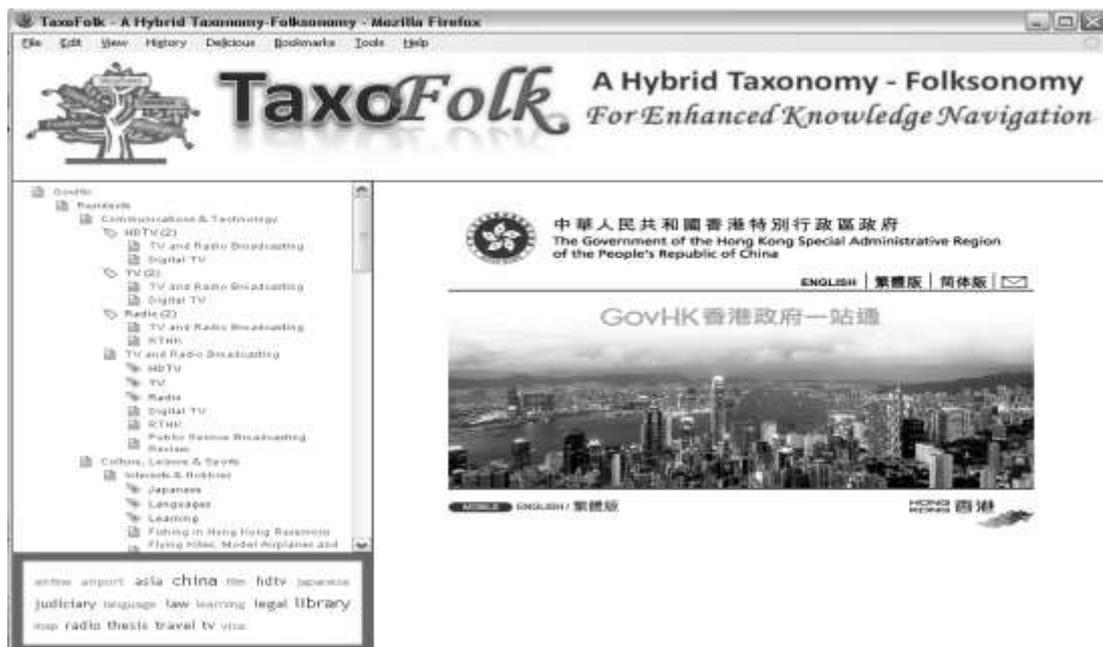


Figure-8: Home Page of TaxoFolk: a Hybrid Taxonomy-Folksonomy

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Lothian and Hayman (2007) discuss the integration of user tagging and controlled vocabulary for Australian education network. Education Network Australia (edna) develops and manages Australian online services for education and training. Its goal is to bring people, learning and technology together. These projects are increasingly involved in exploring the use of Web 2.0 developments building on user ideas, knowledge and experience, and how these might be integrated with existing information management systems. It is a leading online resource collection and collaborative network for education, with an extensive repository of selected educational resources with metadata created by educators and information specialists. It uses controlled vocabularies for metadata creation and searching, where users receive suggested related terms from an education thesaurus, with their results. They recognize that no formal thesaurus can keep pace with user needs, so are interested in exploiting the power of folksonomies.

7. CONCLUSION

Folksonomy has changed the methodology of classification and categorization of resources. It has replaced all concept of hierarchy from the scheme of knowledge organization, facilitating knowledge discovery and web indexing. However, it still posits various problems. Although there is not a perfect system in the world that satisfies every user, Folksonomy still has scope for improvement. The search engines could present search results in clusters and attach each cluster to terms having the highest frequency, designating them as the tagging terms of the cluster by controlling vocabularies They should also be able to recommend tags used by other users. The next chapter discusses data analysis and integration.

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