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## Designing a digital ecosystem for the new museum environment: the Virtual Museum of the Pacific

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# Designing a digital ecosystem for the new museum environment: the Virtual Museum of the Pacific

## Abstract

The Virtual Museum of the Pacific is a social media platform for a digital ecosystem, which enables a variety of user communities to engage with the Pacific Collection of the Australian Museum. The success of the system depends on facilitating the development of culturally relevant folksonomies and encouraging a conversation between online communities. In this paper we explore the relationships between stakeholders, folksonomy and taxonomy, to reveal the design strategies which inform this digital ecosystem. Our analysis defines the scope for the social tagging component of our information model and discusses how users might interact with objects (in terms of their knowledge base) and also contribute to ongoing taxonomic definitions. Given its capacity to span both collection management and community access issues, we contend that the Virtual Museum of the Pacific is a significant model for online community interaction in the contemporary museum environment.

## Keywords

Designing, digital, ecosystem, for, museum, environment, Virtual, Museum, Pacific

## Disciplines

Arts and Humanities | Life Sciences | Medicine and Health Sciences | Social and Behavioral Sciences

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# CHAPTER 20

## Designing a digital ecosystem for the new museum environment: the Virtual Museum of the Pacific

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### **Keywords**

Digital ecosystems; folksonomy; collection management; formal concept analysis; Pacific Island communities and collections; Virtual Museum of the Pacific

### **Abstract**

The Virtual Museum of the Pacific is a social media platform for a digital ecosystem, which enables a variety of user communities to engage with the Pacific Collection of the Australian Museum. The success of the system depends on facilitating the development of culturally relevant folksonomies and encouraging a conversation between online communities. In this paper we explore the relationships between stakeholders, folksonomy and taxonomy, to reveal the design strategies which inform this digital ecosystem. Our analysis defines the scope for the social tagging component of our information model and discusses how users might interact with objects (in terms of their knowledge base) and also contribute to ongoing taxonomic definitions. Given its capacity to span both collection management and community access issues, we contend that the Virtual Museum of the Pacific is a significant model for online community interaction in the contemporary museum environment.

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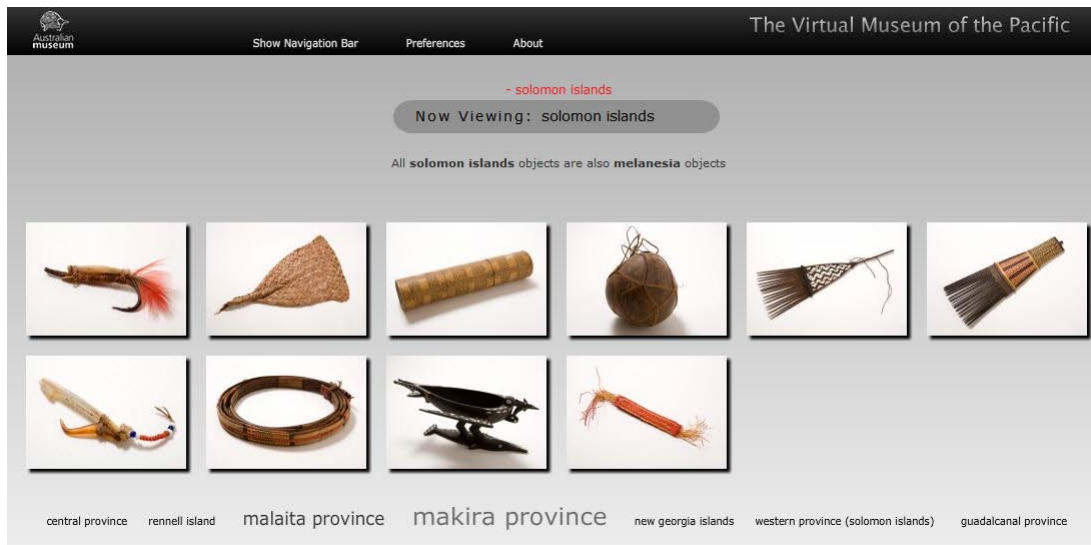
### **Introduction**

Debates about ownership, protection and nation-states pervade the museum industry in the early 21st century, played out in discussion over the Elgin Marbles, the trade in antiquities, the repatriation of Indigenous artefacts and histories of race and nation. In the face of stringent shifts in cultural property laws and collecting policies for antiquities, James Cuno (Cuno 2009) has recently argued a case for the encyclopaedic museum as a site of global cultural diversity which overrides current national agendas. 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. The repatriation of objects, or at the very least, the development of strong communication links with the communities from which they originated, has become an ideal for many museum curators (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 civilised 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 commercialisation are often competing agendas. New technologies are also a significant force in the contemporary museum environment. The project we describe in this paper, the Virtual Museum of the Pacific (VMP), is a model for online community interaction with collections, which operates within an understanding of objects and their meanings as dynamic, contested and negotiable.

The concept of an ecosystem and a museum resonate with each other – if we take an ecosystem to mean 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 VMP draws on in using the metaphor of a digital ecosystem to describe its ambitions and scope. 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. 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. These include creator communities from Pacific Island countries and territories, Pacific diasporic communities in Australia, scholars, and other stakeholders with an interest in Pacific collections.

The relationships between the objects of the collection are explored via a rich Internet client using web services provided by our 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 specialised) neighbours. The navigation paradigm is based on a technique called Formal Concept Analysis (Eklund et al. 2009) and the resulting design comes from more than ten years of research, development and testing. Navigating the Pacific Collection depends on the relationships and attributes described in the metadata associated with the objects in the collection. The semantic associations are derived from this content; as new content is added then new pathways will be revealed.



**Figure 1**

Information technologies have been used in museums since their inception to assist in classification and location. Later on they have also been used for documentation, communication and access; and recently social media's potential for audience development and interaction is also being explored. However, there are complex and unresolved questions about how a 'virtual' 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 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 the gathering of metadata via traditional taxonomies through to addressing specific communities of users. We describe community interaction through tagging, annotation, and metadata management, and show how this can influence the design of the VMP. We conclude that the VMP model suggests some significant technical and cultural pathways for both opening up museum collections and managing diverse community access to them. Technological and social innovations are inextricably linked in this model.

### **Sourcing 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 effort to digitise collection records is the latest part of an ongoing commitment by the Museum to computerise its records, including those of the Pacific Collection. An overview of the typical life cycle of a record demonstrates the evolution of the Pacific Collection's metadata. The Australian Museum 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. For example, the 'pearl-shell inlay comb' (Figure 2) was entered into the Museum's 'Register of Ethnology' as registered item E11110. This registry entry is the first association of the collection's descriptive information – or 'metadata' – of the object, and thus creates its unique and permanent registration number. This registry entry is also 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 who entered the object in the register (the 'users') have the 'warrant' to generate the object's descriptive information.



**Figure 2**

At a later point in time an index card was created which 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 Museum's Archaeology and Anthropology taxonomy is two-level, and it currently comprises 27 categories with 709 object types distributed across these categories. The taxonomy provides a framework for describing objects in the collection. By 'organizational warrant' we mean that it is 'warranted' or authorised within the organisational or corporate context of the Museum.

For the prototype of the VMP an initial 400 objects from the Pacific Collection were selected. From information gathered during this process, we estimate that about 50% of these objects have an entry in the CMS, and that nearly all of these objects need the creation and/or revision of their descriptive information to bring them up to a uniform identification standard. This involves normalising spelling and checking thesauri. 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 of 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 added information provides enormous value 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. In the remainder of this paper, we identify some of the different user communities who will interact with the collection and a number of issues regarding the management of a user-driven, bottom-up folksonomy and its compatibility with this institutionally-derived taxonomy.

### **User communities**

The diverse communities which comprise potential users of the VMP for object discovery and annotation may each create their own specific annotations, and they may also be influenced by the annotations of other communities. There are several evident stakeholder groups that can be inferred as intersecting communities, including (but not limited to) creator communities, museum staff, independent researchers, students, private collectors and anthropologists. The first of these is the original Pacific Island community from which the object was collected or acquired. This is often called the creator community. It could be said that this group had (or still has) a thorough understanding of the object's cultural significance and practical use. In Sydney there is a significant subset (or parallel set) of these communities; the Pacific Island diasporic communities, which tend to be concentrated in specific areas such as the south-west of the city and which, while highly permeable with their communities of origin, also have distinct features compared to 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 19th 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 sets of communities likely to use 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 a different subjective significance and vocabulary to the objects. The interactions and overlaps between private and public views of the objects, and communities' opportunities to leverage one another's knowledge in a respectful way is at the heart of the design of the Virtual Museum of the Pacific.

### **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 for it 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 would therefore be effectively 'lost'. The VMP uses descriptions from the Museum's CMS to seed the relationships between the objects. Once this basic structure is in place, the communities have the opportunity to find the objects that are the most important to them. If each of the communities has access to tools to tag, annotate and refocus the visible vocabulary around objects that they have found interesting, then 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.

Each of the likely communities will have differing profiles for adding descriptive information. Therefore, the ontology of the VMP will be a system of interacting communities and their annotations. The effort that each community makes in object annotation can

influence the conversation about objects in other communities. For instance, if the original Pacific Island community makes public additions to descriptions of objects, then it is almost certain that these changes in vocabulary will affect the language and taxonomy used by scholars at the Museum, thus improving the coverage and timeliness of categorisation and other annotations (Voss 2007; Hayman 2007). Enabling access to objects (which may have few examples in their homeland) will also encourage discussion and knowledge in their communities of origin.

It is likely that communities using the VMP will vary substantially in size and activity. There is a reasonable hope that useful semantics will emerge from the activities of communities of all sizes (Lux et al. 2007; Cattuto et al. 2007). Folksonomies, or informal classification systems derived from ongoing practical use, are currently defined in terms of ‘narrow’ and ‘broad’. ‘Narrow’ commonly describes a user tagging resources for their own purposes, and ‘broad’ usually refers to collaborative tagging by a large number of users intent on knowledge sharing (Vander Wal n.d.; Vander Wal n.d.). We believe that in a system of communities, in which each is more or less distinct from the others, it will become more appropriate to evolve ‘breadth’ as a qualifier for a 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 the Pacific Collection through the VMP, it is important that we capture the data that is fundamental to enabling rich toolsets for community engagement. The most basic data required for analysis is a core triple of  $\langle user, resource, \{tags\} \rangle$ , augmented by a timestamp; this represents a ‘post’ event (Cattuto et al. 2007). It is also important to capture any association between specific users 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 customised tag groups – or ‘perspectives’. This is to ensure that the object tags and their taxonomies are protected 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 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 depends on the relevance, interest and cultural value of the objects as determined by a group’s administrator. Indigenous communities and curators would have a high level of permission and access whereas unregistered users or the general public would have a more restricted access.

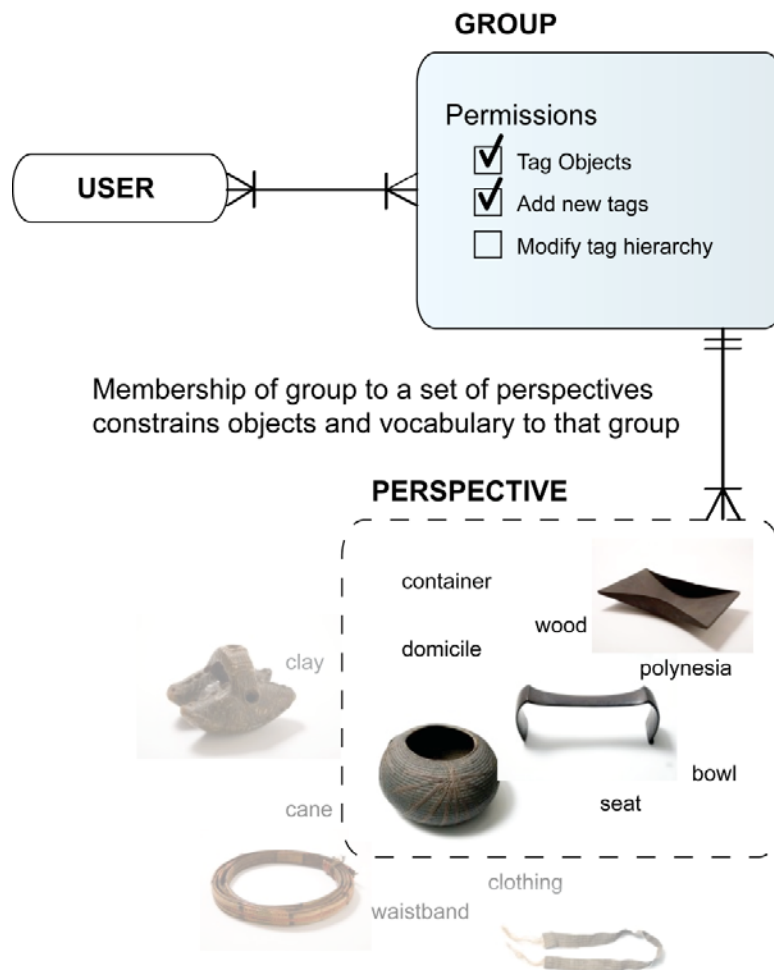
### **Access control model**

The design of the access control model of the VMP is carefully considered in order to achieve a balance between accommodating the interests of the user community and preserving the integrity of the formal taxonomy derived from the Australian Museum.



Additionally, restricted access of selected collections to groups such as the general public or casual users of the VMP may be important with regard to intellectual property or other sensitive issues concerning the exposure of the artefacts to the broader public. The 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. Appendix 1 identifies several user groups with varying levels of permission in terms of their perspectives and ability to view, edit and delete objects, and tag hierarchies. This table represents a subset of permissions made available to users, and represents the first dimension of access control, which is role-based. Note that although four predetermined roles appear to exist, they can be customised according to the permissions set by the administrators of that group.

The second dimension relates to the restricted set of objects that 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 3. For instance, an Indigenous group 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 subset 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 VMP 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 3**

### Interacting folksonomies and taxonomies

The ontologies, and the communities that create them, that are 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 understanding evolves, 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 taxonomy 50, 15, 10 and 5 years ago. Changes have flowed from changing cultures and disciplinary understandings; from evolving interactions with Indigenous 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 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 defunct and obsolete. 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. Given that a user group has enough privileges to do so, they would be able to define or redefine 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 CMS 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. The VMP system, under the auspices of the Museum, anticipates being able to facilitate the emergence of community-derived, dynamic taxonomies from the social media. These taxonomies will be supported by the VMP, and will also contribute to the evolution and relevance of the formal taxonomies of museums. In the digital ecosystem of interacting communities that we expect the VMP 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 community 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 n.d.).

Formal taxa are inevitably influenced by community usage (Cattuto et al. 2007). In the context of the VMP, the 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 the VMP 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 the responses and interactions of communities that use the system, our access control prototypes give us confidence that the technical design of the VMP will meet the requirements of stakeholder communities. User testing will focus considerably on the cultural as well as the technical aptness of the design, ensuring that issues such as cultural sensitivities are addressed appropriately.

## **Conclusion**

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.

### Acknowledgment

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