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Digital image description: a review of best practices in cultural institutions

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Digital image
description

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Abstract

Purpose – This paper aims to present the results of the first phase of a research project aiming to develop a bilingual taxonomy for the description of digital images. The objectives of this extensive exploration were to acquire knowledge from the existing standards for image description and to assess how they can be integrated in the development of the new taxonomy.

Design/methodology/approach – An evaluation of 150 resources for organizing and describing images was carried out. In the first phase, the authors examined the use of controlled vocabularies and prescribed metadata in 70 image collections held by four types of organizations (libraries, museums, image search engines and commercial web sites). The second phase focused on user-generated tagging in 80 image-sharing resources, including both free and fee-based services.

Findings – The first part of the evaluation showed that each resource presented comparable information for the images or items being described. Best practices and implementation proved to be largely consistent within each of the four categories of organizations. The second part revealed two trends: in image-upload systems, there was a virtual absence of mandated structure beyond user name and tags; and in stock photography resources, the authors encountered a hybrid of taxonomies working in combination with user tags.

Originality/value – The analysis of best practices for the organization of digital images used by indexing specialists and non-specialists alike has been a crucial step, since it provides the basic guidelines and standards for the categories and formats of terms, and relationships to be included in the new bilingual taxonomy, which will be developed in the next phase of the research project.

Keywords Digital images, Image indexing, Image retrieval, Cultural institutions, Controlled vocabularies, Tagging

Paper type General review

1. Introduction

With the advent of digital content, printed documents are no longer the most central concerns of libraries, just as cultural objects are not the only preoccupations of museums. Indeed, access to other less accessible documentary forms is now possible. Other types of documents (e.g. maps, pictures, drawings, videos, audio files) are now part of collections preferred by cultural institution users. While many text documents supporting multimedia information can often be identified by the presence of linked text, access to strictly non-text documents continues to be more difficult. In addition, this problem is further complicated when the documents combine various languages. This paper presents the results of the first phase of a research project aiming to develop a bilingual taxonomy for the description of digital images. The objectives of this extensive exploration were to acquire knowledge from the existing standards for



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image description and to assess how they can be integrated in the development of the new taxonomy.

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), with the development of information technologies and in particular the internet, the role of traditional information services must be meticulously revised (UNESCO, 2011). This new environment has unprecedented influence on the work of cultural institutions. By definition, a “cultural institution” means a public or non-profit institution that engages in the cultural, intellectual, scientific, environmental, educational or artistic enrichment of the people. The definition of “key cultural institution” applies to organizations that administer a museum, a library or archives. This includes university libraries and archive collections, school libraries, government department libraries, public libraries, libraries and archives in private organizations such as law firms, private libraries or archives collections, and museums of all kinds.

Cultural institutions are often in the position of caring for gigantic and varied collections of digital documents. These collections can sometimes be unmanageable. They are also very different from one another. However, over the years, one common denominator has become very important: digital image collections. Cultural institutions give access to thousands of digital images from their collections, including manuscripts, rare books, musical texts, illustrations, drawings, paintings and photographs of artefacts.

The goal of our research project is to develop a bilingual taxonomy for the indexing of digital images in order to enhance their retrieval in monolingual and multilingual contexts. This paper presents the results of the first phase of the project. The best practices review consisted of an extensive analysis of existing standards in image description. The objectives of this extensive exploration were:

- (1) to acquire knowledge of the terminology standards; and
- (2) to assess how they can be integrated in the development of the new taxonomy.

For this review, specialized terminologies used by professional indexers were examined. Moreover, with social tagging becoming more popular and users willing to provide annotations and tags for images, the study of tags available in image-sharing systems provided a basis to study what types of terms are employed by real users in their process of personal image indexing. The analysis of image-indexing terms used by indexing specialists and non-specialists alike is a crucial step in the taxonomy development because it provides the basic guidelines and standards for the categories and formats of terms and for the construction of relationships to be included in the new taxonomy.

2. Background

A digital document is presented as a set of files labelled by a unique identifier. This document, whatever it is, must be described so that it is identifiable by a majority of individuals. This description includes a set of metadata. Without metadata, the digital document has no real existence since it remains inaccessible. The primary function of descriptive metadata is to provide a thorough and detailed bibliographic description in a standardized format that allows access to the document as well as exchange with other institutions. Among descriptive metadata, three groups of attributes are considered essential to images (Ménard, 2008):

- (1) the terminological attributes referring to the lexicographical aspects of the indexing terms (number of indexing terms assigned, indexing term types, and indexing level);
- (2) the perceptual attributes related to the physical, functional and identifying features of the described images; and
- (3) the structural attributes identifying more precisely the relationship between the words, with four categories of relations (generic, partitive, instance, and associative).

The second group of metadata, the structural metadata, aims to reconstruct the document's structure, that is, all the files that make up a document (text, images, videos, sounds) and establish the relationships between these files. Finally, there is administrative metadata, which is needed for the management of access rights (copyright, privacy) and use (print rights, reproduction, modification). Administrative metadata also aims to ensure the integrity of files by tracking changes and protecting any technical information needed to read files (Haynes, 2004).

The transition from a traditional cultural institution to the digital one is not only characterized by a strictly technological change, it also requires a change in the paradigm by which people organize, access, and interact with information. The traditional institution has long focused on storage and preservation of physical evidence, including books, periodicals and artefacts. For example, online museums now provide access to pieces that are rarely or never displayed. They also allow researchers and museum lovers from around the world to see works that they otherwise would have to travel to see. In a word, museum collections are on exhibit at all times, from anywhere in the world.

In libraries, traditional organization of documents supposed a very detailed cataloguing process and a navigation system based on the physical proximity of related topics. For example, books on religion were grouped on the shelves. The passive organization of information meant that users had to come to the library to use it, since it was physically assembled in one place. However, digital content libraries differ from the above, since access to these digital documents can be had from anywhere. Indeed, the requirements in terms of physical storage media are eliminated. Cataloguing can be done using the full text and navigation is based on hyperlinks, keywords, classification systems or clustering. Documents dealing with the same subject no longer need to be physically located near each other. Through increasingly sophisticated technological means, users will not necessarily visit the library, because access and dissemination of information can be done electronically. A phenomenon of modern times, the library is located anywhere the user can access it, from home or school, the office, airport and from nearly all means of land transport and others. It should also be noted that the advent of mobile phones, laptops and electronic notebooks has dramatically changed the habits of internet users, as well as users' access to online catalogues. Our previous study (Ménard, 2008) highlighted an evolution in the manner of formulating the queries for image retrieval. Consequently, if the manner of searching images is evolving gradually, maybe it is time to conjecture whether the image indexing methods, and more particularly the controlled vocabulary traditionally employed for the indexing process, is still well adapted to the real and current needs and behaviors of image searchers.

Digital images are searched for and used worldwide by a wide range of individuals, including book and magazine publishers, advertising and design agencies, national

newspapers, TV production companies, graphic designers, greeting card companies and so on. Cultural institutions such as libraries and museums are great digital image providers. In the past, if an individual wanted to visualize a specific museum object, he had to arrange a visit to view the item with a curator, or view an analogue photograph of the object. Nowadays, this process is much simpler, since most museum objects have been digitized and are now accessible from a web page or a database. The possibility of accessing almost any image collection constitutes a great benefit for curators, students, teachers, scholars, lecturers, researchers and specialists. Access to digital images is now made easier and more effective, as disparate images can be studied in new environments. Dissemination of images of unique collections not only encourages scholarly use, but also large-scale research in various contexts. Moreover, images can be used for public relations, educational purposes, sponsorship and promotion.

However, the organization of digital images is far from being standardized. Indexing processes, as well as retrieval devices that provide access to digital data, vary from one institution to another. Text-based image indexing and retrieval have been studied extensively for decades. This study builds on and augments the work of other researchers (Panofsky, 1955; Turner, 1993, 1998; Shatford, 1986; Krause, 1988; Markey, 1988; Armitage and Enser, 1997; Jörgensen, 1998, 2003; Markkula and Sormunen, 2000; Conniss *et al.*, 2000, 2003; Goodrum and Spink, 2001; Choi and Rasmussen, 2002, 2003; Matusiak, 2006; Enser *et al.*, 2007; Enser, 2008; Greisdorf and O'Connor, 2008; Rorissa, 2008; Chung and Yoon, 2009; Stvilia and Jörgensen, 2009). Examination of the different indexing approaches makes it clear that the majority of images are indexed on a minimum and often offer a single point of access (Jörgensen, 1998). Several studies show that most of the indexing approaches are not suitable for image searchers (Besser and Snow, 1990; Roddy, 1991), while other studies emphasize the fact that the main problem concerning image retrieval is the approach chosen for the indexing process (Ohlgren, 1980; Krause, 1988; Turner, 1993).

With a text-based approach, image description can either be achieved with controlled vocabularies or with terms directly extracted from the natural language. These two approaches have been explored in the context of cultural institutions. The results are presented in the next two sections. Following these, the case study of Flickr Commons is described in detail.

3. Traditional description with controlled vocabularies

Professional controlled vocabularies have supported the classification and organization of information in a wide variety of disciplines for hundreds of years with a high degree of precision. General terminologies established by the Library of Congress Subject Headings (LCSH) have been expanded over time to accommodate vocabularies unique to particular disciplines, including Getty's *Art & Architecture Index* (AAT) and the *Thesaurus for Graphic Materials* (TGM). These specialized terminologies enable highly specific collocation of material, sometimes beyond the needs of an everyday user, but essential to scholarly work. In addition, customized taxonomies developed by individual resources, often commercial, serve to create a localized layer of organization which functions in a similar way when more traditional vocabularies are either inappropriate or unavailable. Exponential increases in the production of textual and non-textual data in all subject areas has made it particularly important to understand exactly how effective these methodologies remain and to

examine whether their structure is indeed useful for the description of images, which can present additional challenges. For our purposes, gaining an understanding of these issues will form a foundation upon which to build an improved taxonomy interface for speakers of multiple languages.

Image description comprises more than the fields in which a controlled vocabulary may be implemented. Used mainly to identify a primary subject and the broader category of an item, controlled vocabularies and taxonomies constitute a small but critical percentage of the metadata associated with any item being classified. For the first phase of this study, we examined 70 resources, all of which employ controlled vocabularies or taxonomies. These resources fell into four distinct categories[1]:

- (1) libraries (21);
- (2) museums (16);
- (3) image search engines (18); and
- (4) commercial web sites (15).

Even if commercial web sites are not rightfully considered cultural institutions, we considered the inclusion of a few of these sites important in our review in order to compare their organizational structure with those of formal cultural institutions.

We compiled the metadata for all resources and found that it fell into the following categories: title, date, creator, category, subject, dimensions, material, copyright, original source, collection, location, image format, image date, photographer and digital ID. We discuss the parameters and findings for the resources examined in the next three subsections.

3.1 Libraries and museums

Included in this resource group were the following:

- academic, governmental and public libraries; and
- national, state, local and private museums.

Our analysis revealed that libraries and museums use similar methodologies, so we have chosen to address them together. We did not attempt to establish a definitive list of all libraries and museums, but rather selected a representative sample to evaluate the ways in which such institutions approach the description of images. It was not always possible to identify precisely which controlled vocabularies were implemented at the institutions in question. However, although the precise vocabularies may differ, the need for consistency, high levels of precision and interoperability with other similar institutions across a large user base depends on a reliable structure and interoperability, both of which are provided by professional description built on established vocabularies, such as LCSH, AAT and TGM.

Close examination of the metadata associated with images presented by libraries and museums revealed that the following information is consistently presented in an item record: title, date, creator, subject, original source and collection. With regard to the original object, approximately 40 percent of the resources present dimensions, material and source, and 50 percent address copyright issues associated with either the original or the image thereof (both usually connected to the institution in question).

3.2 *Image search engines*

Cultural institutions large and small manage their collections in physical and digital formats, but also may connect to independent image search engines to expand access to the digital content their users require. Notable examples include ARTstor (art and architecture) and Wellcome Images (health and science), both of which offer sophisticated retrieval options as a result of extensive descriptive content based on professional indexing. Earlier and less sophisticated web sites in this genre are still in use (Art Images for College Teaching, Index of Christian Art, Beazley Classical Archive), but all present the title, date, creator, subject, original source and collection. In addition, 50 percent note where the original item is held. The association with libraries, museums and governmental organizations such as NASA requires that all descriptive content for these resources be accessible to an even larger audience, which once again depends upon the stable foundation provided by professional indexing practice.

3.3 *Commercial sites*

Virtually every commercial web site must manage images of the products they are selling, but this does not mean the images are the focus of retrieval. When images are the products offered, primarily on stock photography web sites, we observed a much more prominent use of tagging in combination with internal site taxonomies. For this reason, we have included stock photography in the next section and examined only those resources not selling images. For all sites in this group, the web site taxonomy served as a localized controlled vocabulary, but it is unique to the resource (i.e. not transferable).

There is a high level of consistency in the descriptive methodology for images associated with collections at libraries and museums, by virtue of the need for interoperability. Successful retrieval depends on the presence of a particular term in the collective description of an item and, where images are concerned, this does not (for this resource group) include what might be considered the obvious components of colour or shape. User interfaces for basic and advanced searching have been built on traditional descriptive practice, which is text-based and does not therefore accommodate a more intuitive and/or visual approach. In addition, although most non-English interfaces offer the option of switching to English for displayed content, this does not always extend to searching. Unfortunately, too many English-based resources offer no additional language choice. Nevertheless, the foundation of image description at an institutional level is traditional descriptive cataloguing, and future improvements need to be integrated with existing best practices in order for image retrieval to continue to function efficiently.

In brief, the first part of our evaluation showed that each type of institution presented comparable information for the images or items being described. Best practices and implementation proved to be largely consistent within each of the four categories of organizations.

4. **Tagging usage in image-sharing systems**

User-generated annotation of images, tagging in particular, has become ubiquitous when posting content in both public and private realms. In order to more accurately describe rare, unusual or especially significant items, cataloguers and indexers have long taken advantage of notes fields to expand the points of access when detailed descriptive terms are unavailable in controlled vocabularies, but tagging is quite

different. Using a controlled vocabulary term requires not only specialized knowledge and education, but also access to the pertinent resources, which are usually subscription or fee-based and often specific to an organization. Tagging is unregulated and user-specific, yet, for the everyday user, it also has the potential to function as a personalized indexing system allowing quick and easy retrieval of personal items. The outcomes are obvious. Tagging is easier and unrestricted by vocabulary or language issues, and it requires no special training to employ. However, it is far from consistent as a result of its individualized nature, so the content retrieved can be voluminous and imprecise when implemented on a larger scale.

The second phase of our investigation focused on user-generated tagging in 80 image-sharing systems accessed online, in three categories[2]:

- (1) image upload (32);
- (2) image hosting (14); and
- (3) stock photography (34).

Detailed examination of each group revealed consistent patterns of descriptive structure, as well as ways in which this comparatively unstructured approach to indexing images can succeed or fail. As in Phase 1, we tracked the metadata presented and compiled the following list:

- tags;
- user/creator;
- predetermined categories;
- albums;
- favourites;
- map;
- Google Earth;
- photo details;
- camera statistics;
- copyright/permissions;
- user comments; and
- social network links.

As in the previous section, we discuss our parameters and observations in three subsections, organized by resource type.

4.1 Image upload and sharing

For the purposes of this investigation, the image upload and sharing resource type was defined as one where the focus was online submission of digital photographs for one (or more) of several purposes: sharing, organizing and linking. We examined 32 web sites covering a wide spectrum of options, ranging from anonymous drag-and-drop uploads to images associated with individuals, institutions and high-resolution web sites for professional photographers. Despite this wide range, the primary target audience for the majority of resources in this group is an individual user, uploading and sharing photographs from daily life, vacation and work.

As anticipated, every resource provided users with the opportunity to tag their own images during or after the upload process, and for other users to retrieve those images in a search by using the same tags. In addition, every resource in this category offered the following metadata options for uploaded images: user/creator, albums, comments and (with a few exceptions) ratings, and links to social network sites. Beyond these basic elements, approximately 25 percent also provided discrete, predetermined categories for image organization (e.g. travel, family, pets, vacation), none of which were mandated and all of which were unique to the site under consideration. Approximately 40 percent allowed for statements concerning copyright permissions and also imported camera metadata for display; 25 percent offered the options of geo-tagging, placing the image on a map provided by the site or linking to Google Earth (Panoramio).

In terms of image description, the presence of predetermined categories offers an additional option for classification. Photobucket, PhotoDekho and Shutterfly are among those offering this choice, and each web site has established its own categories. Close examination revealed many areas of overlap in categorization; for example, in Shutterfly, one can choose Travel US, Travel Asia, Travel Africa, Travel Europe, as opposed to Travel with four subcategories. Tag clouds, seen in 90 percent of these resources, provide an efficient method for retrieving images with the same tag. However, examination of images retrieved in this manner proved to be far from precise, due to the lack of internal web site structure, and the inconsistency of tags chosen by individual users.

4.2 Image hosting

Image hosting sites typically track very little metadata and, contrary to our expectations, do not always provide the option of tagging images, relying instead on the file name and a link to other resources to provide that information. The primary function of these resources is storage and access. Our analysis of 14 resources revealed the only consistent metadata element to be a user/creator, and 50 percent of these sites allowed for anonymous upload. Image hosting sites were determined to be not useful for our purposes.

4.3 Stock photography

As discussed in the previous section, stock photography web sites are often commercial ventures, so it is therefore no surprise that they offer the most structured and professional user interface. Along with defined tag clusters, often arranged by subject, predetermined categories are the norm, and many are detailed and hierarchical in nature (Stock Xchng, iStockphoto, Freepixels). In this way, they function as taxonomies, and some were intentionally designed as such, as are most e-commerce sites. Although unique to each site, the organizational structures also accommodate tagging and intuitive user interfaces for both display and retrieval. Sites such as iStockphoto and morgueFile allow for searches to be refined by colour, shape and image size, sometimes not by entering text but by clicking on an image. Of the three types of sites we examined, stock photo sites were simultaneously the most intuitive and precise. It is important to note that stock photo sites are supported by and target a visually sophisticated audience, and many are fee-based.

Analysis of the resources evaluated in Phase 2 revealed two distinct patterns, clearly organized by resource type. Image upload sites presented a virtual absence of structure mandated by the hosting web site beyond user name and tags, although

users have the option of creating a customized template to present collections, albums and/or favourites, organized by date, thereby tailoring their content to their own needs and preferences. Predetermined categories and tag clouds act as rudimentary filtering devices when searching for similarly tagged information, but without exception the results were imprecise. In contrast, stock photography sites present a type of dual description, combining the structure of a taxonomy with the flexibility of tagging in a user interface that is, not surprisingly, more appropriate for visual material. We believe the best practices associated with stock photography web sites provide a potentially useful model for future image taxonomies and retrieval.

To summarize, the second part of the evaluation revealed two trends:

- (1) in image-upload systems, there was a virtual absence of mandated structure beyond user name and tags; and
- (2) in stock photography resources, we encountered a hybrid of taxonomies working in combination with user tags.

5. Case study: Flickr Commons

There are those who advocate for a hybrid form of traditional indexing methodologies and tagging, but there has been little substantial investigation of how that might work. A collaborative effort between the Library of Congress (LC) and Flickr/Yahoo, initially called The Commons provides an opportunity to examine some of the possibilities as a case study in participatory tagging. Initiated January 16, 2008 as a pilot program, the project was extremely well received by the Flickr community, and ultimately led to the establishment of Flickr Commons, an ongoing Flickr forum where cultural organizations can continue the experiment by offering their own collections to the public for added exposure and information gathering. The program had two main goals, according to Oates (2008) of Flickr:

[...] to increase exposure to the amazing content currently held in the public collections of civic institutions around the world, and to facilitate the collection of general knowledge about these collections, with the hope that this information can feed back into the catalogues, making them richer and easier to search.

According to Raymond (2008):

[...] this project is a statement about the power of the Web and user communities to help people better acquire information, knowledge and – most importantly – wisdom, ... one of our goals, frankly, is to learn as much as we can about that power simply through the process of making constructive use of it.

A report issued by LC at the conclusion of the pilot program (*For the Common Good: The Library of Congress Flickr Pilot Project*) states that public interest and tag contribution was far greater than they had anticipated, leading them to download the entire set of tags for internal analysis. Two photo collections had been posted with three tags for each photo: one in-house LC tag and two machine tags for correlation between Flickr and LC; all others were user contributions. For each collection, 50 sample records were chosen, by selecting every 10th photo from the start of the period. These records were then analyzed by assigning tags to ten categories evaluating the tag content. These categories include new subject words (in six subcategories, including image, for items seen in the image itself), emotional/aesthetic responses,

personal knowledge/research, foreign language, and tags based on LC description. Although the process of assigning tags to categories was sometimes arbitrary and redundant, the analysis revealed that descriptions supplied by LC influenced the new tags provided (seen to be both positive and negative). Although the tags supplied by users were often helpful in identifying people or places in the photos, they were not necessarily valuable for retrieving the photo (Springer *et al.*, 2008). Nonetheless, the pilot program proved that there is public interest in participation, which provides an ongoing opportunity for research, now expanded to include additional institutions.

As of June 2011, there were 52 participating cultural heritage organizations in ten countries, with a wide variety of size and mission, ranging from NASA and the Getty Research Institute, to the London School of Economics, National Archives UK, Reykjavik Museum of Photography and the Nantucket Historical Association. User contributions of annotations and tags have led to a more complete understanding of the posted collections, through tagging as well as user comments. The comments for individual items frequently include conversations between users and institutional representatives clarifying dates, spellings, objects or locations, identifying people and generally improving the quality of the information being presented. It appears to be a genuine partnership, and one can only speculate that these informal exchanges are leading to more precise use of the controlled vocabularies used behind the scenes.

6. Discussion

This review of the best practices for image description revives once again the eternal debate between indexing with controlled vocabularies and free indexing as we encounter most of the time in image-sharing systems. We could summarize the advantages of the former by saying that controlled vocabulary ensures the retrieval of all resources that address the same topic, regardless of which words the authors use to describe that topic. Synonyms are all indexed under the same controlled vocabulary term, so the searcher is spared the job of thinking of and searching for every term that describes a certain topic. In the same manner, controlled vocabulary also avoids problems with spelling variations. However, some problems are also closely related to the use of controlled vocabularies. Actually, there will be times when using controlled vocabulary does not result in the exact search that you need. New topics are not well represented by controlled vocabulary. As well, a very specific and defined topic may not be represented in the controlled vocabulary that provides a subject heading or a descriptor that are much too broad. The advantages and disadvantages of controlled and uncontrolled vocabularies (Table I), used for

Controlled vocabulary		Uncontrolled vocabulary	
Main advantages	Main disadvantages	Main advantages	Main disadvantages
Permits generic relationships to be identified	Slow in incorporating new concepts	Specificity	Lack of consistency
Control for synonyms and homographs	Not always providing the desired level of specificity	Immediate inclusion of new concepts or terminology	No specific to generic linkage
Higher precision in retrieval	Possibilities of inadequacies of coverage	Sometimes provides more results in a shorter time span	False drops (search results that meet search criteria but irrelevant to what users are trying to find)

Table I.
Main advantages and disadvantages of controlled and uncontrolled vocabularies

documents or multimedia indexing, are extensively described in the literature (e.g. Markey *et al.*, 1980; Rao Muddamalle, 1998; Jørgensen, 2003; Savoy, 2005; Arsenault, 2006; Macgregor and McCulloch, 2006; Matusiak, 2006; Rafferty and Hilderley, 2007).

In general, comparison of both types of vocabularies concludes that indexing offers more free access points and the index terms tend to be more specific, whereas the use of controlled vocabularies requires consistency in indexing, by focusing on their hierarchical structure, which tends to focus on cross-references (Lancaster, 2003).

In one of our previous studies (Ménard, 2008), the results obtained confirmed that image retrieval is more efficient when the indexing approach combines the controlled and the uncontrolled vocabularies, compared to the results obtained with each indexing approach considered separately, and this goes for indexing in English and French as well. This could be explained by the fact that indexed images with the combination of vocabularies offer more indexing terms, which results in increasing the probability that the correspondence can be established between the query terms and the indexing terms. This finding was important because it suggested in turn two specific elements. On one hand, the combined use of controlled and uncontrolled vocabularies can be advantageous to improving the retrieval efficiency, as reported by Rao Muddamalle (1998), who stressed that the combination of both approaches improved by 5 percent the retrieval results from each approach examined separately, and Matusiak (2006), who stated that the two approaches should not be considered as alternatives but as complementary resources.

On the other hand, this double indexing, if adopted, also requires an increase in the indexing time. Increasing the cost of indexation is certainly not desirable for economic reasons, especially if the growing number of images available in databases and other sources of information is taken into consideration. However, we must increasingly consider the possibility that self-indexing can be done collaboratively by researchers and users of images, thereby reducing the potential costs associated with the indexing performed by the intervention professionals (Quintarelli, 2005; Macgregor and McCulloch, 2006).

This review of the best practices also reveals that most image description is done in the internet established lingua franca, English. However, image searchers may also want to access images using other languages. Offering the possibility to search with a real multilingual controlled vocabulary represents an exciting solution. Some interesting projects have been undertaken, especially in Europe, where multilingualism is considered a “necessity.” For example, *The UNESCO Thesaurus* is a trilingual controlled and structured list of terms used in subject analysis and retrieval of documents and publications in the fields of education, culture, natural sciences and social and human sciences. It contains 7,000 terms in English, 8,600 terms in French and 6,800 terms in Spanish that are spread among seven major subject domains. However, these multilingual vocabularies are scarce and often very limited in the choice of languages offered.

A possible solution would be the construction of a multilingual vocabulary obtained by the translation of an existing monolingual thesaurus into one or more languages. This approach is challenging, however, since the original language and the target language will not necessarily match. Another solution is the creation of a brand new vocabulary in multiple languages. In this case, creating a multilingual thesaurus or any type of controlled vocabulary can be very expensive, highly complicated (due to

semantic problems between different languages) and time-consuming. Among the crucial difficulties relating to the development of a multilingual vocabulary, Soergel (1997) mentioned that it should include “all concepts needed in searching by any user in any of the source languages.” Language differences often also imply cultural and conceptual differences. Moreover, problems with the structural hierarchy often occur in multilingual controlled vocabulary, particularly when different languages vary in the hierarchical levels at which the concepts are organized.

On the other hand, the use of social network systems allowing collaborative indexing and classification has gone through continuous growth in recent years. This type of indexing, even if it sometimes presents shortcomings, is often closer to the natural language used in image searches and the way of seeing and describing things (Matusiak, 2006). Furthermore, multilingual tags have started to emerge on popular social tagging systems (e.g. Facebook, Flickr) as their user base grows on an international level. For example, we observed that users add tags in different languages (e.g. achat, shopping). In some cases, language identification of the source language acts as a tag (e.g. lang: fi). Nevertheless, it is worth mentioning that other types of difficulties could emerge when allowing individuals to index images with their own keywords. We cannot minimize the linguistic differences among users of a same language. The perfect example can be illustrated by the differences we constantly observe with French speakers from France and Quebec (Canada’s French-speaking province). Even if grammar is similar, terminological issues and discrepancies are numerous. Similar variations can be observed in other languages, such as between standard American and standard British English, Portuguese and Brazilian Portuguese, German and Swiss German, among others. Consequently, this may affect the tags selected to describe digital images and, in the long run, the image retrieval performance.

7. Conclusion

This extensive analysis of existing best practices used to describe images, has been undertaken to identify which elements and standards could be integrated in the development of the new taxonomy we propose to develop, in the next phase of our research project. This examination supposed the inventory and analysis of specialized controlled vocabularies usually used for image description, as well as tags used in image-sharing systems. The framework obtained from the review and comparison of the best practices constitutes the basis of the taxonomy development. The hypothesis of our research project supposes that the combination of “classical” terminologies used by indexing specialists and terms extracted from innovative approaches such as image tagging could facilitate access to images by producing metadescrptors useful in all retrieval environments.

As the above results of our exploration show, terms extracted from controlled vocabulary as well as tags provided by users could constructively complement each other. In our previous research (Ménard, 2008), we studied two approaches for image indexing:

- (1) the use of controlled vocabulary; and
- (2) uncontrolled vocabulary.

Our analysis of indexing terms showed that, in general, three categories of attributes are considered to describe images:

- (1) the terminological attributes referring to the lexicographical aspects of the indexing terms;
- (2) the perceptual attributes examining the physical, functional and identifying features of the object represented in the image; and
- (3) the structural attributes identifying the relationships between the words.

The comparison of the two indexing approaches also highlighted the fact that the combination of controlled vocabulary and tags would provide richer metadata and, consequently, give more chances to users to retrieve images.

Additionally, the issue of multilingual image description is interesting and offers fascinating possibilities for cultural institutions such as libraries and museums, as well as for end-users. In a multilingual environment, making visual resources available in languages other than the mother tongue is becoming more common. Mixing social tagging with traditional expert controlled vocabulary system seems to offer exciting possibilities for accessing visual resources or any type of resources. From this best practices review, it becomes apparent that further research into the topic of multilingualism is needed not only to better understand its complexity, but also to be able to design more adaptable applications. Questions raised by this review include the determination of how terms in controlled vocabularies and tags in different languages should be kept in separate silos, or, more logically, whether they should interact with each other. The distance between languages could eventually be used for connecting like-minded people across linguistic borders.

Inspired by the conclusion obtained from the best practices review, as well as the results of our previous study (Ménard, 2008), the next step of the research project proposes to develop a bilingual taxonomy for the indexing of digital images, in order to enhance their retrieval in a monolingual and multilingual context. Once fully operational, it is intended that the taxonomy be implemented in an image search engine to be developed in a future research project. The new taxonomy is intended to be a powerful tool for use by cataloguers or indexers who are describing works of art, architecture, material culture, archival materials, visual surrogates or bibliographic materials by providing helpful information for searchers. The taxonomy will also act as a search assistant to enhance end-user access to online visual resources. Moreover, since images are an integral part of online catalogues, the future taxonomy will also present an interesting improvement for commercial providers who give their users the opportunity to see images of their products. Finally, since language barriers still prevent users from easily accessing information, including visual resources, the bilingual taxonomy constitutes a definite benefit for image searchers who are not very familiar with images indexed in English, which is still the dominant language of the web.

Notes

1. A list of all examined resources with their URL can be found in Appendix 1.
2. A list of all examined image-sharing systems with their URL can be found in Appendix 2.

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Resources	URL
<i>AIGA Design Archives</i>	http://designarchives.aiga.org/#/home
<i>Alaska's Digital Archives</i>	http://vilda.alaska.edu/
<i>Amazon</i>	www.amazon.ca/
<i>American Philosophical Society Digital Coll.</i>	www.amphilsoc.org/library/digcoll/
<i>Art Images for College Teaching</i>	http://arthist.cla.umn.edu/aict/
<i>Art Museum Image Gallery</i>	http://vnweb.hwwilsonweb.com/hww/results/
<i>Art Resource</i>	www.artres.com/c/htm/Home.aspx
<i>Artyclopedia</i>	www.artyclopedia.com/masterscans
<i>Artefacts Canada</i>	www.pro.rcip-chin.gc.ca/artefact/index-eng.jsp
<i>ArtNet</i>	www.artnet.ch/
<i>ArtStor</i>	www.artstor.org/index.shtml
<i>Avery Art & Architecture Library, Columbia</i>	www.columbia.edu/cu/lweb/indiv/avery/
<i>B & H Photo, Video & Pro Audio</i>	www.bhphotovideo.com/
<i>Beazley Archive Classical Research Centre</i>	www.beazley.ox.ac.uk/index.htm
<i>BNF</i>	http://images.bnf.fr/jsp/index.jsp
<i>Bodleian Oxford Digital Library</i>	www.odl.ox.ac.uk/
<i>Boston Public Library</i>	www.bpl.org/
<i>British Library Online</i>	www.imagesonline.bl.uk/
<i>Centre for Contemporary Canadian Art Database</i>	www.ccca.ca/
<i>City of Toronto Archives</i>	Hosted by eloquent
<i>Collage image Database</i>	http://collage.cityoflondon.gov.uk
<i>Cooper-Hewitt (Smithsonian)</i>	www.cooperhewitt.org/
<i>DBNY (Discontinued Brand Name Yarn)</i>	www.discontinuedbrandnameyarn.com/shop/
<i>Duke University Libraries Digital Collections</i>	http://library.duke.edu/digitalcollections/
<i>George Eastman House</i>	http://licensing.eastmanhouse.org/GEH/C.aspx?VP3=HRender_VPage
<i>Golda's Kitchen</i>	www.goldaskitchen.com/
<i>Home Depot</i>	www.homedepot.ca/
<i>Index of Christian Art</i>	http://ica.princeton.edu/
<i>Lessing Photo Archive</i>	www.lessing-photo.com/
<i>Library & Archives Canada</i>	www.collectionscanada.gc.ca/
<i>Library of Congress</i>	http://loc.gov/pictures/
<i>LLBean</i>	www.llbean.com/
<i>Los Angeles Public Library</i>	http://digital.lapl.org/
<i>Louvre</i>	www.louvre.fr/llv/commun/home.jsp
<i>Metropolitan Museum of NY</i>	www.metmuseum.org/
<i>MoMA</i>	www.moma.org/
<i>Montreal Museum of Fine Arts</i>	www.mbam.qc.ca/en/index.html
<i>Mood Fabrics</i>	www.moodfabrics.com/
<i>Museum of Civilization</i>	www.civilization.ca/cmc/home/cmc-home
<i>Museum of Vancouver</i>	www.museumofvancouver.ca
<i>NASA Marshall Image Exchange</i>	http://mix.msfc.nasa.gov
<i>National Gallery Canada</i>	www.gallery.ca/en/see/collections/category_index.php
<i>National Library of Australia</i>	www.nla.gov.au/pict/index.html
<i>New York Public Library (connects to Flickr)</i>	http://digitalgallery.nypl.org/nypldigital/index.cfm
<i>Nucleus Medical Images (search in 17 lang.)</i>	http://catalog.nucleusinc.com/nucleusindex.php?
<i>Pearl Paint (art supplies)</i>	http://pearlpaint.com/

Table A1.

Resources employing controlled vocabularies or taxonomies

(continued)

Resources	URL
<i>Peets Coffee & Tea</i>	www.peets.com/
<i>Prado</i>	www.museodelprado.es
<i>RISM Répertoire International des Sources Musicales (Picasa for images of manuscripts)</i>	www.rism.org.uk/
<i>SAHARA (hosted by ArtStor, but diff. format)</i>	http://sahara.artstor.org/collection/rlogin.html
<i>Sears</i>	www.sears.ca/
<i>Segre Visual Archives (scientists and work)</i>	http://photos.aip.org/collections.jsp
<i>Smithsonian Civil War Museum</i>	www.civilwar.si.edu
<i>Smithsonian Libraries</i>	www.sil.si.edu/imagegalaxy
<i>Smithsonian Nat'l Air & Space</i>	www.nasm.si.edu
<i>Staples</i>	http://staples.ca/ENG/Catalog/stap_home.asp
<i>Tate London</i>	www.tate.org.uk/
<i>Tea Gschwender</i>	http://shop.tgtea.com/store/
<i>UC Berkeley SPIRO</i>	www.mip.berkeley.edu/
<i>University of Buffalo Digital Collections</i>	http://ubdigit.buffalo.edu/
<i>University of Pittsburgh Digital Library</i>	www.library.pitt.edu/libraries/drl/
<i>US Holocaust Museum</i>	www.ushmm.org/
<i>US National Library of Medicine NIH</i>	www.nlm.nih.gov/hmd/ihm/
<i>VADS</i>	www.vads.ac.uk
<i>Victoria & Albert Museum</i>	http://collections.vam.ac.uk/
<i>Web Gallery of Art</i>	www.wga.hu/index.html
<i>Wellcome Library/Wellcome Images</i>	http://images.wellcome.ac.uk/
<i>Williams Sonoma</i>	www.williams-sonoma.com
<i>World Images CSU CA State Univ. (World Art Kiosk)</i>	http://worldart.sjsu.edu/ (link not functional 2011.07)
<i>Zappos (shoes/bags)</i>	www.zappos.com/

System	URL
<i>23hq</i>	www.23hq.com
<i>Acclaim Images SP</i>	www.acclaimimages.com/
<i>Alamy SP</i>	www.alamy.com/
<i>Aminus3</i>	www.aminus3.com/
<i>Around the World in a Viewfinder</i>	www.jpviewfinder.com/
<i>BurningWell PD</i>	www.burningwell.org/
<i>CanStockPhoto</i>	www.canstockphoto.com/
<i>Cepolina</i>	www.cepolina.com/freephoto/
<i>Corbis Images</i>	www.corbisimages.com/
<i>DoctorStock</i>	www.doctorstock.com/iphoto/main2.htm
<i>dotPhoto</i>	www.dotphoto.com/
<i>dreamstime</i>	www.dreamstime.com/
<i>Dropshots</i>	www.dropshots.com
<i>everystockphoto SP</i>	www.everystockphoto.com/
<i>Flickr/Yahoo</i>	http://flickr.com/photos
<i>Fotki.com</i>	www.fotki.com/Canada/en/
<i>Foto Search SP</i>	www.fotosearch.com/
<i>Free Image Hosting</i>	www.fotoholder.com/
<i>Free Images (UK) SP</i>	www.freeimages.co.uk/
<i>Free Pixels SP</i>	www.freepixels.com/
<i>Free Range SP</i>	http://freerangestock.com/
<i>FreePhotosBank SP (connects to Dreamstime)</i>	www.freephotosbank.com/
<i>Getty Images</i>	www.gettyimages.ca/
<i>Glowfoto</i> **	www.glowfoto.com/
<i>Image Host (now closed)</i>	www.imagehost.org/
<i>Image Place (connected to ImageShack)</i>	www.imgplace.com/
<i>Image Shack</i>	http://imageshack.us/
<i>Image Source SP</i>	www.imagesource.com/
<i>Image Uploads</i>	www.imageuploads.net/
<i>Imagenic</i>	www.imagenic.net/
<i>ImageVenue</i>	http://imagevenue.com/
<i>Imgur</i>	http://imgur.com/
<i>Immagg.com</i>	www.iimmagg.com/
<i>ipernity</i>	www.ipernity.com
<i>Israeli Images</i>	www.israelimages.com/
<i>istockphoto.com</i>	www.istockphoto.com/
<i>Kodak EasyShare Gallery</i>	www.kodakgallery.com/gallery/welcome.jsp
<i>Le monde en images</i>	www.ccdmd.qc.ca/monde/
<i>Magnum Photos</i>	www.magnumphotos.com/Archive/
<i>Mejuba</i>	http://mejuba.com/
<i>Minus ("share simply")</i>	http://minus.us
<i>morguefile PD SP</i>	www.morguefile.com/
<i>Natuba</i>	www.natuba.com/
<i>Open Photo SP</i>	www.openphoto.net/
<i>P D Photo (Public Domain) PD</i>	www.pdphoto.org/
<i>Panoramio</i>	www.panoramio.com/
<i>PBase</i>	www.pbase.com
<i>phanfare</i>	www.phanfare.com/home.aspx
<i>Photo Dekho</i>	http://photodekho.com/

Table AII.
Image-sharing systems

(continued)

System	URL
<i>Photo Xpress SP</i>	www.photoxpress.com/
<i>Photo.net</i>	http://photo.net/
<i>Photobucket (connected to TinyPic)</i>	http://media.photobucket.com/
<i>PhotoRack SP</i>	www.photorack.net/
<i>photoshelter.com</i>	www.photoshelter.com/
<i>PhotoSwarm (professional site-builder)</i>	www.photoswarm.com/
<i>Picasa/Google</i>	http://picasaweb.google.com
<i>Pict!</i>	www.pict.com/
<i>Picture to Go</i>	www.picturetogo.com/
<i>PictureTrail</i>	www.picturetrail.com/
<i>Picupine</i>	http://picupine.com/
<i>Pixa</i>	www.pixa.us/index.htm
<i>Pixagogo</i>	www.pixagogo.com/Home.aspx
<i>PixMac SP (similar search tool is interesting)</i>	www.pixmac.com/
<i>Postimage.org</i>	www.postimage.org/
<i>Shutterfly</i>	www.shutterfly.com/
<i>Shutterstock SP</i>	www.shutterstock.com/
<i>SmugMug</i>	www.smugmug.com/
<i>Snapfish</i>	www.snapfish.com/snapfish/welcome
<i>Stock Vault</i>	www.stockvault.net/
<i>StockXchange (part of Getty family) SP</i>	www.sxc.hu/
<i>The Easy View "online storage"</i>	www.theeasyview.com/
<i>TinyPic related to Photobucket</i>	http://tinypic.com/
<i>UK Landscape Stock Photo Library</i>	www.scotland-photo-library.co.uk/
<i>Unprofound PD (created/run by designers)</i>	www.unprofound.com/
<i>UploadGeek (now suspended)</i>	www.uploadgeek.com/
<i>Veezle SP</i>	www.veezle.com/
<i>Webshots</i>	www.webshots.com/
<i>yfrog (connected to Twitter)</i>	http://yfrog.com/
<i>Yogile</i>	www.yogile.com
<i>Zoomr</i>	www.zoomr.com/

Table AII.

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Elaine Ménard is Assistant Professor at the School of Information Studies, McGill University (Montreal, Canada). Her teaching expertise includes cataloguing, indexing, classification and information retrieval. Her main research interests deal with cross-language information retrieval, image indexing and metadata. Professor Ménard has published in a number of scholarly journals, including *The Indexer Journal of Information Ethics, Knowledge Organization, Library Resources & Technical Services*, and *Documentation et bibliothèques*. Elaine Ménard is the corresponding author and can be contacted at: elaine.menard@mcgill.ca

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