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CollectionWeb Digital Ecosystems: A Semantic Web and Web 2.0 Framework for generating Museum Web sites

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http://www.youtube.com/watch?v=YbSgKvWauP8

Abstract

CollectionWeb is a development platform for Web-based social media sites that distribute, display, annotate and management digital collection content. CollectionWeb is based on an approach that generates semantic navigation interfaces that induces pages from collection metadata using Formal Concept Analysis.

Keywords: Semantic Web, Collection Management, Folksonomy Culture and IT, Web 2.0 and Social Media, Web-based Information Systems and Applications, Folksonomy

Cultural Context

Debates about ownership, protection and nation-states pervade the museum industry in the early twenty-first century, played out in discussion over the Elgin Marbles, the trade in antiquities, repatriation of artefacts and histories of race and nation. In the face of stringent shifts in cultural property laws and collecting policies for antiquities, James Cuno recently argued a case for the encyclopedic museum as a site of global cultural diversity which over-rides current national agendas (Cuno 2009). In Australia, where the antiquities issue is less highly charged, museums have become acutely aware of the connections between their cultural collections and the living Indigenous communities from which they originated. Repatriation of objects, or at the very least, the development of stronger communication links with the communities from which they originated, has become an ideal for many museums (Batty 2005). While objects, and their storage, display and interpretation remain central to the museum's existence, intangible heritage – narratives, memories and functions of human interaction with objects – is increasingly valued as an alternative source of authority and enrichment for museums. The voices of traditional owners of cultural collections are being listened to as well as the histories of colonial missions, trade, governance and exploration which brought them into existence in the Western institution that is the museum. But if the social and cultural value of both museums and the objects within them is widely acknowledged and embedded in the concept of a civilized society, how that value is demonstrated, and for whom, is constantly under negotiation. In the contested space of the museum, access and education, conservation and research, exhibition and commercialization are often competing agendas. New technologies are also a significant force in the contemporary museum environment.

Our Projects

The Virtual Museum of the Pacific

The primary project we describe in this paper, the Virtual Museum of the Pacific (VMP), is a model for online community interaction with the Pacific Island collection of the Australian museum, which operates within an understanding of objects and their meanings as dynamic, contested and negotiable. The VMP is a digital environment for exploring and defining the relationships among a selection of the 60,000 objects in the Pacific collection of the Australian Museum (AustMus or The Museum). The main motivation in the experiment of the VMP is to provide better access to the Museum's Pacific collection for a wider variety of stakeholders and to give those communities a useful mechanism for accessing and annotating objects that are important to them. Our stakeholders include – creator communities from Pacific Island countries and territories, Pacific diasporic communities in Australasia, scholars and other stakeholders with an interest in Pacific collections.

The Art Collection Ecosystem

The Art Collection Ecosystem (ACE) is an experimental instance of CollectionWeb, which sources artworks from the University of Wollongong's art collection. Through a series of user evaluations and iterative design, users found it easier to browse collections in an explorative manner then they did in a comparative social media site, Flickr, the conclusions drawn from ACE are equally valid in the Virtual Museum of the Pacific.

Technical Context

The concept of an ecosystem and a museum resonate with each other – if we take an ecosystem to be a complex system of interaction between organisms and their physical environment that is simultaneously self-contained and highly interdependent. It is this resonance that the CollectionWeb framework draws on in using the metaphor of a digital ecosystem to describe its ambitions and scope. The relationships among the objects of the collection are explored via a

rich Internet client using Web-services provided by a Formal Concept Engine. These services are used as input for generating Web pages (Figure 1.) that assist users to navigate by unobtrusively rendering a concept view with links to its upper (more general) and lower (more specialized) neighbors. The navigation paradigm is based on a technique called Formal Concept Analysis (Eklund et al. 2009) and the design results from more than 10 years of research, development and testing. Navigation of the Pacific collection is dependent only on relationships and attributes described in the metadata associated with the objects in the collection. The semantic associations are induced from this content so that as new content is added, so too new pathways will are revealed.

Figure 1.The formal concept “Solomon Islands” within the “Origin” perspective.

Information technologies have been used in museums since their inception to assist in classification and location, later for documentation, communication and access; most recently, social media’s potential for audience development and interaction is being explored. But there are complex and unresolved questions about how a on-line museum could operate, with very few viable models in operation, and little information about the limits and capabilities of such a concept. This is the terrain that the Virtual Museum of the Pacific (VMP) ventures into. We outline how the VMP moves across the various genres of information management in museums, incorporating each of them into its structure, from gathering metadata via traditional taxonomies through to addressing the needs of specific communities of users. We describe how community interaction through tagging, annotation, and metadata management can influence the design of the VMP. The CollectionWeb model used for the VMP, suggests some significant technical and cultural pathways for opening up museum collections and managing diverse community access to them. Technological and social innovations are, in our view, inextricably linked.

Sourcing Metadata

VMP metadata

The metadata used by the VMP for navigation and discovery within the collection is imported from the Australian Museum’s Collection Management System (CMS). The current digitization of collection records is the latest of an ongoing process and commitment of the Museum to computerize its collection records, including the Pacific collection. To understand the evolution of the Pacific collection metadata we give an overview of the typical life-cycle of records. The Australian Museum (AustMus) acquired the objects in its Pacific collection from many sources over the last 150 years. The process of adding an object to the collection is reasonably uniform and best illustrated by an example. The ‘pearl-shell inlay comb’ (shown in Figure 2.) was entered into the AustMus ‘Register of Ethnology’ as registered item E11110. The registry entry is the first association of the collection’s descriptive information – or ‘metadata’ with the object, and thus creates its unique and permanent registration number. This registry entry is the initial source of the ‘user warrant’ (National Information Standards Organization (U.S.) 2005, p. 10) for the vocabulary associated with the object. By user warrant we mean that the staff that entered the object (the ‘user’) in the register has ‘warrant’ to generate the object’s descriptive information.

Figure 2. Perl-shell inlay comb with Item Number E11110.

At a later point in time an index card was created that included the object's provenance, more detailed descriptive text and (on the card's reverse), the object's physical measurements. Later, as objects are added to the CMS, they are further described, and have a simple, practical corporate taxonomy applied to them. The spreadsheet documenting the Museum's taxonomy presents the 'organizational warrant' (National Information Standards Organization (U.S.) 2005, p. 7) for the metadata. The AustMus Archaeology and Anthropology taxonomy is two-level, with 27 categories and 709 object types distributed across those categories. The taxonomy provides a framework for describing objects in the collection and by organizational warrant we mean that it is 'warranted' or authorized within the 'organizational' context of the Museum.

From information collected during preparation of an initial 427 objects for the prototype of the Virtual Museum of the Pacific (VMP), we estimate that about 50 percent of the objects in the 427 have an entry in the CMS, and nearly all objects need either creation or new or the revision of old descriptive information to bring them to a uniform exhibition standard. This involves normalizing spelling and thesaurus checking. For example, testing whether "mother of pearl" or "pearl shell' should be used as an attribute or whether a "dagger" should be tagged as such or with a preferred term such as "knife". We estimate that an average of one hour's effort per object is required for basic metadata cleaning, and another hour to write an interpretive label (reminiscent of the descriptive card in a museum exhibition case). So, while the metadata adds enormously to the value of an object for research and Web-based exploration, there is a significant staff and time cost involved in establishing an adequate information base for it. This additional information provides enormous value adding by identifying, cataloguing and describing the object, thus making it readily accessible to various communities.

The translation of the Australian Museum's existing metadata into a formal taxonomy, which is then applied into the VMP, presents an interesting and novel application of the collection that has sparked considerable stakeholder interest in communities that wish to explore and annotate the objects. A further discussion will follow on the different user communities that will interact with the collection, along with issues concerning the management of a user-driven, bottom-up folksonomy and its compatibility with the derived taxonomy discussed above.

ACE metadata

The first step in the construction of the Art Collection Ecosystem is to analyze the existing curatorial meta-data from the art collection. This phase permits the collaboration of a developer and a curatorial specialist in the process of determining how that data would be represented in the form of tagged objects. The raw data that will be fed into the design artifact is illustrated in Figures 3 and 4.

The high-resolution image files and the representation of the object descriptions constitute the objects within the collection. Any metadata that could be extracted and tokenized into tags will represent the attribute vocabulary of the collection and forms the basis of the taxonomy used to classify the tags that describe the objects. All other metadata, such as the titles of the artworks and the year the works were produced in will remain as meta-data of the object rather than as a 'tagged' association.

The key objective in this stage of the design process was to extract as many 'tags' as we could from existing meta-data within the collection, while having those tags remain true and unambiguous to the object's description as defined by a collection manager.

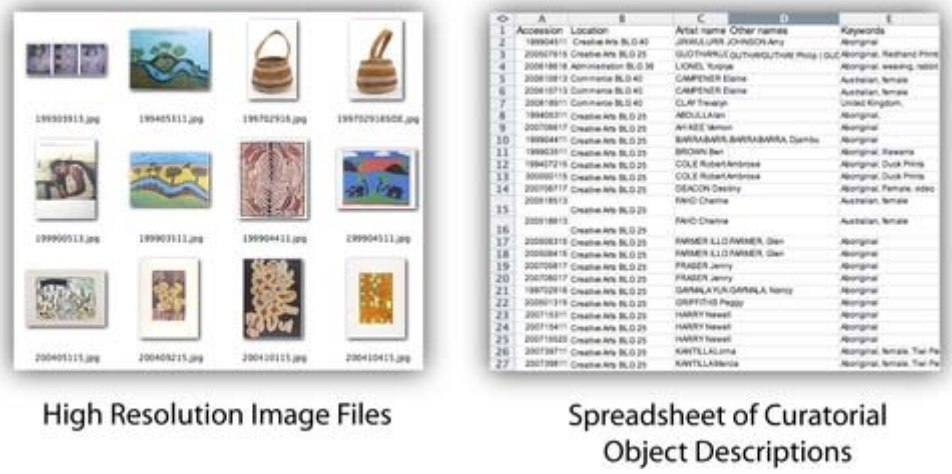

Figure 3. Collection of images and meta-data from the University of Wollongong's Art Collection

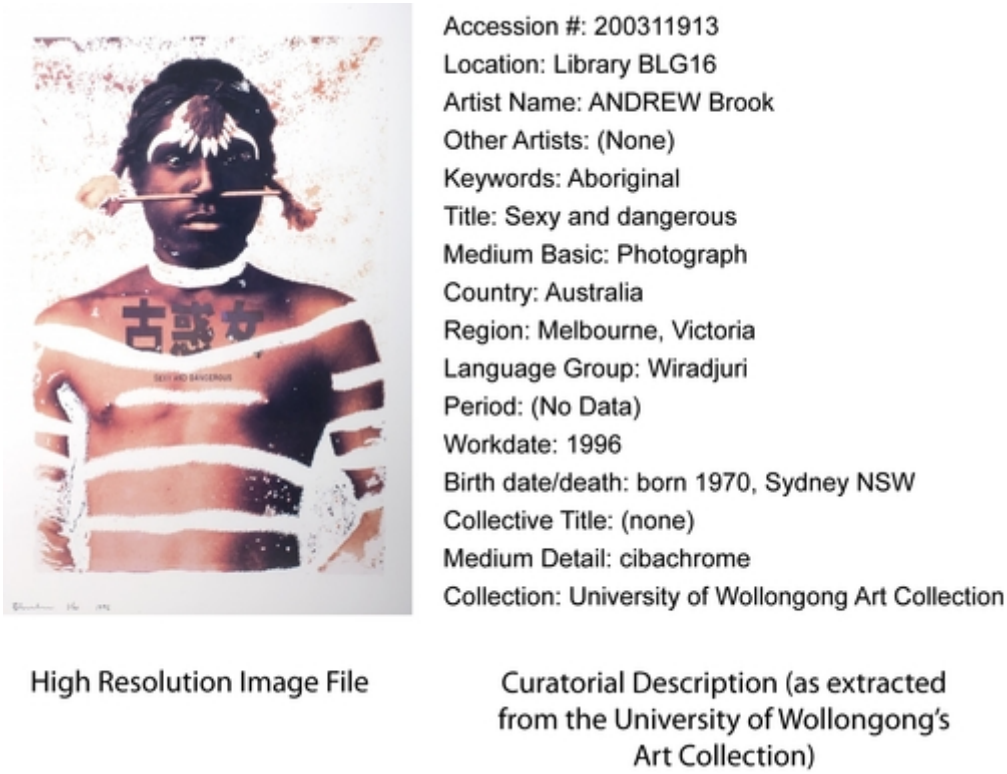

Figure 4. An individual high resolution image and it's associated meta-data from the University of Wollongong's Art Collection

The curatorial data within the Art Collection is stored as a FileMaker Pro database. Individual art objects are primarily identified by their accession number, where the first four digits of that number identify the year that the artwork was acquired into the collection. Various other fields describe the provenance, location and medium of the work.

A critical aspect in determining how the objects and their attributes would be stored within ACE is the fact that although the data would be converted into a different format suitable for browsing using formal concept analysis, the data must remain true to its source as much as possible. This ensures no data is lost when it is exported or imported into the system, and in doing so, it provides interoperability between the data models and any other content management systems that interface with it. At the same time, the extracted metadata and 'tags' should be atomic and unambiguous, and the derived taxonomy of tags used to augment searching and browsing without resorting to overly complex vocabularies or highly specific tag classification schemes. Table 1 describes the various metadata fields within the FileMaker Pro database.

Field Name: Accession Number Example: 199904511 Findings: The first four digits represent the year that the artwork was required. The following digits represent an ordinal sequence that increases as more works are acquired into the collection. Method of extraction and storage: As all artworks have a unique accession number, it will be the primary identifier of objects within the design artifact

Table 1: Data analysis of artwork meta-data from the ACE collection.

Some of the key findings from ACE that relate back to the general CollectionWeb framework concern folksonomy and the use of tag-based metadata to describe objects.

- in many cases a consistent naming or formatting convention needs to be used when extracting tags from existing datasets, particularly for tags that are used to aggregate or categorize objects;
- certain attributes, such as a region, location or a place name can cause problems if they were to be extracted as tags due to the fact that they can be ambiguous if interpreted out of context;
- extracting a vocabulary of tags used to describe people can be problematic, due to the fact that naming conventions can differ across cultures, or that a person could have multiple variations on their name depending on locale and dialect;
- a set of keywords or data within a specific field can refer to multiple dimensions or aspects of those objects, and in some cases, individual tags on their own (such as female) take on multiple meanings, or describe multiple aspects of an individual object;
- issues of hierarchical ambiguity and polysemy can occur if the extracted tags from a dataset are highly specific, descriptive or technical or easily interpreted out of context;
- issues of tag polysemy, synonymy and formatting inconsistency remain problematic, even from a data source that is relatively authoritative and controlled in comparison to a folksonomy.

The process also requires close collaboration with a collection manager to ensure that the tag extraction methods and proposed data model effectively accommodate and represent a collection of works beyond that of the dataset. This is particularly important to accommodate the range of perspectives of both the institution and the audience of the works, and to ensure that the data model remains true to the requirements and expressiveness of the curatorial views of the content.

Some of the key issues identified by the ACE collection manager that can be generalized to the CollectionWeb framework include:

- the ‘artist name’ of a work can take on many representations due to changing qualifications and status. Their names can also take on many variations due to cross-cultural differences and interpretations – for instance, many artists within art collections have both indigenous and westernized names;
- some artworks don’t have a title, and the use of the word ‘Untitled’ in this case should not be used to indicate that a work doesn’t have a title, as some artists specifically use the name ‘Untitled’ as the title of their works.
- both the country and the region of a work can be represented in multiple ways, using either an Anglicised taxonomy to represent regions (e.g. Northern Territory, Ayers Rock etc.) or indigenous ones (e.g. erub, kuku, ernabella etc.). These views of a region may or may not necessarily be mutually exclusive, and the data model needs to be designed to accommodate multiple views or taxonomies.
- the ‘language group’ field was used to represent a specific non-location based provenance of the work from an indigenous perspective. Some language groups, such as ‘ganalbingu’ may be both a language group and a region.

User communities

VMP Communities

We have identified a range of diverse communities as potential users of the VMP for object discovery and annotation. Each community may create its own specific annotations, and may be influenced by the annotations of other communities. There are several evident stakeholder groups that can be inferred as intersecting communities – Creator Communities, museum staff, independent researchers, students, private collectors and anthropologists is a non-exhaustive list. The first of these is the original Pacific Island community from which the object was collected or acquired: often called the creator community. It could be said that this group had, or still have, a thorough understanding of the object’s cultural significance and practical use. In Sydney there is a significant sub-set (or parallel set) of these communities, the Pacific Island diaspora communities, which tend to be concentrated in specific areas such as the south-west of the city, and which of course are highly permeable with their communities of origin but also with distinct features compared with the original creator communities.

There are then possibly multiple transactions between the people or entities, the ‘collectors’, who have possession of an object before it reaches the Museum. The documented information passed on by collectors along with classification and provenance documents form the foundation of the metadata associated with the object at the Museum. Given that parts of the Pacific Collection date back to the early nineteenth century and that the Pacific Island creator communities may have transformed considerably over that time, the information about an object in the possession of the Museum becomes increasingly important in defining its meaning and significance as time passes.

The minimal set of communities likely to make use of the VMP are scholars, the diaspora from the originating communities, the creator communities in their homeland and the general public. Each of these communities attaches different subjective significance and vocabulary to the objects. The interactions and overlaps between private and public views of the objects, and communities’ opportunity to leverage one another’s knowledge in a respectful way is at the heart of the design of the Virtual Museum of the Pacific.

ACE communities

The content of ACE are 45 artworks from the University of Wollongong's art collection. The collection is small but key in choosing the content was to ensure that there was a sufficient overlap within the multiple dimensions of the collection's attributes, so that the system could fully exploit the semantic clustering and hierarchical navigation features

provided by formal concept analysis. In our case study, the selection composed of a mixture of Australian indigenous and contemporary artworks with a high variation in their materials, media, provenance and thematic features. ACE is built as a social media Web-site that exhibits the collection of works it contains. In other words, the 45 works have been carefully selected to tell the story called “Digital Natives”.

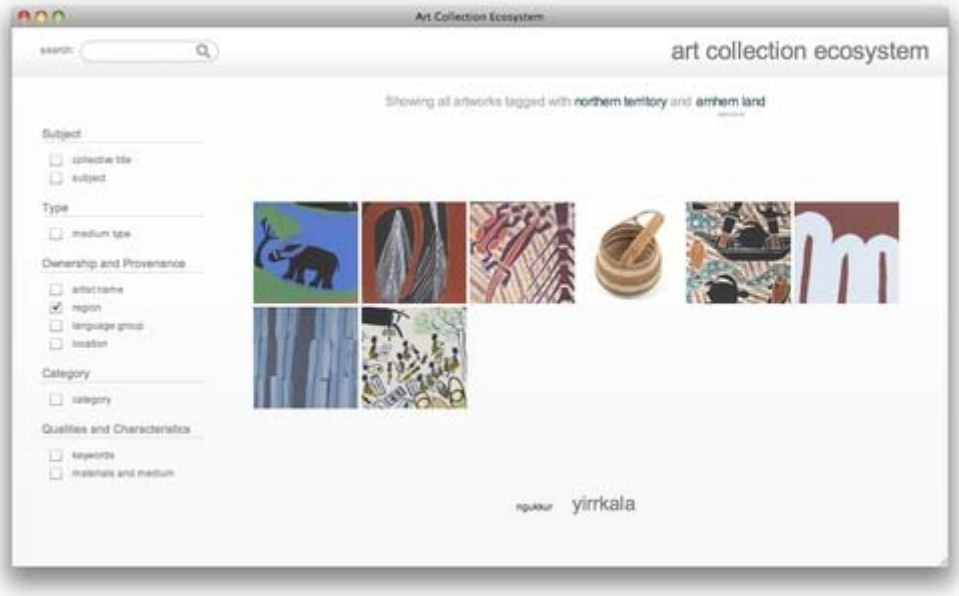

Figure 5. ACE showing the set of artwork from the Northern Territory and in particular from Arnhem Land.

Digital Natives is an exhibition of artwork of 10 Australian artists engaging with new media as an art-form as concept or as socio-cultural phenomena. Curated by Fatima Hijazi, the artists and artworks in this exhibition have been selected from among 200 artists and over 3000 artworks in the University of Wollongong art collection.

The exhibition also responds to the Web-based exhibition of ACE and draws attention to multidimensional systems of display and layout. The two methods of exhibition cross-reference a collaborative concern in information management, cultural evolution and artistic practice. The Web-site project deals with the curatorial consideration of 21st century access and display systems – such as interactivity and audience, tagging and classification, analog and digital, original and reproduction.

We can conclude from this that the community of interest for ACE is an audience interested in the content of the collection both in its physical display form and as a social media website.

Critical Mass, Tagging Intensity, Community Size and Involvement

The sheer scale of the Pacific Collection raises questions about the scope of an online interpretive structure and how people might interact with it. A collection of 60,000 objects from any source without metadata is a daunting prospect for exploration. Imagine a library of books with blank covers, and no cataloguing or ordering of books on its shelves. For this reason, the existing metadata provided by the Museum is of extraordinary value. Without it, every object would have no point of reference and therefore be effectively ‘lost’. The VMP uses descriptions from the Museum’s CMS to seed the relationships amongst the objects. Once this basic structure is in place, the communities have the opportunity to find the objects most important to them. If each of the communities has access to tools to tag, annotate and re-focus the visible vocabulary around objects that they have found interesting, they are able to adjust the conversation to improve the relevance to themselves, as well as improve, correct and extend the quality of the metadata.

Challenges of ACE and tagging

ACE uses the CollectionWeb framework. CollectionWeb consists of a set of software components and Web services that allow conceptual and semantic navigation over content sourced from a collection in which its metadata (and hence navigation structure) is influenced by community input by means of social tagging. It is through the evaluation of this case study and others that the generality of the technological platform has been demonstrated.

There are many unresolved issues of leveraging and managing community folksonomy in a CollectionWeb application. Issues such as a reliable access control and vocabulary moderation model need to be discussed. Experimentation that involves the collection of community sourced tagging data needs to be evaluated against the three tiered tag classification model. While findings in this case study were gathered regarding its implementation, its application on another data source may need to be required in order to determine its generality. This model may, among others, provide a nexus between fixed ontological frameworks and user contributed tagging.

Each of the likely communities for CollectionWeb applications has differing profiles for adding descriptive information. Therefore, the ecology of CollectionWeb will be a system of interacting communities and their annotations. The effort each community makes in object annotation can, where appropriate, influence the conversation about objects in other communities. For instance, it is almost certain that if the original Pacific Island community makes public additions to descriptions of objects, that these changes will affect the language and taxonomy used by scholars at the Museum,

improving the coverage and timeliness of categorization and other annotation (Voss 2007; Hayman 2007). Access to objects that may have few examples in their homeland will also encourage discussion and knowledge in their communities of origin. On the other hand tagging and annotation in ACE would have a more playful purpose, to convey impressions, emotions or experiences rather than contributing knowledge about the content.

It is also likely that communities using a CollectionWeb will substantially vary in size and activity. There is a reasonable hope that useful semantics will emerge from the activities of communities of all sizes (Lux, Granitzer & Kern 2007; Cattuto, Loreto & Pietronero 2007). Folksonomies, or informal classificatory systems derived from ongoing practical use, are currently defined in terms of 'broad' and 'narrow'. 'Narrow' commonly describes a user tagging resources for their own purposes, and 'broad' refers to collaborative tagging by a large number of users intent on knowledge sharing (Vander Wal; Vander Wal). We believe that in a system of communities, each more or less distinct from the others, it will become more appropriate to evolve 'breadth' as a qualifier for folksonomy. Breadth may come to represent the size of the community and the rate of diffusion of its vocabulary within other communities.

In order to deliver a useful environment for constructive social engagement with a collection through the CollectionWeb platform, it is important that we capture the data fundamental to enabling rich toolsets for community engagement. The most basic data required for analysis is a core triple of <user, resource, {tags}>, augmented by a timestamp; this represents a 'post' event (Cattuto, Loreto & Pietronero 2007). The other important association to capture is that between the user and any groups of which they are members. This user and group association is important to assist in separating the semantics emerging from each group and in reducing the apparent 'noise' that would occur if many small groups activities were aggregated as one large tag-space.

Additionally, the partitioning of users into groups can introduce a level of control with the quality of both the tagging of objects (the associations between the tag and the object) and the definition of customized tag groups – or 'perspectives' – discussed in Section II. This is to ensure protection of the object tags and their taxonomies from abuse or nuisance tagging. A user may be a member of one of more groups, in which each group has a certain level of permission. Some groups may or may not be able to tag objects, whereas others may or may not be able to create their own tags or folksonomies or interact with an existing folksonomy. This control – and its moderation – is crucial as the clarity and multi-dimensionality of the tag hierarchy is a key determinant in providing cross-dimensional relationships or interpretations of museum objects, especially as the interpretive description of an object can be highly influenced by its context and user community. The level of involvement that a group would have with the collection and folksonomy is dependent on the relevance, interest and cultural value of the objects as determined by a group's administrator. Creator communities and curators would have a high level of permission and access whereas unregistered users or the general public will have more restricted access.

Access Control Model

The design of the access control model of CollectionWeb involves carefully achieving a balance between accommodating the interests of the user communities and preserving the integrity of any underlying formal taxonomy. Additionally, restricted access of subset collections to groups such as the general public or casual users of the CollectionWeb application may be important in regard to intellectual property or other sensitive issues concerning the exposure of the artefacts to the broader public. Roles and permissions of registered users are primarily determined by their group membership. Groups can be either public or private, where users can opt-in to join a group or be registered exclusively by invitation only. Table 2 in Appendix 1, identifies several user groups with varying levels of permission in terms of their ability to view, edit and delete objects, tag hierarchies and perspectives. Table 2. represents a sub-set of permissions made available to the users, and represents the first dimension of access control, which is that of a role-based one. Note that although four pre-determined roles appear to exist, they can be customized according to the permissions set by the administrators of that group.

The second dimension relates to the restricted set of objects a group is allowed to interact with along with a restricted vocabulary set – known as a perspective, that assigns semantic meaning to those objects as shown in Figure 6. For instance, a creator community from a certain region of the Pacific may have a high set of permissions relating to the ability to extend the vocabulary of tags but their perspective may be limited to a particular sub-set of objects from that region. This model can be extended to other user groups where restrictions may be required to address concerns surrounding the exposure of culturally sensitive objects or potential abuse of the formal taxonomy. By clustering users into groups, which are then defined by permissions and perspectives, the CollectionWeb encourages inter- and intra-group collaborative efforts while still retaining control over the exploration and tagging of objects. This model ensures vibrant community participation and folksonomy generation with little or no risk to the valuable data contained within the researched metadata and extracted formal taxonomy.

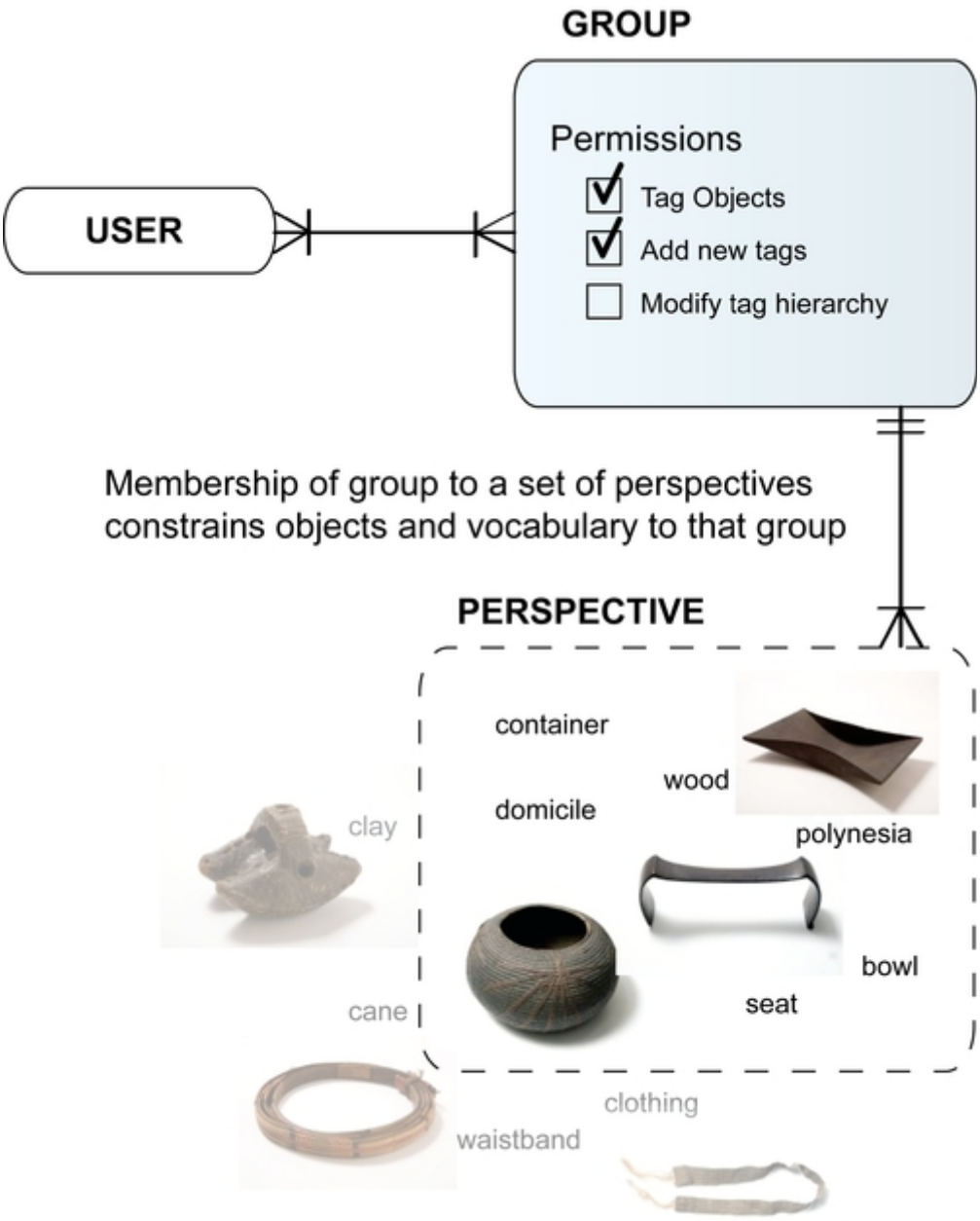

Figure 6. Perspectives constrain the vocabulary and objects of a group's access

Interacting Folksonomies and Taxonomies

The ontology and the communities that create them, associated with long-lived collections like those of the Australian Museum, evolve over time. How do annotations behave over a long period of time? Terminology in any community changes as understandings evolve; nomenclature drifts with time and contemporary tagging frequency changes. Historical tags compete with current usage for our attention. The museum had a particular taxonomy 100 years ago, and another 50, 15, 10 and 5 years ago. Changes have flowed from changing cultures and disciplinary understandings; from evolving interactions with creator communities; and because of clashes in technological approaches, such as an attempt to apply 'big' general taxonomies which was later rejected. What was once a relevant taxonomy in a subject area which had a high currency can be made less relevant by a contemporary less frequently used taxonomy – for instance concepts such as 'phrenology' and 'phlogiston' were both popular in their time but are now rejected by contemporary science. Likewise, terms used to describe, classify or evoke the functions or cultural significance of artefacts may change over time, and hence the classification models or terminology may adapt as such. Given that a user group has enough privileges to do so, they would be able to define or re-define a classification schema to suit contemporary trends.

The Australian Museum has created and administers its own corporate, formally managed taxonomy embodied in the Museum's Collection Management System (CMS) its own descriptive vocabulary. While the annotations and tags applied by stakeholder communities to objects in the collection are likely to be folksonomic rather than formal (Vander Wal 2007), the system has been designed on the understanding that the warrant of all formal taxonomies emerges from the vocabulary of a community of interest. We expect to facilitate the emergence of community derived, dynamic taxonomies from the social media that the CollectionWeb platform will support, as well as contributing to the evolution and relevance of the formal taxonomies of museums. In the digital ecosystem of interacting communities we expect CollectionWeb instances to become, these terms describe the endpoints but obscure the probability of there being a continuum of formality and breadth. We expect that the interaction between formal taxonomies and the communities'

folksonomies will enrich both, keeping the former fresh, and up-to-date, and provide some stability and common vocabulary for the latter, creating a useful metadata digital ecology (Rosenfeld 2005; Barbosa 2008).

Formal taxa are inevitably influenced by community usage (Cattuto, Loreto & Pietronero 2007). In the context of a CollectionWeb instance, folksonomy represents a readily available representation of community usage for analysis. Much of the discussion of folksonomies mentions the occurrence of typographic errors when applying tags, but does not suggest the use of stemming, thesauri or other Information Storage and Retrieval tools to help manage the intrusion of errors. Since applying algorithms to the tags after posting by a user may introduce misinterpretations, it seems more useful to provide support and suggestions from tools before the user commits the post, thus ensuring the user's intent is captured more accurately (Hayman 2007). Some of these tools can include data validation to determine if a new tag already exists, the use of edit distance or other string-based metrics to compare new tags with existing ones within the folksonomy or taxonomy, and visual tools for graphically navigating and modifying tag hierarchies to ensure that the tag is placed within its relevant category or perspective if it is being added to a formal taxonomy.

The access control model that we propose for CollectionWeb describes how social media resulting from community tagging will be captured and treated. Our conclusion is that the formal taxa be maintained separately from the folksonomy tags. While detailed case studies are yet to be conducted on responses and interactions of communities that use the system, our access control prototypes give us confidence that the technical design of CollectionWeb will meet the requirements of stakeholder communities. User testing will focus to a considerable extent on the cultural as well as technical aptness of the design, ensuring that issues such as cultural sensitivities are addressed appropriately.

Conclusions

The Australian Museum has well-developed links with the creator communities, both through organizations such as the Pacific Islands Museum Association, Major Pacific Island Museums and Cultural Centres and with individuals in particular communities both in the Pacific and within the Sydney diaspora. As a contemporary museum seeking to make sense of the vast acquisition processes that have informed its development and manage its collections responsibly, strengthening those links and increasing access to its Pacific Collection is a priority. The Virtual Museum of the Pacific, as a digital ecosystem that allows social tagging by its stakeholders as well as flexible and multi-dimensional browsing through online objects, has the potential to deliver significant advances on that agenda. Its capacity for facilitating and expanding debates about and categories of objects via tagging and folksonomy is situated alongside the Australian Museum's taxonomy and creates a space for considering and contesting assumptions about the role of objects in relation to social ontologies. It operates within understandings of language and taxonomies as dynamic and changeable social processes rather than fixed categories, and as such it foreshadows future developments for collection management and social innovation in the museum industry.

The Art Collection Ecosystem (or ACE a Web 2.0 application that supports browsing and discovery in art collections using formal concept analysis as a way of driving content-based navigation in a principled way. ACE is an important bridge from the practice of browsing and discovery using FCA manifest in the VMP to a more general social media, Web 2.0 and tagging application framework. Our observations on ACE have feedback into the CollectionWeb framework and have lead to our ambition to release CollectionWeb as an opensource framework for generic collection management and social media website development.

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Appendix 1

	Collection Managers and Curators	Research Specialists	Indigenous Communities	General Public (Registered Accounts)
Viewing Object Metadata				
Label / Description	X	X	X	X
Category / Item Name	X	X	X	X
Acquired Date	X	X	X	X
Materials	X	X	X	X
Location	X	X	X	X
Dimensions	X	X	X	X
Registration Number	X	X	X	
Keywords and 'tagged' attributes	X	X	X	X
Indigenous Names	X	X	X	X
Managing and Editing Objects				
Add a tag to an object	X	X	X	
Remove tag from an object	X		X	
Add a new object	X		X	
Change / upload an object's image	X	X	X	
Edit object metadata (excl. tags)			X	
Managing and Editing Attributes / Tags				
Define a new attribute / tag	X		X	X
Change the definition of an attribute	X		X	X
Remove an attribute / tag	X		X	X
Managing and Editing Perspectives				
Define a new perspective	X	X	X	X
Assign / Unassign attributes to existing perspective	X	X	X	X
Remove Perspective	X	X		
Wikis and Rich Multimedia Content				
View Wikis assigned to objects	X	X	X	X

Table 2. Preliminary Access Control Table

References

Barbosa, D. (2008). Taxonomy Folksonomy Cookbook. Available at: http://solutions.dowjones.com/cookbook /ebook_sla2008/ ?from=synapticabanner_cookebook19jun08&segment=IT [Accessed May 25, 2009].

Batty, P. (2005). White redemption rituals: repatriating aboriginal secret-sacred objects.(Commentary). Arena Journal.

Cattuto, C. et al. (2007). Semiotic dynamics and collaborative tagging. Proceedings of the National Academy of Sciences, 104(5), p.1461.

Cuno, J. (2009). Whose Culture?: The Promise of Museums and the Debate over Antiquities illustrated edition. Princeton University Press.

Eklund, P. et al. (2009). Designing the Digital Ecosystem of the Virtual Museum of the Pacific in 3rd IEEE International Conference on Digital Ecosystems and Technologies. IEEE Press.

Hayman, S. (2007). Taxonomy Directed Folksonomies in New Developments in Social Bookmarking, Ark Group Conference: Developing and Improving Classification Schemes, Sydney June.

Lux, M. et al. (2007). Aspects of broad folksonomies in Database and Expert Systems Applications, 2007. DEXA'07. 18th International Conference on., pp. 283-287.

National Information Standards Organization (U.S.) (2005). Guidelines for the construction, format, and management of monolingual controlled vocabulary 172nd ed. (Bethesda, Md): NISO Press. Available at: http://openlibrary.org/b/OL19928653M/Guidelines-for-the-construction%2C-format%2C-and-management-of-monolingual-controlled-vocabulary [Accessed August 6, 2009].

Rosenfeld, L. (2005). Bloug: Folksonomies? How about Metadata Ecologies? Available at: http://louisrosenfeld.com/home/bloug_archive/000330.html [Accessed May 24, 2009].

Vander Wal (2007). Folksonomy :: vanderwal.net. Available at: http://vanderwal.net/folksonomy.html [Accessed May 14, 2009].

Vander Wal, T. Explaining and showing broad and narrow folksonomies. Vanderwal. net, http://www.vanderwal.net/random/entrysel.php.

Vander Wal, T. Folksonomy Explanations :: Off the Top :: vanderwal.net. Available at: http://www.vanderwal.net/random/entrysel.php?blog=1622 [Accessed May 23, 2009].

Voss, J. (2007). Tagging, Folksonomy & Co-Renaissance of Manual Indexing?

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