

A Postcard is Not a Building

Why we Need Museum Information Curators

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Abstract:

If currently museums are asked to make their inventory records online available, there is frequently a great reluctance or even inability to do so. Since the inventory data were created for internal use, their scientific status is not established and quality is often insufficient to go “public” for professional and amateur users alike. Even though, there are great values to be gained by going public. This paper presents experiences from the effort of the National Museums of Singapore [1] to make all if not most of their collections available online. The mission of the curator in the traditional role of a researcher appears to be ultimately incompatible with going horizontally through the collection, and documenting each object (a) according to the latest stage of knowledge and (b) its trans-disciplinary relevance. National Museums of Singapore therefore employed dedicated staff to do that. This turned out to be quite efficient. Good descriptions of objects could be produced in large scale. However, capturing transdisciplinary relevance still suffered. We found for instance, that a historical collection documented a postcard (which shows a building) as a building instead of a postcard depicting a building; whereas the art collection documents a documentary painting of a building only by the artistic style. In an in-house user study, we analyzed the “knowledge economy” of the organization. We found that different museum disciplines have different potential objectives and benefits from going online, which should be taken into account for the design of Web presence. From practical examples and literature, we propose simple guidelines for documenting relevance and significance in a discipline-neutral way. The paper argues that it is should be a task of CIDOC to develop a professional framework and guidelines for effective, attractive and sustainable online documentation of museum collections and their objectives, according to the specific museum disciplines.

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1 Introduction

Information technology is rapidly increasing scale, performance and social coverage and with this comes a raising interest in making cultural heritage information available through the Internet, to the benefit of the interested public, private and public education, and research by professionals and educated amateurs. It is quite natural that library and digital library experts are leading most of these efforts, since their mission and expertise has been to provide public access to information assets since hundreds of years. Moreover, among the different kinds of memory institutions, the library community has been most successful employing IT technology, homogeneous standards, global access (the so-called OPACs) and controlled vocabularies.

However, if currently museums are asked to make their inventory records online available, there is frequently a great reluctance or even inability to do so – to the surprise of the information scientists on the other side. Many museums question the value of online information, in particular of making **all** objects online available. This is still the case, even though there have been and are large scale cultural heritage information integration enterprises, such as CHIN, RLG Cultural Materials Initiative, Taiwan Digital Library Project, China State Administration, IMLS-DCC, Europeana, and European funded projects such as AQUARELLE, SCULPTEUR, MINERVA, ATHINA, CARARE. In this situation, simple recipes and moral admonitions addressed to museum management are not missing. It seems that more under public pressure than in their own interest and insight, museums accept to fill in “standard core metadata” of allegedly domain-independent nature. The problem is widely prejudged by people outside the museum milieu as a simple “homework exercise” for the museums.

In this paper, we firstly report the particular experience by Singapore’s National Museums, under the National Heritage Board (NHB) of Singapore, to make all if not most of their collections available online. The museums encountered the usual problem that inventory data contained errors. In order to “clean” these data, new personnel were hired, but actually, data were not just “cleaned”, but new content - captions for the wider public – were produced in large scale. In a subsequent user study issued by NHB, the authors could dig deeper into the “knowledge economy” of these museums, which is quite representative for the community’s current good practice and has its good reasons to be as it is. Particularly insightful was the comparison of the behavior of three different museum disciplines belonging to the same authority.

Setting these experiences in relation to observations from the above mentioned information integration enterprises, which Martin Doerr, one of the authors, is privy to, we propose a far more complex and systematic picture of the museum mission and its relation to the new demands of the information society. How museums should provide digital information to the public and in which form and why this should be different from other memory institutions can be analyzed based on the following factors:

1. The definition and agreement of the purpose and function for museums to put their collections information online, the corresponding understanding of the benefits for the museum itself as well as for the public, and the relation to the traditional flow of information into and out of the museum.
2. The nature and structure of the museum knowledge itself, which has a highly unbalanced distribution in quality, size, depth and relevance over the total of objects

in a museum, making completely homogeneous documentation both useless and impossible.

3. The traditional museum mission, which focuses on the physical preservation of material holdings, and the research (knowledge production) and presentation of cultural contexts of public interest by virtue of the material evidence held in various museums.
4. The roles and missions of the museum personnel and their professional awarding yet geared towards the traditional mission.

In the sequence, we suggest that museums, professionals, scholars and public can gain much from going online in an adequate manner. We suggest a more comprehensive approach to provide and integrate museum information online, regarding the four aspects above. CIDOC seems to be the ideal forum to bring forward such an agenda. To initiate the discussion, we outline some guidelines, how we envisage this to happen. As a key element, we suggest the new professional role of a “museum information curator”, who combines a cataloguing approach similar to library practice with a professional understanding of museum knowledge and the professional and public information requirements about material object holdings.

Of course, these can only be quite initial ideas, which will need a lot of elaboration, experimentation and evolution. On the other side, our current naive approaches to bring museum information online may create yet another legacy of data of limited use and quality, which will be very costly to recover from.

The structure of this paper is as follows: In section 2, we outline how the dedicated team came about and the “data cleaning” experience. In section 3, we present relevant results from the user study conducted by the authors in 2008 and relate them to a more general model of the current knowledge economy at museums. In section 4, we suggest functions and benefits of museum online information and justify and draft the role of a “museum information curator” that integrates into the museum knowledge economy. In section 5, we summarize our findings.

2 The Web Content Creation Project

The National Heritage Board (NHB) is one of the statutory boards under the Ministry of Information, Communication & the Arts (MICA), Singapore. Its primary function is to “explore, promote and present the heritage and nationhood of the people” [2], by “actively championing the development of a vibrant cultural and heritage sector in Singapore” [3]. NHB operates leading museums, heritage institutions and interpretative centres in Singapore, including the following National Museums of Singapore that will be mentioned in this paper:

- *Singapore Art Museum (SAM)*, responsible for the curation and exhibition of NHB’s Fine Arts collection [4].
- *Asian Civilisations Museum (ACM)*, responsible for the curation and exhibition of NHB’s collection that centres on the material cultures of the different groups originating from China, Southeast Asia, South Asia and West Asia.
- *National Museum of Singapore, (NMS)*, responsible for the curation and exhibition of NHB’s historical collection related to Singapore’s history.

The *Heritage Conservation Center (HCC)*, a heritage institution under the board, provides central conservation services to museums under the board. It is responsible for storage, registration, administration and conservation of artefacts and collections belonging to the board and the central information services. Its key departments are the *Collections Services* and the *Conservation Services*. The collections under its custody comprise of about 150,000 objects.

2.1 Background

In 2005, the National Heritage Board museums had just completed the massive migration of their collections data to its new collections database, the Integrated Museums Collections Management System (IMCMS), aimed at being the resource by which all of NHB's knowledge about its collections holdings is ultimately connected, promising comprehensive collection management functions. Its deployment quickly revealed the need to "clean-up" the data in the new system to make the system useful for its users. Consequently, an "IMCMS Team" of senior officers from the NHB museums and HCC, who were subject matter experts and familiar with IMCMS, was formed under the lead of the Director of HCC, in order to plan, organize and supervise the data cleaning project.

Between July 2005 and early 2006, the team decided on the ways to carry out the objective of the project. Its primary objective was "to provide a set of good data which would document the collections effectively and be of use to internal users such as curators. However, it would also take into consideration, where possible, the need to open the database to the public. Given the different condition and needs of each museum's collection data, a consultative approach was used to determine the appropriate ways to achieve the objectives of the team. These pertained to information sources, definition of the intended content, standards, and deployment of personnel. The task turned out to be much more complex than initially anticipated.

Jyue Tyan Low, the Registrar at HCC and one of the authors of this paper, was the co-coordinator of the IMCMS team. What follows is an account from the author's perspective working with the IMCMS team.

2.1.1 Extent, internal and public content

The team was confronted with two diverging demands: a) data-cleansing to achieve a reliable (i.e. accurate, consistent and comprehensive) database to serve the internal users; and b) to put the collections online and how much to put online. Even though it seems natural (and convenient) to enhance backroom information and to produce information for the public together, it actually requires *different writing skills and forms of research*.

The team was first set out only to clean the data to achieve quality and integrity for internal use. Though, there was another conflict of objectives: In order to quickly make the database good enough for internal use, so called "priority fields" that are mandatory to clean-up were identified, but also another smaller subset of seven fields to be published online (The fields to be published online included, Object Name/Title; Accession Number; Artist/Producer; Dimensions; Dating; Geographical Association;

and an optional Credit Line. All published items must have an image). On the other side, there was the ideal to make the database records as comprehensive as possible, by including into the database all or as much as possible available information about the objects (past, present & future), i.e. published materials, information from old catalogues and records, historic research information that were on paper etc. In the end, the latter turned out to be *beyond the capacity* of a limited “project”, and rather a long-term goal, given the volume of information to be dealt with.

In the course of the project, the museums realized that putting information from the database online actually meant to provide *suitable* content for the public domain. This required more than just identifying fields that can be made available to the public, but also, that contents of the fields may have to be *different*. But in which way, was *not at all obvious*. One of the most controversial fields was “Object Name/ Title”. This field is deemed the most basic one to be shown to the public. Internally, there may be only a generic name (“type”) used in the Registrars’ master ledger, such as “vase”. The team debated to great length on how that content of the field should be changed now that it is to be ported to a public domain – If they should be more specific and more descriptive in order to make sense for the public, and what should make up that specificity. For example, for a vase, should its provenance be included and call it a “Qing dynasty vase” or should its physical description be included and call it a “blue & white Qing dynasty vase”?

The first set of about 5,600 records was launched in middle of 2007. These records were cleansed in the identified fields for launch to the public domain. The Minister who launched the site then spoke of the aim to have richer contents of the artefacts which were displayed online. This alluded to that the seven fields with basic information were not enough. This gave impetus to the need to produce more online information about the items. New content of approximately 100 to 150 words description per object was to be written under the “label text” field.

The volume of the envisaged horizontal content development was comparable to working on an exhibition with label texts for hundred thousands of objects, far exceeding working on normal exhibition content, one of the major tasks of the curators. This new demand meant that the team not only needed to clean ten thousands of records of fields with few words for accuracy and consistency, but at the same time to create new descriptive content suitable for public for all these records. It was thus naive to say this could be done by existing curators and staff.

The team finally agreed to adopt the “non-purist” approach to fulfill the demand of putting up the collection online in both breadth and depth. The team would pass broadly across the collection with an attempt to do what the museums deemed were “due diligence” to find out and research about the objects to fulfill writing the new contents and in order to cover looking at all the collections.

2.1.2 Quality standards

One of the concerns pointed out even at the first meetings were the need to develop or adopt common standards/ guidelines for filling-in the data fields. Even studying of the standards to adopt turned already out to be a challenge. The use of controlled vocabularies or authority controls can be very demanding, in particular since there was

no previous experience in this field. The museums did attempt to standardize descriptive terms to a certain degree, but given the scale of an NHB-wide effort, the team decided that it was *not practical to establish a thesaurus* of object types and other controlled vocabularies within a reasonable timeframe.

To undertake any project to develop a classification tool like a thesaurus would require a huge, dedicated effort spanning over a longer period. The development and management of a thesaurus required *specialized training and skills* with certain competencies and knowledge not present at the museum.

To avoid any further delay to this exercise and yet achieve basic standardization, a set of documentation guidelines and a style sheet for long texts were developed instead, including common data values and formats. This was institutionalized through the representatives in their respective museums. The museum representatives would disseminate and facilitate any training to all personnel directly involved in the data cleansing.

Luckily, HCC had a separate image database capable of holding multimedia content, in which all the necessary considerations such as image standards, metadata of the images, workflow etc had been dealt with prior to the collections management system. In short, a system for image standards was already in place. The team only needed to deal with standards of the textual captions and lesser for digital images. Indeed, the challenge was more maintaining and patching up images to make the backlog records complete, and catching up on photography for the new acquisitions.

2.2 Recruitment

The team initially worked towards the end of 2005 for the first set of data (approximately 3,800 records) to be done. However, this proved to be extremely difficult and over-ambitious. There were mostly representatives in the team and *no real “do-ers”*. At that time, the only dedicated staff was temporary casual staff recruited to do routine tasks such as data-entry. Relying on existing staff and curators who were already bogged down with existing roles and responsibility rendered the progress painfully slow and almost non-moving.

Almost at that time, a modest amount of S\$73,000 was granted when the chairperson, the Director of HCC, sought for funding. The sum was distributed to the involved museums and institutions to *engage assistance* to expedite the project. Due to political pressure that NHB should have more of the National Collection accessible online and following the VFM (Value for Money) audit recommendation, subsequent funding could be found from the Government, which was successful in helping NHB sustain the team. Initially, the team had much difficulty drawing up the job description, qualification and tenure, and also difficulties getting people with the required qualification under the limitation of the funding. There was *no precedent* of such a **professional role** in the museum world, which thus manifested itself by a long and intensive debate about the job title. Eventual compromise was the position of a “Generic Manager” with degree holders starting out as “Assistant Managers (IMCMS research)”, besides others with the following specifications:

- Manage and input content in the IMCMS database relevant to the Museum’s collection; verify and enhance existing data, and obtain new information related to the collection; fulfill the targets set out by the data cleansing project; excellent research and writing skills.
- Conduct and implement independent research to enhance the quality of the information in the museum collections database by:
 - Assisting with research into historical and other data relevant to the artefact
 - Analysing information from published sources /curator's additional research information
 - Compiling bibliography and summarising the information
 - Liaising with curators and other specialists where necessary to verify and develop content on the database. This includes editing and proofreading to ensure the coherence of the information

The individual museums required in addition:

ACM: Honours degree in Asian Art, Archaeology, Humanities or Art History
At least 1-year working experience in editing or research-writing.

NMS: Honours degree in history, sociology, political science, anthropology or art history. At least 1-year working experience in editing or research-writing preferably with knowledge and research experience in Singapore history. Proficiency in one other language - Chinese, Jawi, Malay, Tamil or Dutch, French or German would be advantageous.

SAM: Degree in Art History. At least 1-year working experience in editing or research-writing preferably with research experience in Singapore and South East Asian art history.

Based on these specifications, new employees could be found that provided very satisfactory work. Nevertheless, there remained several problems with the new jobs:

- Financial sustainability – there is no politically accepted business model of this role.
- As NHB is still accountable for the content, there is still a need for internal review and approval (to ensure its integrity and accuracy) by the curators before the records go online. This, the author feels is partly as a result of the temporal and relegating nature of the post as there is no such profession with its own notion of “good workmanship” in the museum world.
- The issue of attracting and keeping qualified people, when
 - There is no promise of career growth and *prestige*. Interestingly, at least 3 of the AMs/ researchers who worked on the IMCMS project subsequently joined the curatorial team, which can be regarded as a success.
 - There is the inherent demand of quantity (breadth) versus quality (depth). Thus the tasks became routine when quantity and the pressure to hit target and churn out numbers takes precedence over quality and not as fulfilling as when it requires doing more in-depth research to “perfect” the records.

The major issue is, until there is a clear mandate, that there is no standard or yardstick in the museum world for this new but urgently emerging need for such a profession.

Therefore, the team struggled to justify convincingly and articulate clearly the definition of this role. The team could only do its best to evaluate and make well-intended decisions based on its intuition and the current local situation.

Some of the solutions explored include hiring independent expertise to research and write on their relevant subject areas; exploiting people who are creative but might not want to be confined or tied down in any long-term job by working in the museum as regular staff and thus do not mind working on short term contractual posts. However, this proved to be no different from having subject expertise such as curators doing the research and writing, as someone is still needed to assimilate the information into a succinct description for the public. There are also issues of a *lack of continuity*, difficulties keeping standards and quality under frequent change of hands, the investment to retrain new people every time, and time lapse and break in momentum of the project.

Of course, the demands of migrating the complete documentation of a museum to a new state requires a lot of temporary staff. But even in the long term, the museums will still want to execute the same functions, maintain and always enhance their digital information holdings. Furthermore, the job requires a continuity of methodology and skills. However, since the current profile of museum professions does not foresee such a role, there are no such long-term positions available.

2.3 Results and critique

Between a span of 4 years (2007 to 2010), the museums explored, experimented and reviewed on the number of AMs and researchers [6] needed to achieve its targets:

ACM had 1 AM and 1 or 2 researchers over time
 NMS had 1 AM and 2 or 3 researchers over time
 SAM had 1 AM and none to 1 researcher over time

The targets achieved are indicated in the table below.

Museums	FY2007	FY2008	FY2009
NMS	2700	14,300	10,400
ACM	1700	2571	3456
SAM	1200	1400	273*
Total	5600	18,271	14,129

* see notes [5]

The numbers above denotes the number of records that were cleansed and enhanced with new content to go online. Though the depth of research and length of content may vary from museums and from records to records, one such record is indicated below:



Figure 1: Screen dump of the NHB collections online (SGCOOL)

The cleansing and content creation process executed was as follows:

1. Data Cleansing
 - Parse: During the cleansing process, errors/ defects were identified by exporting the data over into Excel format to better compare the fields to be cleansed.
 - Standardization: The team had agreed on common data values and formats according to some rules as spelt out in a 'Documentation Guidelines'. To ensure textual information conforms to a pattern, a style sheet was introduced.
 - Correct: Both the Museums and HCC would verify and update existing data in the fields they are in charge of.
2. Data Enhancement
 - Appending additional information to increase the value of the information would be done by the museums. Additional information might come from existing publications, old records and documentation, new research information. New information was input into the "Object Description" field. The AMs/ researchers then assimilated from all the information gathered and research done on the object to create a 100 to 150-words textual description of the object in the "Label Text" field.

As an example of the amount of research done per object, figure 1 shows an object as it is now presented online. The internal object description for this example reads:

“Seated figure of bodhisattva in the posture of sattvaparyanka and shaded by a parasol. The 7th-16th centuries saw the widespread adaptation of the Hindu Buddhist religion and concepts of kingship from India within Southeast. Bronze and stone images of Hindu and Buddhist deities were produced in Indonesia, not only in association with the kingdoms of central (8th-early 10th centuries) and east Java (early 10th-early 16th centuries), but also in Sumatra, Bali, Kalimantan, Sulawesi and Sumbawa. Local bronzesmiths were quick to adopt new ideas and styles from Indian prototypes, and pieces such as this Vajrapani (see also Kubera 1995.00297) typical of the localised central Javanese style.”

The internal text contains a complicated account of history of art on occasion of this object, with terms not much meaningful to the laymen. The online description (fig.1) newly introduced a perfect account of the iconography in comprehensible terms, but, following the required style and , missed the professional-historical account. In other examples (fig. 2), the internal object description is only about the material evidence, and the online information (“label text”) researched and complemented a rich, relevant historical context.

Basically, the project did remarkable achievements. It could be demonstrated that it is feasible with a reasonable amount of money, motivated personnel and efficient management to produce high-quality object descriptions in the scale of complete, medium sized collections. The numbers above can be used as example for other institutions to estimate the cost of such a project. To our opinion, pressing further on output would compromise the quality of information a museum is committed to give to the public.

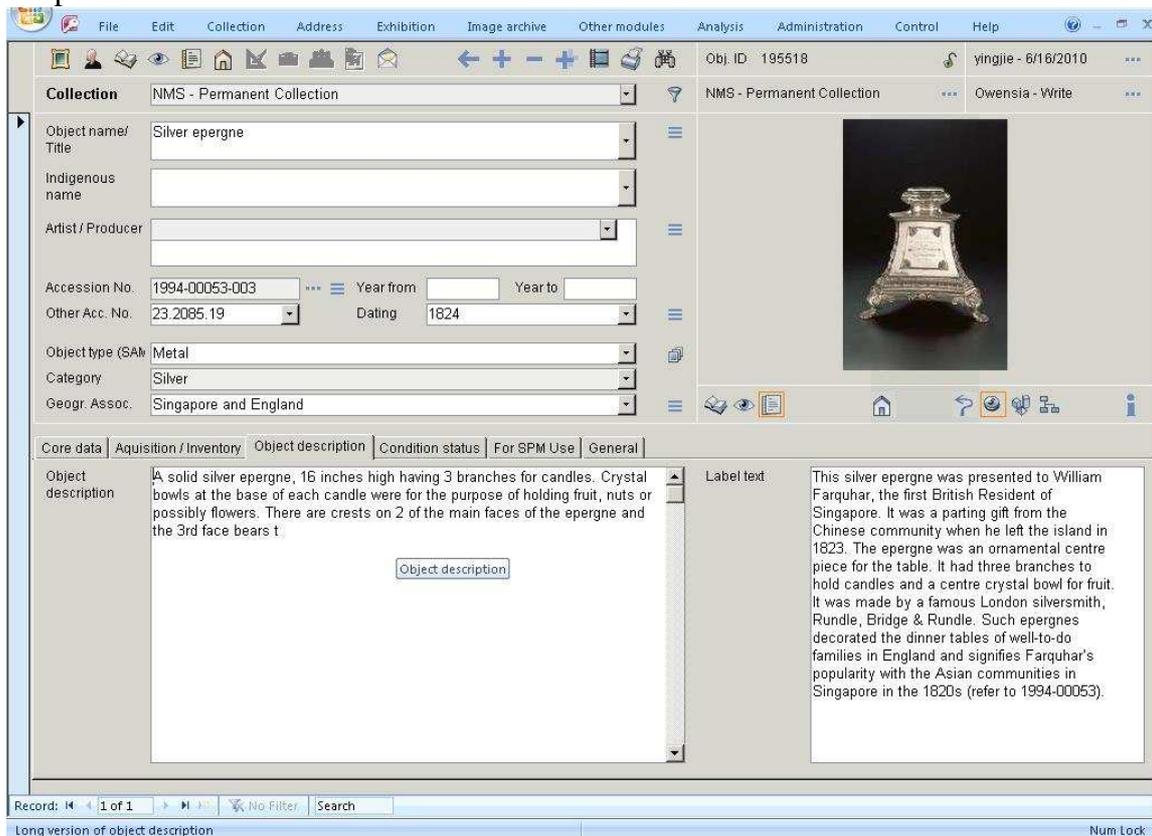


Figure 2: Screen dump of the IMCMS record 1994-00053-003

But the learning curve does not end there. Through working on the project and a user study we conducted, we experienced many things that could be done better, possibly needing modified processes and involvement of more people or other expertise:

- Very old, old and new inventory documentation is based on different methodologies, may need different interpretation and may contain errors. There is a need to interpret, verify and complement the older data.
- The intellectual demand to research, assimilate and integrate information from *different* sources into an eloquent yet concise write-up is very high. This is not a task that could easily be completed by a typical staff member.
- (Parry 2007) commented that the museum, unlike library, “was not a place of standard practice and rigid protocols” (p106). Indeed, few museums have ever solved the problem of having authority control and thesauri even though there are a number of standards available in the museum field such as the Getty vocabularies, out of various reasons (see also Doerr 2009). Nevertheless, it would be good to have and to explore, how this could be set into practice.
- We also found for example how a postcard depicting a building was documented as a building in one museum; in another museum, a documentary painting of a building was only documented artistically by the artwork’s stylistic significance and not the building. There is recently a consciousness for “neutrality” in museum documentation that could potentially be resolved by a transdisciplinary approach to documentation (see notably guidelines in Russell & Winkworth 2009), obviously not an easy task with the current disciplinary focus of each museum or museum department.

The points presented above confirm our conviction that museums need dedicated personnel to work on these issues: someone who is trained and can ‘document the “building” aspects of the artwork.’ Until the museum community endorses the need for such a role in our information society today and sanctions guidelines for the digital documentation tasks this new professional should undertake, museums that go online will likely continue to struggle with difficult decisions and partial solutions.

3 A Museum Knowledge Economy

In order to support their future information systems policy, NHB issued an internal user study in 2008. In this study, the authors have interviewed representatives of all professional roles in all NHB museums and the HCC, which have to do with handling museum knowledge. Besides to the aforementioned “Assistant Managers”, we have spoken to: curators, registrars, conservators and system administrators, and asked them about their scientific interests and questions, the information they communicate and the information products they use and create. We further asked what professional use a Web communication platform could have. We believe we have captured at NHB an example of the typical, international, *good practice* of museums. We present here a summary of our findings.

3.1 Curators

Curators belong in NHB to one of the three National Museums of Singapore. They are responsible for the curation of a collection. i.e., they **study and describe** the *cultural-historical relevance* of the objects in the collection. It pertains to social-historical contexts, events, dates, places, persons, related objects and categories. The direction of research is normally “*vertical*”, i.e., it follows a *research topic*, given by an exhibition,

a project, a personal interest or a particular information request. Curators generally are *knowledge creators* and *the authority* for the quality and correctness of the scholarly museum information. Their collection and research follow a *disciplinary focus*.

3.1.1 General knowledge flow

The *results* of their research are captured in:

- *Personal archives*
- Internal *inventory documents*, particularly “object descriptions”, and inventory information *on the Web*.
- *Exhibition catalogues* and *exhibition labels*.
- Scholarly *publications* (journal papers and books)

All curators systematically draw on the following information sources:

1. Physical inventory documents or books. They are organized by *accessions number and accession date*. It is important to understand that inventory documents methodologically **evolve** over the centuries and therefore are *highly heterogeneous* in quality and quantity of contents.
2. Inventory database (collection management system). It is mainly used by curators to look up information about an object the curator *knows that it exists*, and for *key-word search* in the *object-name/title* field.
3. *Exhibition labels*, exhibition and auction *catalogues*.
4. Their *personal archives* of notes, which differ considerably in form per museum.
5. Archives of notes of *previous colleagues*, which may be in any state of order.
6. External *archives*.
7. *Literature*, in-house and in other libraries. Each museum keeps its own *library*.
8. *Internet resources* becoming increasingly relevant and successful (different sites per museum).
9. *Evidence* on the object, regular *conservation reports* or requested information from *conservators*, including for object analysis done by third parties.
10. *Field studies* and *interviews*, which are recorded (different forms per museum).
11. Communication with *colleagues* or other academic *researchers* by phone, e-mail, personal visits, within NHB and world-wide. Communication with *previous owners*.

Further, curators **inform** visitors, researchers, museum guides, volunteers etc. The three NHB museums receive about 1200 research requests per year. Volunteer guides may refer visitor questions to curators. Finally, curators organize **exhibitions** and **increase the collection**.

3.1.2 Disciplinary Differences: The Modern and Contemporary Art Museum

A particular finding of this study was to which degree the disciplinary differences affect in the curators’ ways to deal with information.

The curators of the **Singapore Art Museum** focus on the work in a “world” of artists, benefactors, sponsors and donors. Curators create **Artist Files** and **Donation Files**, which are maintained by the library. They contain which contain interview notes with

artists or donors, photos, background information, catalogues, photocopies from other sources etc.

Primary information sources include vivid community contacts such as interviews with artists which are usually taped as audiotapes or typed as notes; and discussions with artists struggling for publicity. Other information sources are all the ones from section 3.1.1. Frequently used *Web resources* include J-STOR, MUSE; ARTNET. Comparison of auction prices are also of interest. Volunteer Guides research themselves a lot and gather their own notes from their own reference library.

In digital resources, curators usually search first by *artist name*. The effective way of searching is by browsing through *image thumbnails* of artworks by artist. When selecting objects for exhibitions, *no digital resource* provides adequate contextual search. Colleagues are a better source! Curators expressed the interest in a Web communication platform to support the dialogue with colleagues.

Typical *information requests* comprise: Questions from academics, people writing their theses or articles; questions from volunteer guides to complement their guiding notes; requests for information about artworks and artists and an artists' techniques. Curators support the Acquisition Committee with highly detailed information for acquisition decisions. There are characteristically requests for high quality images.

3.1.3 Disciplinary Differences: The Historical Collection

The curators of the **National Museum of Singapore** focus on the systematic documentation of Singapore's History. NMS acquires objects that were really used by known people, and that illustrates or informs about particular events, persons and things. Their significance is usually tied to whom they belonged to, which particular person used it, or which facts are reported by it. NMS also maintains archives of personal letter, treaties, contracts which overlaps with the National Archives. In contrast to the other museums, few objects have ever appeared in other museum, exhibition or auction catalogues. Besides exhibition making, curators engage on a *regular basis* in historical publications and books, such as: "Wartime kitchen", or "19th century photographs and prints", and longer academic papers.

Primary information sources include interviews with donators of heirlooms, interviews on family history or other witnessing, and notably *newspapers*. Object information by serious dealers (in particular photographs). *Digital archives and Digital Libraries* with key-word search on headlines and articles become *important* information sources, as well as other historical collections. Web resources include J-STOR and Lexis Nexis. To have a local placename register and georeference was regarded as very useful!

In collection management systems, curators usually search first for terms in "*object name/ title*", because this is typically the filed where context information and events are implicitly described (in contrast to art objects, which have a proper title!), and headline/title/article body in newspaper archives.

Information requests come characteristically from students ("net surfers"), researchers of family history or donors themselves, but the curators collaborate closely with academia, history and sociology departments. The museum has the highest number of

requests per curator. The museum maintains information, which is very dense about people and places. I.e., there is a high chance for any place, person or thing to be referred more than once across the collections, without curators to know that. There is still much relevant *knowledge out in the public*. Therefore it was regarded as most useful to engage the public of Singapore and academic collaborators in communicating *factual knowledge* and *co-reference information* via a Web 2.0 system.

3.1.4 Disciplinary Differences: Ethnology and Arts

The curators of the **Asian Civilisations Museum** focus on the material culture of the different groups originating from China, Southeast Asia, South Asia and West Asia and how the communities define themselves. The collection is made up of things of ethnological relevance and valued art objects of the past. Curators produce *files* by human *activity* types, such as celebrations, production techniques etc. per *community*, e.g., “Weaving in Thailand”, a travel project. They also maintain *Donor Files*. The museum is interested in living traditions. Academic journal papers have been written on iconography, cultural practices and museology. The research topics are usually exhibition-driven.

Primary information sources include interviews ethnic communities, for instance, asking, locals for memories about the use of “old objects” (there is a holding of 8 years of recordings). Another source is travel reports. Objects are typically acquired from the people and community directly, providing good primary information. Also serious vendors and dealers may have good provenance information, but missing *provenance* knowledge, incomplete and unreliable information and *authenticity* is a major issue. A major primary information source is *material research* of consistence and traces on the object at the conservation department, and scientific dating methods.

Curators may seek for *similar objects* in museum or auction catalogues, on the Web in J-STOR, or ask colleagues. They may seek for objects *belonging* to a particular person, or from a time and place. They may seek for particular *types of objects* and *materials* and their provenance or documented places and times of use.

Information requests come characteristically from laymen about objects they own, from visitors through the guides and from other museums. There is a high number of requests. Guides may also learn relevant information from visitors! Web 2.0 communication tools are welcomed for curators to capture knowledge, in particular to resolve provenance or to elicit community knowledge about object use.

3.2 Conservators

NHB’s conservators belong to HCC. As in all museums, they become regularly active at acquisition, exhibition, loan-in and loan-out of objects. They document the condition of the objects, assess the need of treatment, carry out treatment, and control damage during loans. Because this role is closer to administration, their scientific work is often overlooked. Their disciplinary focus is orthogonal to the museum disciplines, and is determined by the *base material* of objects (painting, metal works, fabric etc.), *traditional techniques* and modern treatment methods.

They research following their particular professional interest. Research may include assessing efficiency of pollutants, scavengers or agents, but also *acquiring particular skills* in traditional techniques. They may do in-depth studies on the structure of complex objects, and discover surprising features of historical relevance, such as underdrawings or fingerprints.

Primary information sources are experiments and experimental reports from colleagues, but it may also imply *field trips* to learn local techniques. They could also use information from curators. Web resources include JAIC, Getty's AATA conservation journal, ICOM-CC, BCIN. Otherwise, they use information sources as curators generally (section 3.1.1).

Information requests come characteristically from curators and colleagues, besides the regular conservation activities in the narrower sense. Conservators provide the curators with key knowledge about authenticity of an object, traces representing evidence for the history of an object, its construction and physical similarity with others. They exchange treatment and agents information with colleagues. Since treatment and technique information has an overwhelming volume, there is a high need for Web2.0 communication tools. Knowledge about deteriorations and treatments is very fragmented. It is better published bit by bit in dedicated databases rather than journals, but there are still no comprehensive international digital resources.

3.3 Registrars

NHB's registrars belong to HCC. Registrars are responsible for the management, integrity, security and preservation of the collections, the identification of the object, but also for the management of the inventory information, which comprises general characteristics, material properties, and the integration of basic curatorial and conservation knowledge. Registrars oversee a group of Collections Officers (COs) to enter the inventory data into the collection management system.

They are responsible for accuracy of the digital contents, though not necessarily for the academic contents. In contrast to the curators, they are not concerned with the significance of an object, but with the adequate application of equal standards for management, physical treatment, storage and information management to all objects.

They communicate with the system administrators, which are responsible for the administration of the IT infrastructure.

3.4 The knowledge economy and the Web

Our study has shown that the traditional roles are perfect for the study and presentation of museum objects and the research that benefits from the knowledge of the material heritage. The digital world makes it possible to present larger quantities of information to the public than ever before, which initiates the wish to open the knowledge about all museum objects to researchers, amateurs, interested communities and the public in general.

The naive assumption, that the inventory information is what the public needs turns out to be wrong. It is highly heterogeneous due to methodological evolution, often

incomplete, unconfirmed and project specific. It is not even so essential to the curatorial research itself. Curatorial knowledge is partially in the inventory, partially in “files”, partially in exhibition catalogues and scholarly publications. To request the curators to produce horizontally across the collection general information for the public, would effectively stop curatorial research, with its high-quality exhibitions and publications, and the freedom of choice of scholarly subject as we know it. Without curatorial research, the museum would lose its knowledge authority.

Registrars on the other side manage the information horizontally for all objects, but are primarily concerned with the integrity of the physical holdings, and not trained in scholarly information. As we see above, we even look for people being able to integrate information from different disciplines. Therefore we argue for a new role in the museum of the future.

4 Museum Information Curation

A recent user study (Marty 2008) indicated that :

- a) Much more museum information is and will be consumed online than by museum visits, if available (rather, increasing the interest in physical museum visits).
- b) Online information should take advantage of the medium and satisfy other needs than what physical museum exhibit can achieve.
- c) Most users expect to find research and archive material, images and collections data online, significantly more than to have “online experiences”, such as virtual tours, personalization, etc., which many research projects have concentrated on.

The study above shows that cultural heritage institutions’ online materials are sought after for *research and education*. It corroborates with our argument that online museum information should primarily satisfy unpretentious scientific needs and not public entertainment.

We thus posit that museum online information fulfills three objectives:

- a) Project the disciplinary/ museum's view
- b) Present the "polysemy" and transdisciplinarity of the collections
- c) Gather and aggregate associations by communication with other knowledgeable people

4.1 Purpose of museum online information and its benefits

Traditionally, “knowledge” of a museum’s collections is only available through one or very few access points, one of which is through the curator (asking the person himself/herself). With the promises of the digital age, there is the potential of unprecedented access to collections information when information is collected and presented online. Museums would eventually or inevitably converge towards being also a digital information provider. We hear it all the time – Making museum information available online will achieve the noble good of contributing to society by improving public

access to cultural heritage. There is certainly much more than just nobility. As Cameron puts it, “Digitization and networked access enable a productive relationship between public culture and museum culture to emerge as a way of gathering a broader range of associations around collections, intimately connected to cultural, social and political formations, debates and events” (Cameron & Mengler 2009).

If the collections information is available online, analyzed and designed to facilitate enquiries and find commonly sought-after information about the collection, the first people to really benefit would actually be the museum staff and the museum itself, as a memory institution (Keene p.27), as it serves not only to capture collections information and curatorial knowledge, but also more generally to preserve corporate memory. As mentioned at the onset of this paper – one clear incentive for museums to put their collection online is the potential to aggregate objects of a given context dispersed far and wide. Among all memory institutions, museums suffer from the highest contextual fragmentation of items. This may not be all negative, as it reduces the risk of complete loss of evidence. Examples are sherds and pieces from the same archaeological object, as Sir John D. Beazley was capable to aggregate by memorizing from his museum visits, objects from the same excavation, preparatory drawings and the resulting artworks, plates and prints, furniture from the same historical room, property of the same person, etc.

As Robert S. Martin, former director of the Institute of Museum and Library Services (Callery p.xiii) aptly puts it, “...it is imperative for museum professionals to develop new approaches that maximize community awareness of, and access to, the rich resources in the collections of all museums... to connect museum resources to comparable and correlated resources in other cultural heritage institutions, such as libraries and archives.” In particular, if online information is coupled with a community feedback platform (“Web 2.0”), it could elicit “dormant knowledge” in the public. For instance, there are millions of witnesses of recent historical events that could help in validation of facts and provision of relevant details, as *curators* of NMS pointed out to us. Local cultures, families, be they industrialized or indigenous, keep oral traditions, customs, knowledge of technologies and use of traditional tools that can provide relevant context to respective museum collections. Billions of local place names referred to in literature, archeological records and collection reports can only be verified by local knowledge dispersed over the world.

Though there are some controversies and concerns of museum professionals to which degree public comments would promote real historical knowledge, it is indisputable that there is much important “dormant knowledge” in the public, not to forget all the *educated amateurs* and other related non-museum *professionals* out there. As the axiom goes, “many eyes see more”; online exposition of museum information can improve spotting of inconsistencies, errors and can *discover* important cross-links. Actually, all staff at NHB agreed that a dialogue supervised or guided by a curator would be helpful for the museum.

Hence we are not advocating so much public authoring or interactivity, as a majority of authors currently do, but more scenarios of public communication and education fostering effective secondary knowledge production by professionals and students research and educated amateurs. This includes the requirement, that online content should not only be “easy to digest” by the public, but a source for *scholarly reference*.

If these premises can be met, presentation of rich online information has all chances to substantially contribute to a museum's scholarly and public reputation. "Curators' knowledge will only be valued if it can be made much more apparent than before, captured in knowledge bases or expert systems,..." (Keene, p.85). Though this will pose a new burden on museums, the incentives of putting its collections information online would likely (or should we use "far"?) outweigh the investments. Going online is thus, a "constructively disruptive" (Parry, p.140) empowerment for museums to fulfill their tenet to full glory.

4.2 The need for dedicated people

The curators in the traditional role of a researcher has the task to increase the collection by adding pieces relevant to his/her discipline, and to elaborate publications and exhibitions about selected collection objects in a contextual framework. This mission not only requires all their labor, but it also does not encourage curators to go horizontally through the collection, neither are they awarded for doing so. Ross Parry in his book *Recording the museum* elucidates comprehensively on how curators have traditionally been rewarded to build on 'their' collection. However, this is not something unique to museum curators but innate of the humanities on a whole, as Borgman puts it, "... [Humanistic] scholars are rewarded for publishing, not for managing data – is especially strong in the humanities" (Borgman, p.222). Even though, archaeologists in the begin of the 20th century had invested a lot in so-called corpora – they would now be databases - of comprehensive collections of similar items, such as vases, seal rings, inscriptions etc., but those were even more specialized than collections are.

Digital realm is a new dimension that requires investment. We are not even referring yet to any advance "authoring" or "interactivity tools". Even though the book, *Digital Collections: Museums and the Information Age* by Suzanne Keene, was published some 10 years ago, it is still relevant and insightful, when Keene states that "building a digital collection implies committing substantial resources to it, on a permanent basis" (Keene, p.42). Many others underpinned that argument, including Ronchi which asserted that organizations would need to train qualified staff if they were to extend their operations to provide content online (Ronchi, p.29).

In order for museums to put collections online, there is a need to curate this information. Information curation of such kind is not the same as the museum curation we are all so familiar with, nor is it like library cataloguing. It requires a different skill set and competencies. Actually, the demand to put collections information online is akin to marrying the tasks of curator, registrar and librarian – applying homogenous treatment of information and data management and care for the integrity of the collections (quite like what a registrar does); elaborating on the contextual information and disciplinary significance of the object (quite like what a curator does), but online; and accommodating information access and integrating all kinds of disciplinary views (quite like what a librarian does).

It would have been an ideal to capture curatorial information and knowledge by allowing curators to feed information and content into a system progressively as they conduct their research or when they work on exhibitions that can be directly accessible and searchable by the public. But as we have elaborated above, quality and quantity of

content, the level of detail and language must be adapted to different levels of users for access and use of information. It requires considerable additional intellectual effort to enable searching all knowledge/ concepts effectively. There is a need for some standardization and conformances, and someone needs to be “trained” to translate curatorial information and input information in an appropriate manner that can allow knowledge to be searchable. This is an information science challenge.

The curators, who are specialists in their scientific or scholarly domain, cannot all of them simultaneously become information science expert. There is thus a need for a “specialist” to do such translation and mediatory work between the curator and the system. Not only, but we also require the capability to communicate with multiple information providers and to integrate transdisciplinary view. The understanding of the nature of museum knowledge, its relation to material evidence and the reconstruction of “possible pasts” with its various flavors of uncertainty and ambiguity, is also not in the training of current information scientists. Thus, when push comes for museums to put collections online, neither the curator nor the registrar could profess to be the best candidate to take on this task adequately. There is not only a need for dedicated people to do this job in a museum, but also a need for adequate education.

4.3 The Museum Information Curator

So, what do these information curators need to do? Cameron sums it up quite nicely in *Digital Knowledgeescapes*:

With a universe of applications for new digital technologies opening up for museums, as well as the need to effectively draw together existing information resources, museums will need to consider the creation of new staff roles responsible for the digitization and linking of related data. These new information brokers will be responsible for identifying documentary sources and creating relationships between data in previously unrelated fields or disparate media categories. (Cameron 2007, p.184)

We have seen from our experience described above that the purpose and function of museum online presence is primarily to support *research and education*. That means the ability for users to search scholarly knowledge is a germane attribute for web content. In order to serve that function, we had also stated earlier that web content must fulfill the following:

- a) Project the disciplinary/ museum's view
- b) Present the "polysemy" and transdisciplinarity of the collections
- c) Gather and aggregate associations by communication with other knowledgeable people; and distinguish well-supported knowledge from assumptions.

We thus see that museum collections information needs to be re-documented in a transdisciplinary way; specialist language and implicit background knowledge needs to be resolved and curatorial information needs to be collocated and assimilated for them to be searchable on the web. Information must be preserved and put in a persistent form that can be cited in research work. Links to relevant literature, related objects and co-reference have to be resolved. Communication with the interested users should be maintained and questions guided to the resource or specialist that can answer them. These are exactly the tasks that should be carried out by a museum information curator.

4.4 A professional policy and framework for effective, attractive and sustainable online documentation of museum collections

4.4.1 Transdisciplinary documentation

The germane question is thus, how then do museums document trans-disciplinarily? It is not our intention to draw up a complete guideline here, as that is a task for adequate community committees. ICOM-CIDOC could develop guides for creating cultural contents online.

Whereas different disciplines may obviously assign different significance to objects and stress different, interacting contextual aspects, the so-called transdisciplinarity, Cameron et al. (2007) also stresses the “polysemy” of objects due to different cultural or theoretical background, even in the same discipline.

The “Significance 2.0” is an approach published by the Collections Council of Australia (2009) on assessing significance of objects. It emphasizes on documenting why and how objects found its way into a museum, but also the significance objects may have for others. It is based on the premise that there must be something significant about the object for it to be identified as an object worth preserving for posterity. The authors feel that the “Significance” guide is a laudable effort of the museum community to document relevance and significant of objects in really tangible terms.

It offers a step-by-step assessment of objects’ significance that can potentially uncover “new information, even about well documented objects” (Russell and Winkworth 2009). They advocate for four standardized criteria (historic; artistic or aesthetic; scientific or research potential; social or spiritual) to assess significance. We suggest to derive from these criteria the aspects of what should be documented in on-line information, as long as they are relevant for a particular object. At the first level, we suggest to distinguish the current, verifiable material evidence from information about its history and historical impact; its value as an individual from its role to illustrate a context or to illustrate a kind; scientific/technological characteristics from artistic/aesthetic values; and finally its future research or use potential (see also Doerr et al. 2008, Constantopoulos & Doerr 1995). In a more schematic form:

Material evidence

1. Construction, substance and condition: The object as it appears now, provenance of materials if relevant
2. Information content, if any: Inscriptions, graphical or figural representations and identification of referred or depicted things, people, places, events.

Historical facts

3. What happened to the thing from its conception?
The factual history and context (where it is created, found, used, its change of ownership & custody, exhibition involved in etc) as known.

Values and significance

4. Individual value:
 - a. Artistic, stylistic significance.
 - b. Social, spiritual, symbolic value
5. Illustrating a context:
 - a. Presence at a historical event, property of a person
 - b. Historical impact in art, technology, social history
 - c. Scientific evidence, such as chronology of an excavation layer
6. Illustrating a kind:
 - a. Rarity or representativeness
 - b. Value of the kind as such: Stylistic significance, historical impact, scientific evidence
 - c. Value of the kind illustrating a context: Ecosystems, traditions and customs of social groups, communities and nations.

Potential

7. Research potential to reveal historical or scientific facts or to support interpretation
8. Potential future use

We suggest that aspects as the above could further be developed into as a kind of comprehensive checklist and guideline of what an online documentation of an object should be about, as long as the respective aspect is relevant or significant for any discipline we regard *as significant as well*. Of course, future may bring about other interests, and online communication bears the wonderful potential that any social group may link to their own interpretation on their own sites, not necessarily one supported by a museum. We clearly advocate that a museum should provide a sort of authority for the content on its sites, because the community needs trust in the quality for any serious use. This implies that the selection of projected views must stay under the museum's control. A good way to achieve quality of transdisciplinary content may be systematic collaborations between museums of different disciplines and academia "cross-documenting" their collections.

4.4.2 The new role in the museum milieu

It seems to be an opportune time that CIDOC serves as an advisory for museums to recognize that the needs for "institutional changes" in order "to adopt and adapt new technologies" (Ronchi, p.329) – such as going online. As an international body, CIDOC can initiate representative working groups to identify new skill sets and how such organizational structure might look like. New reward system, social role and job description should also be established at an international level.

To summarize, the job profile of a "museum information curator" may look as follows:

Research on the Object's "Significance":

- Carry out "horizontal" documentation across the museum collection.

- Collocate all information such as existing curatorial information, past documentation, published and non-published scholarly materials about the object.
- Rewrite expert information for public understanding.
- Manage *knowledge warrant* of an object. That means document the object according to its “latest state of knowledge”, which state this is and what resources this knowledge is based on.
- Maintain dialogue with users, professionals, digesting/ monitoring Web feedback on the collection, directing questions to experts. The significant assessment process is hailed as “most effective when it involves a range of people, skills and consultation” (Russell and Winkworth 2009)
- Organize co-authoring of documentation. Co-authoring approach or contribution by other disciplines with no stake in the object’s research/ acquisition is suggested by Cameron et al. (2007) to improve objectivity and promote “plurality of meaning” of the object (Cameron, p.180). Collaborate with partner institutions for that sake.
- Cleaning of the sources, scientific references, cross-links of objects.
- Establish controlled *access points*, *authority control* and *controlled vocabularies*.
- Carry out version management, digital preservation for the “fixity” of Web content to enable scientific citation, for instance by creating and publishing snapshot copies on permanent media.

Research on the Information Science aspect:

- Carry out data normalization work and semantic integration of heterogeneous sources. Migration of content to changing IT platforms.
- Carry out the “information science” research such as classification, access efficiency, linking, referential integrity and other formal quality criteria.
- Digital preservation of volatile content.

We believe that such a professional role would fit perfectly into the museum environment, and provide a great enrichment and flexibility for the services provided by the museums. We perceive professional challenges of their own kind, distinct from the curators and ideally complementing and adding values of other kind to their work.

5 Conclusions

We have analyzed a case of museums going on-line. The experiment clearly showed the need of dedicated personnel, and exhibited distinct job requirements, as also observed by related work.

We have analyzed the knowledge economy in a set of collaborating institutions in the transition to provide also online services. Only on such a background a successful strategy can be designed. Traditional functions cannot be simply redefined and replaced. They are still needed. We argue against the opinion, that internal museum inventory information can simply be made public. Online information takes over a different place in the museum knowledge economy: that of interaction with external resources and answering to professional and visitor requests, which was so far only mediated by curators and museum guides. Disciplinary differences are a key to understand the museum knowledge economy. Only on this base an adequate online information exchange which benefits all partners in the knowledge economy can be devised.

Based on our own research and on related work, we propose objectives for museum online data which focus on research information. We do not advocate for untargeted “interaction of the public with cultural content”, nor speak against such public participatory platform, but we clearly see a priority and high professional-scientific utility for museums to go online. Rather, museum information organized in such way will be much richer scientifically, much more valuable to public and professionals, and a “seed” of integrated, high-quality primary knowledge for research and education on all levels. Following these objectives, new documentation principles emerge, which systematically try to take into account the significance of objects under all major disciplinary and social aspects – the transdisciplinary and polysemic approach. Associated with these new principles come different processes to acquire, document, enhance, communicate and update knowledge horizontally across collection items and with different partners.

Under these considerations, we suggest the profile for a new kind of museum professional, the “museum information curator”, which “inherits” not a few virtues from librarianship, but has also its own specific museum character, and could ultimately help to bring closer together not only the human memories but also other memory institutions. We argue that this does not mean a “convergence” of memory institution methods as sometimes proclaimed, because “core” museum information – be it online or not - has a completely distinct form and function from library or archive information, as the analysis of the knowledge economy reveals. Rather, we advocate for a much more subtle integration and adaptation of methods between memory institutions, which will require – in any case – careful definition, a lot of empirical verification, and - last but not least - distinct professional training programs. It would much contribute to the advancement of integrated, accessible knowledge, in a world which is lost in overspecialization and drowned in an undigested information flood.

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7 References

- Borgman, C.L., 2007, *Scholarship in the digital age : information, infrastructure, and the Internet* /, MIT Press, Cambridge, Mass.
- Callery, B.G., ed., *Collaborative access to virtual museum collection information : seeing through the walls* /, 2004, Haworth Information Press, Binghamton, NY.
- Cameron, F. & Mengler, S. 2009, "Complexity, Transdisciplinarity and Museum Collections Documentation. Emergent Metaphors for a Complex World", in *Journal of Material Culture* 14(2): 189-218
- Cameron, F. & Robinson, H. 2007, "Digital Knowledgescapes: Cultural, Theoretical, Practical, and Usage Issues Facing Museum Collection Databases in a Digital Epoch" in *Theorizing digital cultural heritage : a critical discourse* /, eds. S. Kenderdine & F. Cameron, MIT Press, Cambridge, Mass.
- Constantopoulos, P. & Doerr, M. 1995, "An Approach to Indexing Annotated Images", 1995, In D. Bearman (Ed.), *Multimedia Computing and Museums, Selected Papers from the Third International Conference on Hypermedia and Interactivity in Museums (ICHIM '95 / MCN '95)*. San Diego, California, USA, October 9-13, 1995. Archives & Museum Informatics, Pittsburgh, PA, USA, ISBN 1-885626-11-8, pp. 278-298.
- Doerr, M., Bekiari, C., Heraklion, C., Le Bœuf, P. & nationale de France, B. 2008, "FRBRoo, a Conceptual Model for Performing Arts", 2008 Annual Conference of CIDOC, Athens (September 2008), <http://www.cidoc2008.gr/cidoc/Documents/papers/drfile>, pp. 06.
- Doerr, M. 2009, "Ontologies for Cultural Heritage", in: Second Edition of: Steffen Staab, Rudi Studer (eds): *Handbook on Ontologies*, Springer
- Keene, S. 1998, *Digital collections : museums and the information age*, Butterworth-Heinemann, Oxford; Boston.
- Marty, P.F. 2008, "Museum websites and museum visitors: Digital museum resources and their use." in *Museum Management and Curatorship* 23 (1), 81-99
- Parry, R. 2007, *Recording the museum : digital heritage and the technologies of change* /, Routledge, London; New York.
- Ronchi, A.M. 2009, *eCulture : cultural content in the digital age* /, Springer, Dordrecht; London.
- Russell, R. & Winkworth, K. 2009, "Significance 2.0, a Guide to assessing the Significance of Collections", Heritage Collections Council of Australia Ltd., ISBN 0 642 75094 7 (print), 0 642 75100 5 (online), <http://significance.collectionscouncil.com.au/pdf/colour/Significance20.pdf>

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[1] These are museums under the National Heritage Board (NHB), Singapore.

[2] <http://app.mica.gov.sg/Default.aspx?tabid=69>

[3] <http://www.nhb.gov.sg/WWW/aboutus.html>

[4] For the purpose of this paper, we collectively refer to all NHB visual and fine arts form to be exhibited and curated by the Singapore Art Museum. There has been more recent development –

for most current status of the museums please visit the Singapore Art Museum website <http://www.singaporeartmuseum.sg/> and The National Art Gallery of Singapore website <http://nationalartgallery.sg/>

[5] In this year, SAM had to clear copyright issues for most of the records, therefore only 273 out of over a thousand that were produced could go online.

[6] We shall use the term “Assistant Manager (IMCMS research)” (or its acronym “AM”) to denote the “museum information curator” that NHB hired, while the term “researcher” refers to the personnel employed who has a more focused role of research and writing with no additional administrative/ managerial/ supervisory and other “overview” tasks expected of the AMs.