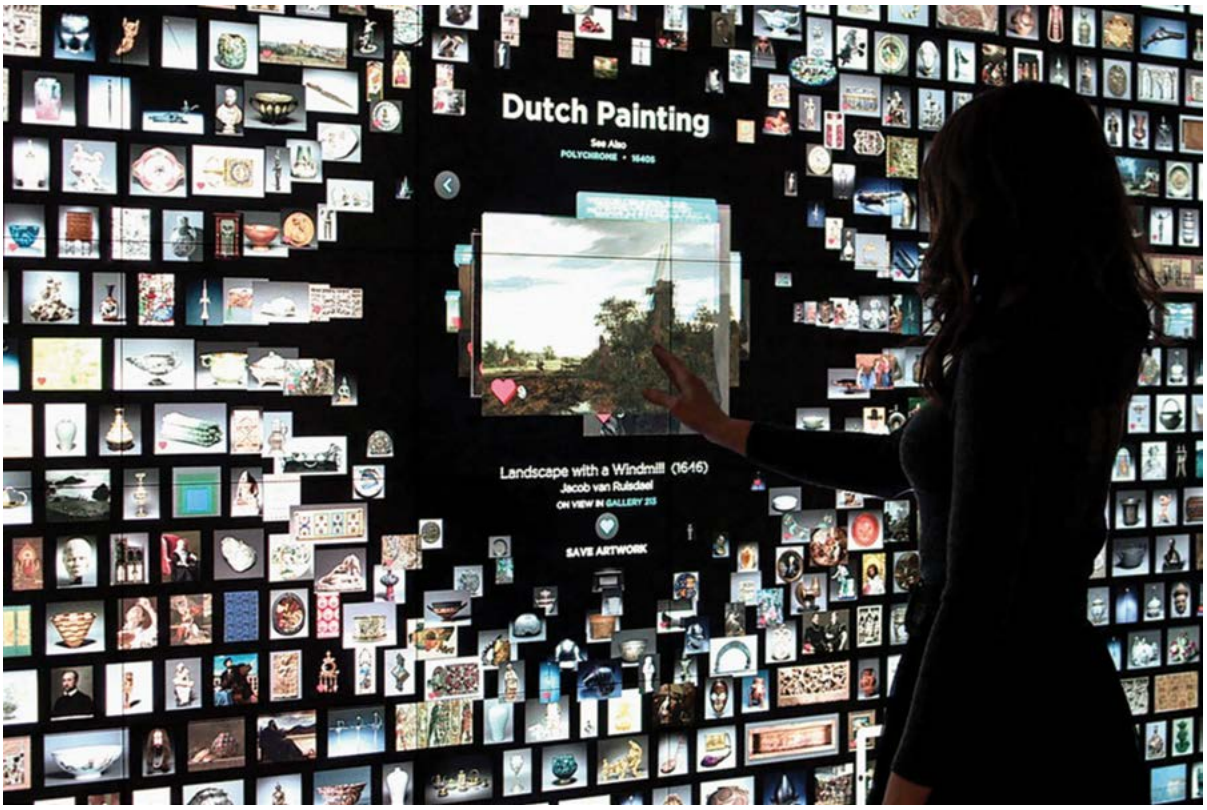
REPORT OF THE

SUMMIT ON DIGITAL CURATION IN ART MUSEUMS



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Cover photo courtesy of Cleveland Museum of Art and Local Projects

REPORT OF THE

SUMMIT ON DIGITAL CURATION IN ART MUSEUMS

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The summit was co-organized by Phyllis Hecht, director of the JHU M.A. in Museum Studies program, and Joyce Ray, coordinator of the JHU Digital Curation certificate program; it was held in Washington, DC, October 8-9, 2015, with the support of the Samuel H. Kress Foundation and Johns Hopkins University

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EXECUTIVE SUMMARY

In October of 2015, Johns Hopkins University (JHU) Museum Studies Program convened a group of cultural heritage professionals to discuss digital curation, its integration into the art museum community, and the role the JHU Program in Digital Curation might play in this effort. Attendees included representatives from museums, libraries, archives, foundations, and the JHU Museum Studies Program.

The meeting took place over two days. The first day and a half included a series of short presentations that addressed innovative projects; infrastructure, staffing and workflows; digital curation tools; curatorial considerations; internships, residencies and research opportunities; and local and international collaborations. Each presentation served as a springboard for facilitated discussions where these issues were considered in greater depth.

Breakout sessions on the last afternoon moved the discussions from conceptual to pragmatic. Participants met in small groups to discuss ways to increase awareness of digital curation in art museums; to identify what the key principles, roles, and responsibilities of digital curation internships in art museums should be; and to suggest innovative student/intern research projects that would contribute to digital curation and advance a museum's mission.

In the course of these activities, Summit participants discussed the definition of digital curation (and digital curator), how this field is evolving, and who might assume the roles and tasks of digital curation in art museums in the near future. The following definition of digital curation used by the JHU digital curation program was adopted for the purpose of Summit discussions:

> ***Digital curation is the planning and management of digital assets over their lifetime, from conceptualization, through active use and presentation, to long-term preservation in a repository for future use.***

Common themes that emerged during discussions included: 1) the different challenges digital curation poses for small, medium, and large museums, 2) the need to promote digital curation as a way to mitigate the risk of losing cultural heritage embodied in digital form, 3) the types of digital curation education and training needed in the museum community, and 4) how digital curation can lead to changes in other areas of museum practice.

This report summarizes the Summit presentations, follow-up discussions, and the following suggestions for "next steps."

SUMMARY OF RECOMMENDATIONS

1. **Resolve the ambiguity that exists around the terms "digital curation" and "digital curator."**
2. **Create an advocacy strategy.**
3. **Highlight digital curation work in art museums.**
4. **Clarify principles of digital curation internships/residencies in art museums**
5. **Identify partners and responsibilities in art museum internships/residencies.**
6. **Identify innovative digital curation research projects that might be undertaken by students/interns.**

External projects, initiatives, and publications mentioned during the meeting or in Twitter backchannel (#jhudigcur) conversations are included here in an appendix of suggested resources and in the endnotes. An online version of this report, slide presentations and Twitter backchannel conversations are available at: *advanced.jhu.edu/academics/certificate-programs/digital-curation-certificate/program-resources*

Information on the JHU Digital Curation program is available at: *http://advanced.jhu.edu/academics/certificate-programs/digital-curation-certificate/*

The Summit was made possible through the generous support of the Samuel H. Kress Foundation and Johns Hopkins University.

INTRODUCTION

The Johns Hopkins University (JHU) Museum Studies Program *Summit on Digital Curation in Art Museums* emerged in response to concerns about the long-term viability of cultural heritage embodied in digital forms. Art museums in particular are acquiring digital collections and creating vast amounts of digital assets in the normal course of their activities. These efforts represent a large investment of time and resources in materials that, because of their digital nature, are fragile and prone to obsolescence within a few years time. Yet few art museums are addressing the long-term care, use, and preservation of these materials. A "perfect storm" is brewing, one in which materials that art museums acquire and create will begin to disintegrate and become unusable. Digital curation provides a strategic approach to mitigating this risk.

The museum profession needs to cultivate staff with knowledge of digital curation and skills to successfully address its many facets. Recognizing a need for digital curation education in the museum field, the JHU Museum Studies program created a digital curation certificate program in 2013; in 2014, a dual program combining the MA in museum studies and the certificate in digital curation was approved. Designed to impart digital curation skills to current and future museum professionals, this program requires digital curation internships and research projects for its students as an integral part of their education. The program's faculty takes an expansive view of these opportunities, seeing them as a way to stimulate innovation, advance a museum's mission, highlight the critical nature of digital curation, and help position it to become a core activity in an institution.

To move forward on this vision, the JHU's Museum Studies Program invited professionals from the library, archive, and museum communities to address digital curation in the context of art museums. What are the needs? What are the perceptions of digital curation in this community? How can digital curators help art museums care for their digital holdings in a way that ensures they remain usable in the future? How can the community promote digital curation as integral to the core mission and activities of art museums?

The ubiquity of digital materials in art museums makes this an urgent conversation. If these materials are to enable innovation and engagement with art, they must be cared for with the same level of attention that museums give to their physical collections. How can this be made a reality? How can students and graduates of a training program such as the one at JHU advance this effort? The Summit emerged as a way to highlight and address these challenges and give voice to the large gaps in understanding and practices.

THE SUMMIT STRUCTURE AND ORGANIZATION

Twenty-nine professionals met over the course of two days to discuss:

- The value of digital curation in art museums
- The opportunities and challenges associated with innovative practices supported by digital curation in art museums
- The potential that digital curation internships hold for art museums, and the roles and responsibilities of interns, faculty, and host institutions in bringing this potential to fruition.

Because the concept of digital curation is relatively new to the cultural heritage community, and its definition remains open to debate, the Summit's conveners put forth the following working definition for the purpose of guiding the meeting's discussions:

> ***Digital curation is the planning and management of digital assets over their lifetime, from conceptualization, through active use and presentation, to long-term preservation in a repository for future use.***

Speakers were asked to use this working definition as a guideline when developing their presentations. Participants were asked to consider it when determining if their comments, ideas, or advice fell within the Summit's topical scope.

The Summit was organized around two activities. The first was a series of short, thought-provoking presentations that addressed the topics of innovative projects; infrastructure; tools; curatorial considerations; internships, residencies and research opportunities; and local and international collaborations. Each presentation highlighted issues in digital curation, and served as a springboard for facilitated group discussions where these issues were considered in greater depth.

In the second activity, participants were assigned to smaller groups and asked to address three questions:

1. What next steps can the art museum community take to move digital curation forward in their institutions?
2. What are key principles of digital curation internships in art museums, and what are the roles and responsibilities of all the partners involved in these internships?
3. What research projects might students and interns undertake that will contribute to digital curation and advance a museum's mission?

After discussing these questions, the entire group reconvened to consider the individual group suggestions and to offer their final comments.

BACKGROUND: Johns Hopkins University (JHU) Museum Studies Program and Its Digital Curation Certificate Program

Phyllis Hecht, Director of the Master of Arts in Museum Studies program at JHU, gave an overview of her institution's program.[1] The program is conducted online, with the exception of one two-week seminar. Over 350 students of all ages and levels of experience currently are enrolled, and over 400 students have graduated from the program. Most students in the program are US-based, but a significant number are international. Seventy percent of enrolled students work in museums.

The program curriculum offers a mix of theory and practice that crosscuts all types of museums and that has technology as an underlying thread in each course. Students must complete nine courses and one two-week seminar to earn the M.A. Community building among students is important since most of the program is conducted online. The program relies heavily on social media to help keep everyone connected and engaged.

The Museum Studies program also offers a digital curation certificate program[2] that can be pursued on its own or jointly with the M.A. Museum Studies program. Joyce Ray, coordinator of this new program, spoke briefly about its development and structure. She noted that museums manage and share a diverse array of research information (on collections, exhibitions, conservation, field projects, interactive media, etc.) that is unique to the museum world, yet nearly all digital curation education currently occurs in library and information science (LIS) programs. At a digital curation meeting held in 2013,[3] museum professionals observed that the library and archives training focus meant few individuals are prepared to understand digital curation issues in a museum context. In response, the JHU digital curation program launched in 2013-14 with the goal of positioning museum professionals as active participants in museum and cultural heritage digital curation.

The program's curriculum is modeled on similar LIS programs, but its focus is on the digital curation needs of museums. Applicants must have an M.A. in museums studies or related field, or hold a Bachelor's degree with at least five years experience in a library, archive, museum or related cultural heritage organization, or be currently enrolled in the JHU museum studies MA program. Students take online courses on digital preservation, foundations of digital curation, and managing digital information in museums, in addition to one elective from the museum studies curriculum. They also complete an onsite internship at a host institution and a semester-long research course. The internship includes at least 120 hours of onsite work on a specific approved internship project; oversight by an onsite supervisor; weekly online journal entries that document the internship work; participation in an online forum with other program interns; completion of a project product or report, and a final internship report. Approximately thirty students currently are enrolled in the program, most of whom are pursuing the M.A. in Museum Studies concurrently.

After summarizing their respective programs, Hecht and Ray expressed their hope that synergies would emerge between the students in their programs who are interested in art museums, and the art museums where they aspire to do internships and conduct research. As educators, they want to better understand how their students might help jumpstart digital curation initiatives and advance its practice in art museums. To that end, their goal in organizing this Summit is to seek advice on digital curation from various experts in cultural heritage, and share these insights with the broader cultural heritage community.

PRESENTATIONS AND DISCUSSIONS

Each of the seven presentations given during the Summit was followed by a lengthy (50 minute) discussion period. The presentations are summarized below, followed by the digital curation topics considered in the follow-up discussions.

PRESENTATION 1: INNOVATION IN DIGITAL PROJECTS + ITS CHALLENGES

John Ryan, Director of Interaction Design at Local Projects,[4] described his design firm as a place that creates digital experiences for visitors to prompt inspiration, thought, and meaningful interactions. His firm's primary partners are museums, and some of its clients include the Cleveland Museum of Art, the 9/11 Memorial Museum, and the Cooper Hewitt, Smithsonian Design Museum.

Photo courtesy of Cleveland Museum of Art and Local Projects

Ryan identified three challenges – posed as questions – that his firm and its museum partners face when developing innovative projects. The first challenge is "How much technology should be used, and how deep should the experience be?" A digital layer that is too shallow fails to draw people out in a meaningful way. A layer that is too deep can be overwhelming. Similarly, the technology used to mediate the interaction has to be appropriate. The goal is to find the balance between the depth of experience, the amount of content, and the type and amount of technology. Ryan highlighted how this balance was achieved by examples from the various interactives[5] in the galleries of the Cleveland Museum of Art.

After the first challenge is addressed, the next challenge is, "What tool or platform should be used to build whatever has been defined?" Digital tools are the most recent manifestation of our long history as toolmakers, and their purpose remains the same as for nondigital tools: to address a problem and the person facing the problem (much like a hammer functions as an extension of a person's arm as it solves the problem of getting a nail in a wall.) For Ryan and his colleagues, the goal is to find a digital tool that "disappears into the background" so the experience comes to the fore. Cooper Hewitt's "Pen"[6] is one such example. It lets users seamlessly collect and create, using the museum's collections, without the user being distracted by the tool.

The final challenge is to consider whether all the elements will work when pulled together. The way to address this question is to prototype an idea early and often. Ryan emphasized that you never know how people will engage with something

until you "put it out there" and get it in front of visitors. He illustrated this challenge with an example from the New York Hall of Science (NYHS). The Local Projects' team worked with the NYHS to develop interactives that help children explore math and science in the world around them. But they found that their initial choice of hardware was unworkable. It took months of trial and error over various prototype stages to finally achieve success.[7]

Ryan concluded by paraphrasing Steve Jobs' view of technology: it is worthless without people. Tools enable people to do "wonderful things," and his firm's challenge is to work with institutions to make this possible.

[DISCUSSION POINTS]

The "shelf life" of innovative, experiential projects

What is the "shelf life" of innovative projects such as those developed by Local Projects and its partner museums? And what discussions take place among project partners about investments in sustaining these projects?

For Ryan, "shelf life" is determined by how long the project continues to be relevant and engaging. He suggests designing around technology-agnostic principles to ensure the longest "shelf-life" possible. However, many of the Summit participants felt the issues of technology, particularly the investment in it, cannot be ignored. Some wondered if the investments in new technologies (such as Cooper Hewitt's Pen) might be shared with other (often smaller) museums that could never afford such an investment.

The Cleveland Museum of Art did discuss the "life" of their interactive projects and when the underlying technology might need to be swapped out, and they also considered how long the art works would remain on display in the gallery. Speaking from the perspective of a member of the museum team working on the museum's interactives, Jane Alexander felt the real investments must be made in the area of content, especially the metadata and databases. These entities must be robust so they function even with the inevitable changes in hardware. Also, the limits of a particular technology sometimes are known in advance, so institutions can plan for new iterations at the very beginning of the project's development. For Alexander, the real issue with these projects is that they are ongoing: they don't end with a public launch. Members of the museum's project team and administration must be made aware of this so that continual investments of time and money in a project aren't a surprise.

What needs to be preserved here?

What should be preserved in experiential projects? Or, as one participant asked, "What is the archival unit of an interactive project?" And who bears the responsibility for preserving these projects?

Participants felt the preservation burden must fall to museums, and that museums should strive to preserve both the media and the experience. As one participant stated, "If we're not thinking about how the experience stays alive, who will?"

> The museum bears the responsibility of considering preservation at the very beginning of the development process, not after a project has been designed and implemented

The challenge of identifying what is to be preserved is followed by the challenge of how to do so. Is documenting experiential projects "good enough"? Or do these projects need to be replicated in some manner? Replication brings a host of rights issues into play. For example, does the community have a clear understanding of legal agreements that will allow these innovative, experiential projects to undergo digital curation activities without violating intellectual property rights? A fair use case may be made for large portions of these projects, given their transformational nature and their scholarly and/or educational, nonprofit use. But museums need to proactively invoke fair use when preserving these projects and their components, and when making them available for reuse.

Documenting innovative, experiential projects

How are these projects being documented now? Is it sufficient to gather all correspondence, agreements, and other written materials related to the project to consider that project "documented"? Is it adequate to document these projects on video, or place their code on GitHub[8]? Do any of these mechanisms preserve the thought processes behind the decision-making that occurs in the context of these projects? Moreover, how are these projects assessed so they can be appropriately curated? And are digital curation specialists trained to do such assessments?

The importance of documenting innovative projects goes beyond preservation. As one participant noted, these projects have so many "moving parts" that it is critical to document them in an ongoing manner just to keep control and manage the development process. Ongoing documentation also helps shorten learning curves for new members who join project teams. Yet even when projects are documented in this manner, a complete "big picture" narrative of an entire project is needed after the project is launched. Unfortunately, as time passes and other priorities arise, this aspect of the documentation process rarely takes place.

Ryan felt all parties involved in these projects need to develop better ways to document "the evolution of the process behind the project." Suggestions were made to bring librarians and archivists on board in the planning stages of these projects, and to enlist the participation of conservators who are thinking about preserving digital code and its components. But these suggestions are not failsafe, as often these professionals are not trained or interested in digital curation, or are not given a mandate to take on these activities.

In the end, documenting is only one way of curating these types of digital projects. Preserving them so that their components can be reused or repurposed is a much harder problem. There may be assets that simply cannot be curated, or that require an infinite number of resources to resuscitate. In these instances, documentation may be the only solution.

Innovative projects could lead to changes in museum practice

Innovative projects often provide museums with information (such as public interest in collections) that is not otherwise apparent. Is this type of information being fed back into the curatorial process? Are there examples of where this feedback takes place?[9]

Douglas Hegley gave an example from his own institution (Minneapolis Institute of Art), where an institution-wide project addressing digital interpretation forced everyone to rethink the way content is conveyed in online platforms. This effort then prompted the museum to consider how it communicates its "off-line" content, such as wall labels. In the end, this digital project led to a reconsideration of all communication modes, regardless of whether they were mediated by technology.

Anne Goodyear also gave an example of how the development of an online scholarly catalogue at her institution (Bowdoin College Museum of Art) introduced curators to technology-mediated concepts and how they can be used to reach the public. The process, defined by Goodyear as "incremental education," helped curators see the value in this type of outreach and become more receptive to it in future projects.

Today's digital curation is retrospective; tomorrow's must be prospective

Thorny Staples of the Smithsonian Institution pointed out that current digital curation practice retrospectively addresses digital assets. And while stabilizing existing assets is important, eventually a change will be needed in the field of digital curation towards building toolsets that people work in and that automatically capture/curate data at the point of creation and use. The focus must shift to making things "curatable" as we go along, not after an activity has been completed.

PRESENTATION 2: DIGITAL CURATION IN ART MUSEUMS: TECHNOLOGY, PEOPLE, PROCESS

Douglas Hegley, Director of Media and Technology at the Minneapolis Institute of Art (Mia) summarized some of the issues with the infrastructure for digital curation, particularly technology, staffing, and processes.[10] While he professed not to be an expert in digital curation, and finds the term problematic, Hegley is concerned with its application, as his institution (like all museums) now has a plethora of digital assets, as well as born digital artworks, that need the application of digital curation principles.

At the moment, digital asset management systems (DAMS) are the primary tool museums use to manage, store, and access digital materials. But the DAMS industry is immature: it includes a vast number of systems, most of which were built for commercial needs. None of the systems address cultural heritage asset management in a satisfactory manner.

Museums also use collections management systems, desktop systems, and other repositories to store some of their digital assets. The multiplicity of systems makes it hard to find assets across a museum. To address this problem at his own institution, Hegley and his staff (with support from the Institute of Museum and Library Services), recently created a unified interface (MetaMia) to help internal users search for assets across its different repositories. Hegley is looking forward to reviewing how other digital curation tools such as MoMA's Digital Vault (see Presentation # 3, below) are being used, and to seeing how the growing use of GitHub may fit into the process. He urged the cultural heritage community to keep supporting tool development of this nature.

Turning to the issue of people in the digital curation process, Hegley highlighted the absurd number of job requirements that have been articulated for digital curation professionals in job advertisements.[11] Few people have or will ever possess all these skills. Hegley suggests when hiring, museums find someone who can start some digital curation processes and acquire the deeper knowledge and skills needed as the process moves forward within our institutions.

When considering digital curation workflows, museums must acknowledge that their systems are not set up to handle long-term preservation and archival practices. Too often museums adapt their in-house workflows to outside systems, instead of the other way around. The museum community also faces a number of other challenges, such as identifying simplified metadata models that cover a core set of file formats, and finding ways to ensure that assets and metadata travel well together. Better tools are needed to track where assets go and how they are used once they are released.

Museums can look outside for development of tools that will help them manage assets. But they need to look inward when it comes to digital artworks. Museums increasingly acquire these works with little forethought about how they will manage and preserve them, and with little understanding of the costs involved in doing so.

Despite these challenges, Hegley is optimistic about the future of digital curation in museums. He believes museums are "on the cusp of understanding" the importance of digital curation and the need to acquire digital curation tools. Long-term preservation issues are gaining greater prominence in museums, and he sees the beginning of community-based solutions to our community's most intractable problems.

> The museum profession needs to demand excellent tools, more widespread digital curation education and training, and workflows that serve preservation needs.

[DISCUSSION POINTS]

Digital curator – the definition, the role, the responsibility

The use of "digital curator" as a job title is confusing for many in the profession. At a time when the traditional understanding of "digital" and "curation" are being called into question, referencing a job title that combines both terms leads to further obfuscation. Names and titles reflect political choices. What is the cultural heritage community advocating for when it uses the term "digital curator"?

The confusion engendered by the title extends to the job's role and responsibilities. The numerous tasks that have been assigned to digital curators strike everyone as unrealistic. At the same time, some agreement about the role of a digital curator is needed, or else it risks being defined narrowly by an institution's chief technology officer or by the specific technology parameters of a museum's digital collection.

In the end, the task of defining a digital curator's roles and responsibilities may be a short-term problem. As humanity exceeds its capacity to manage the vast amounts of data it creates, everyone will be taking on activities and using workflows that help them mediate and discriminate (i.e., curate) information. The notion of digital curation as an independent role embodied by a single person may evolve into a view of digital curation as a collaborative undertaking of many individuals. For the foreseeable future, however, the role of an individual digital curator is essential to promoting digital curation practices in museums.

The interplay of digital curation and art history training programs

Since many art museum curators are trained in academic art history programs, these programs might be a pipeline for moving digital curation concepts into art museums. The JHU Museum Studies and Digital Curation programs might wish to build a strategic case for such education and training, and consider ways to integrate its programs with those in art history.

Another entrée into academic art history programs might be through the emerging field of digital art history. This field is having a growing impact on graduate art history training, introducing students to tools and methodologies for interpreting and manipulating digital materials in the field.[12] Art librarians also might be brought into the picture to help increase digital curation awareness in the field.

Changing perceptions and paradigms

The museum profession uses a linear model when describing cultural heritage collections: records are created for objects and information is added to these records over time. This model, which began in the 19th century, continued to be used even when museums made the leap to electronic catalogues in the 1970s. But in the last two decades the Web has altered how we discover and use information, and the linear information model has not adapted to this changing paradigm. Museums are creating an organized body of information but have not built systems for people to work with this information in new ways. The efforts undertaken by staff at *FiveThirtyEight*, an organization that aggregates data and publishes statistical and visual analyses on politics, economics, and culture,[13] provide an illustrative example. Using MoMA's collections metadata with various visualization tools, the *FiveThirtyEight* staff derived new insights about the parameters of the collection that were not evident from traditional museum approaches used to query collections.[14]

Learning from the private sector

The commercial sector addresses digital curation issues on a much larger scale than museums, yet museums know very little about their processes. Marvel Comics, for example, successfully manages over 30 million digital assets with its DAMS. MLB.com,[15] which began as an asset management system for Major League Baseball's content, has spun off a division that offers digital preservation infrastructure and services for other organizations. These are only two examples of commercial enterprises that address digital curation needs at scale. While their solutions may not meet the specific needs of cultural heritage collections, the cultural heritage community should be examining commercial sectors efforts more closely to see what it could learn.

PRESENTATION 3: DIGITAL CURATION: BALANCING PRESERVATION, ACCESS AND MANAGEMENT

Ben Fino-Radin, Associate Media Conservator at the Museum of Modern Art (MoMA), outlined the information ecosystem at his institution and his efforts in creating a digital repository for collections materials.[16] He took as his model the philosophy of The Schaulager,[17] a museum in Switzerland that houses works from the Emanuel Hoffman Foundation that are not on exhibition or loan. These works are placed in a "living storage" facility, where they are on display and accessible to researchers and staff. Fino-Radin believes that digital repositories should emulate this model by ensuring that digital objects in a repository are not divorced from access.

To that end, he has been working to develop a repository system at MoMA that has three main components: a packager (the "assembly line"), a warehouse (the storage system) and an indexer (the tracking system). The packager is run by software called Archivematica,[18] which analyzes a file and identifies, in both human and machine readable language, information about the bits/bytes, file formats, file types, fidelity levels, etc. It stores this information in standards-based metadata, along with the digital object, in an archival package.

Courtesy Ben Fino-Radin, The Museum of Modern Art

The archival package is put into an archival storage system (the "warehouse") that is designed and managed by a company called Arkivum.[19] Archivematica works with Arkivum's software and writes the archived package out to very fast disk and to tape. These systems will be installed in MoMA's primary location in Manhattan, at MoMA QNS in Long Island City, and (an offline copy) at MoMA's film preservation center in Hamlin, PA. Arkivum conducts integrity checks to ensure that all three copies agree with one another. If anything goes bad in one location, it pulls a good copy from another location, so content is never lost.

MoMA also built an indexer (the tracking system) called *Binder*.[20] This system scans the archival packages and extracts rich technical metadata that it puts it into a system where it can be effectively used and managed. *Binder* also facilitates on-demand streaming access to all collections material, following The Schaulager model of offering access while preserving. *Binder* is open source, and available on GitHub.

The structure and design of the digital repository systems were determined after MoMA conducted a detailed analysis of its current systems and in-depth interviews with staff. These efforts uncovered the areas of digital preservation that were not being addressed by existing tools or processes. Using this information, the museum created a requirements document that guided the process of system development.

The packager, warehouse, and indexer make up the digital repository portion of MoMA's information infrastructure. However, the first steps in the digital curation process are human-centered, and involve the acquisition and registration of digital materials using a collections management system and various custom-built scripts and tools. Ingest, storage, and bit preservation follows, and this piece is automated (via the packager/warehouse/tracking systems.) After these steps, human-centered activity comes back into play with MoMA's DAMS, *Binder*, etc. *All* systems talk to each other via open RESTful APIs,[21] so the museum can analyze its collections in ways never before possible.

Fino-Radin concluded his presentation with a discussion of cost models that supported MoMA's decision to choose on-site (versus Cloud) storage, and projections of development, implementation and management costs for the system over the next 10 years. A side benefit of all their repository-development efforts is that MoMA now has a model that can estimate the total cost of ownership for all its digital assets, and this model is being used to project infrastructure and capacity needs over time.

[DISCUSSION POINTS]

More on MoMA's digital repository and preservation strategy

The digital repository system currently stores the MoMA's collections. However, the museum's other departments have digital assets that also need a repository solution. For example, their imaging and visual resources department generates terabytes of material in the course of its activities, and there are discussions underway to see how these materials might leverage the same storage structure of the MoMA repository. Fino-Radin also thinks MoMA will be collecting more film, which could require a rethinking of strategy because of the huge storage needs of this media.

MoMA's digital repository effort is similar to what is underway in the private sector, with one important distinction. Private sector efforts are based on replication, not redundancy. But replication strategies are not appropriate for museum collections because they do not safeguard data integrity. Redundancy strategies have data integrity as their core concept.

Digital repository solutions for small to mid-size museums

MoMA's digital repository strategy is not cost effective for small to mid-size museums. For these types of institutions, there are no easy answers. Fino-Radin and his MoMA colleagues have discussed how they might offer a support network and infrastructure for smaller museums, but there is concern about risks in storing another museum's digital assets, so this idea has not moved forward. There are organizations[22] and consortia that offer repository services to small to mid-size museums But for institutions with small numbers of digital collections, it might be easier and more cost-effective to copy their collections to hard drives and store them in different locations rather than use a service that does this by other means.

Another possible solution for small to mid-sized museums is "Hydra-in-a-Box."[23] This IMLS-funded project is developing a framework for building interfaces to Fedora-based digital repository systems. The project will create a turnkey method for installing and maintaining these systems and will be exploring the idea of a hosted solution as well. However, one participant warned that institutions often adopt "in-a-box" solutions and then want to customize them further for their local environments. In the future it might be more advantageous to consider the co-evolution of systems with staff and curators/researchers working together with tools that are close to turnkey, but flexible enough to be enhanced when needed.

Fino-Radin suggested that all museums should look into *Matters in Media Art*.[24] This project will be releasing the

third phase of its work, which addresses issues such as scoping out budgets for storage and repository infrastructure. The project will provide museums of all sizes with important guidelines and strategies that can inform decision-making about repository solutions.

Impact of MoMA's digital curation activities on museum practice and perceptions

Following up on earlier discussions of how digital curation practices are changing institutional practice in other areas of a museum, participants asked about changes at MoMA. Has MoMA's digital repository changed curatorial practice around acquisitions? Has senior museum staff become more aware of the true costs of acquiring digital works?

Fino-Radin responded that acquisition decisions are not limited or otherwise affected by the repository program. MoMA's baseline storage infrastructure is scalable, so if a curator acquires an entire archive of a filmmaker's work, and it is 100Tb in size, they can handle it. However, the project has affected decisions on digitization and preservation of acquisitions. For example, the museum may decide to postpone the scanning of a large film archive: film-scanning technology is rapidly evolving and it might be more efficient to scan in a few years' time. On the other hand, the timeframe for digitization of the museum's analog video may be sped up because this medium's obsolescence is predicted within the next ten years.

MoMA's staff does have a greater appreciation of the true costs of acquisition of digital works as a result of the project. Media conservators are involved in the pre-acquisition process to assess a work and identify the long-term costs of storing it in the repository, so potential costs are apparent early in the process. The museum also has a media working group that meets on regular basis and raised digital curation awareness across the institution.

Logistics — ensuring data integrity

Fino-Radin noted that MoMA generates checksums of collections materials at the point of acquisition (i.e., when collections are taken from the storage medium in which they are delivered). Files are also checked when they are moved to Archivematica, when Archivematica stores them with Arkivum, and every six months thereafter. In theory, MoMA should not see a failure because checks are taking place at intervals that are five to ten times the mean-time-to-failure of the medium. But if a failure is found, the system is designed to pull a 'good' copy of the file automatically from another storage repository.

Industry threats

For Fino-Radin, the biggest external threat for digital repositories comes from the hard drive industry. Disk storage is reaching the limits of its design and will no longer be getting cheaper over time. As museum collections continue to grow, and storage costs rise, the overall equation shifts. Compounding the problem is stasis in the tape industry. Tape manufacturing is now in the hands of a few companies, and the incentives for innovation are few. Together these factors will massively increase costs, forcing cultural heritage organizations to shift to a different paradigm, such as identifying "levels of preservation" for various collections.

Fino-Radin also expressed concern about the many groups in the public and private sectors that are putting their materials in the Cloud. Because different industries run different Cloud-based services, if one provider leaves the market, its clients must migrate massive amounts of information to the Cloud-based service of another provider. The time and costs involved in such migrations can be staggering. Few organizations using Cloud storage consider the risks.

The growth of digital collections

The possibility that, at some point in the near future, art museum collections will comprise more digital art than traditional works (like painting and sculpture) struck many of the participants as an improbable scenario. However one participant was less doubtful, noting that

> "it took MoMA one hundred years to acquire 3500 paintings; it is not unreasonable to assume that in the next hundred years it will acquire more than 3500 digital works."

Few museum professionals are thinking through the implications of such a scenario.

PRESENTATION 4: COLLECTING, DISPLAYING, AND PRESERVING DIGITAL ART: A CURATORIAL AND DIRECTORIAL PERSPECTIVE

Anne Goodyear spoke about the ways her work with time-based media art (TBMA)[25] as a curator at the Smithsonian National Portrait Gallery helped inform her thinking about digital collections in her present role as Co-Director of the Bowdoin College Museum of Art.

In 2006, the National Portrait Gallery exhibited two TBMA works: Andy Warhol's *Screen Test: Edie Sedgwick* (1965) and Jason Salavon's *The Late Night Triad* (2003). Concerned about how to care for these works, Goodyear reached out to various interdisciplinary staff around the Smithsonian (e.g., curators, conservators, audiovisual specialists, etc.) and to TBMA artists, resulting in the creation of the Smithsonian Time-based Media Working Group.[26] This group addressed programming issues faced by those who collect, exhibit, and preserve new media with the goal of helping trustees understand the long-term costs and care of TBMA before they acquire these works. The group faced several challenges (particularly in reconciling vocabulary and with competing professional priorities) but it succeeded in raising the profile of TBMA around the Smithsonian, and demonstrated the importance of collaboration in addressing TBMA issues.

Goodyear continues to support this collaborative model at Bowdoin College. She and her colleagues at the Museum of Art view digital art and art that is digitized as a way of sharing collections and facilitating new scholarship. The museum released its public and historical image collections as open access and is working on collaborations that will extend the use of its holdings and research. Goodyear cited two recent examples of collaboration: a digital project[27] that commemorates the 50th anniversary of the museum's seminal exhibit entitled, *The Portrayal of the Negro in American Painting*, and its creation of an online scholarly catalogue of America's earliest drawing collection entitled, *Art Treasures, Gracefully Drawn: James Bowdoin III and American's Earliest Drawing Collection*. Both projects involved cross-disciplinary teams of professionals located in different campus departments.[28] For Goodyear, the success of these efforts reinforced the notion that campus museums are laboratories for modeling scholarly and public engagement with digital resources.

> Large art museums might help their smaller peers by sharing resources and expertise. In turn, small museums can give their larger peers access to the new and diverse audiences that exist in an academic community.

Goodyear also views cross-institutional collaborations as a way for small museums to acquire and preserve TBMA works. For example, the Bowdoin College Museum of Art is part of a consortium of small New England art museums[29] that jointly purchased a TBMA work by William Kentridge (*Tango for Page Turning*, 2012-13.) This purchase allows the consortial institutions to share - with their students and across their institutions - a TBMA work that would otherwise not have been available to them, for none of the institutions could have made the purchase on their own.

Goodyear believes the next logical step to consortial efforts of this nature is the creation of cross-institutional collaborations that help small museums address the preservation aspects of their TBMA works.

[DISCUSSION POINTS]

Collaborations among small museums

The joint acquisition of the William Kentridge work by a consortium of campus art museums prompted discussion of how this process is playing out and what it might mean for the care and preservation of the work. Although the acquisition process is underway, Goodyear emphasized that it would never have come to fruition without a strong network of museum directors in the New England region who saw the benefit of jointly acquiring a work that would exceed any one of their individual budgets. Moreover, the artist was enthusiastic about making the piece available to so many students across different institutions.

The group currently is working on an agreement about what it means for the partners to participate in the consortium. To date they have agreed that all consortial partners will share ownership of the work. The work will be exhibited at one institution at a time, but each museum will have a copy that they can show to students in teaching and other situations. It is not yet certain how the consortium will address the preservation of the work. Each consortial museum has its own strategy for preservation, and they all will have to come together to share notes and identify issues/solutions. Goodyear looks forward to this challenge. Alluding to the "standards are like toothbrushes"[30] adage, she pointed out how the museum world is rife with institutions developing individual solutions to common problems. The consortium will be working on a common solution. Because the partner museums have made a financial investment in the Kentridge work, they also have an investment in preserving it. They will have to work together to align their different approaches. Goodyear hopes that their efforts in doing this will demonstrate to the broader museum community how working together on these solutions is better than going it alone.

Partnerships between small and large institutions

Building on Goodyear's comments about partnerships between small and large institutions and how they might fuel larger change in the community, the conversation turned to the value of these partnerships.

> Bringing students into large, nonacademic institutions fuels diversity and can spawn a future generation of museum colleagues who are attracted to TBMA and its challenges.

Students gain familiarity with broader professional concerns, learn to be part of a larger professional community, and receive practical training. For smaller institutions, the gains include access to expertise and infrastructure. A significant benefit for both large and small institutions is the opportunity to share information on new initiatives in the world at large (such as guidelines, standards and new projects on the horizon) that can help in forming shared solutions.

Capturing the attention of professional organizations and art museum leaders

Leading individuals and organizations in the art museum community are not necessarily looking at cooperative ways to address issues in digital curation. Early efforts at collaboration, such as Association of Art Museum Directors (AAMD) guidelines on resolution standards for online images,[31] though important at the time, have been overtaken by current needs. New initiatives in promoting fair use[32] are valuable, but are limited to a U.S. context. The museum community needs to initiate multipronged efforts to get artists, professional organizations, and leaders in the community to recognize the importance of digital curation issues and the collaborative effort needed to address them. Granting agencies and foundations may have a role to play here in that they can offer incentives that encourage collaborative solutions.

Online publications as a paradigmatic shift

Goodyear's discussion about her museum's online scholarly catalogue elicited a comment about the impact of such efforts. Do they result in changes in the ways curators and staff work in a digital context, or do they simply mimic analogue models in digital form? Goodyear believes the online catalogue represents a major paradigmatic shift. Unlike print catalogues, the online scholarly catalogue is

a cumulative, open effort that accepts input from different scholars and students: it thus becomes a collaborative work that evolves over time. This dimension is a huge shift for art historians, who have been entrenched in a sole authorship model and often find it challenging to work as part of a team producing scholarship. For students, particularly undergraduate students, it offers a rare opportunity to take part in a serious research and publication effort that benefits the scholarly community.

Rob Stein of the Dallas Museum of Art added his observations to Goodyear's assessment. Stein was involved in the Getty's Online Scholarly Catalogue Initiative[33] and the toolkit that emerged from that project. He noticed curators, conservators, and other museum staff continuing to use the OSCI toolkit after the publication of their online catalogues to gather their research and exhibition notes, and to share these notes with one another. The toolkit, initially developed to facilitate online publishing is being repurposed as a shareable digital research notebook used for non-publication purposes. This is an unintended but transformational use of the toolkit.

PRESENTATION 5: NATIONAL DIGITAL STEWARDSHIP RESIDENCY: OVERVIEW, LESSONS LEARNED AND MOVING FORWARD

George Coulbourne, Chief of Intern and Fellowship Programs at the Library of Congress, spoke about the National Digital Stewardship Residency Program (NDSR).[34] The program was launched in 2013 and is jointly sponsored by the Library of Congress and the Institute of Museum and Library Services (IMLS). The mission of NDSR is to define core competencies in digital stewardship training and create a community of experts in the field. The program emerged in response to several observations about cultural heritage and digital stewardship: 1) digital projects often lie dormant in cultural institutions because of staff needs; 2) executive leadership in these institutions often neglects digital stewardship as a core function; 3) new graduates of professional cultural heritage educational programs need hands-on experience; and 4) postgraduate residency models for digital preservation are nonexistent. NDSR addresses these gaps with a program that matches recent graduates with digital stewardship projects in host institutions.

The program issues a call for proposals from institutions that wish to be a host site. These institutions must identify compelling projects in their institutions that are challenging, deeply steeped in some aspect of the digital preservation lifecycle, promote innovation in the field, and provide leadership opportunities for both the resident and their institutional mentors. A joint team of professionals conducts a site visit to the candidate institutions to determine commitment and viability to serve in a host capacity. Selected institutions are required to demonstrate a high level of commitment, including sign-off on a commitment letter by the institution's director (or equivalent) and the assignment of two full-time staff members to serve as mentors to a resident for one year. Host institutions also must provide space and resources to the resident, and incorporate the resident into the entire culture of the institution.

Since its inception, the NDSR has developed three cohorts of fellows based in Washington, D.C., Boston, and New York, respectively. In 2016, a "virtual" program will be launched, via WGBH in Boston, which will help explore how the NSDR might be made available more broadly by untethering it from a specific geographic locale. Two evaluations of the program have taken place to date (with the New York and Boston cohorts), and they revealed some interesting findings. The residents in these cohorts are perceived as "silo-busters" in their host institutions. Having no alliance to an existing in-house culture, the residents could ask probing questions and cross institutional borders that regular staff felt they could not breach. The residents rated the program very highly, seeing it as a unique professional opportunity that helped them build new contacts and skills. The evaluations also identified issues and made recommendations that were used to refine the program in subsequent years.

Coulbourne highlighted the variety of host institutions that have participated in the NDSR program. These institutions cross all sectors, including museums. He felt that, with strong leadership and backing, and with some modifications to address museum-specific issues (e.g., rights management), NDSR program could be a model for similar residencies in the museum profession. He urged the museum community to explore the model further, citing its long-terms benefits for building a leadership for digital preservation in museums.

[DISCUSSION POINTS]

Future plans for the NDSR Program

NDSR is funded through 2017. Although various parts of the program have been evaluated in the past, IMLS recently awarded the Council on Library and Information Resources (CLIR) a grant to undertake a full evaluation of all the cohorts over the life of the program. This evaluation, which will include interviews with current and former residents and hosts, will assess the influence the program plays in the long arc of a resident's career. CLIR's experience with its own fellowship programs suggests that good residency programs develop a level of prestige over time. This prestige helps shift some costs from the sponsoring program to the host institutions, as the latter increasingly value the programs and are willing to help support them financially. This shift can help sustain these programs when grants end and sponsorship changes.

Host institution proposals and mentors

NDSR considers a number of criteria in its proposal assessment, such as considering whether the project can be completed in one year, is sustainable, and offers lessons or benefits for the broader community. But selection criteria are not monolithic. The review panel's main goal is to ensure that the proposed project is solid and that the host institution is committed to giving the resident a useful learning experience and professional work experience that they can add to their portfolio.

Mentors also are important to the success of the program. To ensure that mentors are aware of their responsibilities, they are vetted during site visits and are required to attend certain residency events such as the residents' immersion workshop and NDSR host meetings.

Lessons for the JHU Digital Curation Program

IMLS funding has been critical to providing the financial support and framework for NDSR. The museum community would need to find a similar funding base if it were to model the program. But even with similar support, the NDSR Program success could not be adopted "as is" by the JHU Digital Curation program because the former is a postgraduate experience, while the latter provides graduate education and some hands-on training through its internship requirement. Nevertheless, Coulbourne encouraged JHU (and the broader museum community) to consider residency-like training experiences. They are a critical part of training in other disciplines (such as science and medicine) because they offer richer, real world experiences.

As an alternative to a new type of residency program, one participant suggested the museum community advocate for digital curation fellowships in the educational development programs that exist in large museums. These programs currently offer research internships and fellowships in scholarly disciplines, in education, and in conservation. Digital preservation is of equivalent intellectual value as these offerings, and has the element of urgency behind it as well.

PRESENTATION 6: DIGITAL CURATION ISSUES IN A COLLABORATIVE PROJECT

Eleanor Fink, Manager of the American Art Collaborative,[35] spoke of changes and trends in art museums that have brought some of the collaborative efforts we see today. One of these efforts is the *American Art Collaborative* (AAC), a consortium of 13 American art museums – varying in size, locale, and administrative structure – that have come together to learn about, and publish their collections data as, linked open data (LOD).

LOD is used in the publishing, commercial, science, and government sectors, but only recently has come to the attention of museums and art communities. It is a method of publishing structured data to enable greater connections across different domains and to enhance usability in the online environment. The process involves structuring data in a markup language, the Resource Description Framework (RDF),[36] and combining it with a domain ontology[37] that allows for the creation of relationships between subjects, predicates, and objects. The end product is more refined search results: in lieu of thousands of "hits" that *potentially* are relevant, the results are more specific and pertinent to the particular query.

The AAC began with a planning phase funded by the Andrew W. Mellon Foundation. This phase included educational briefings on LOD and its supporting concepts (such as ontologies like the CIDOC-CRM, the RDF markup language, and various tools used to convert data to LOD.) These efforts brought all the partners to the same level of understanding about LOD and its value. The partners then developed a mission statement and roadmap for the Collaborative, and enlisted the support of their institutional leaders to move forward in sharing collections data as LOD.

The AAC recently received an IMLS Leadership grant to help implement their project roadmap over the next 12 to 21 months. The activities in this roadmap include:

1. Converting a subset of the Collaborative's data to LOD using the CIDOC-CRM[38] ontology.
2. Linking this information to the Getty Vocabularies and contributing data on American art to these Vocabularies.
3. Implementing an application programming interface (API) and reader that is compliant with the International Interoperability Framework (IIIF)[39]
4. Developing open source tools to convert data to LOD, such as a link curation tool and IIIF/ CIDOC-CRM translator
5. Developing a browse demonstration
6. Promoting open access: LOD is linked OPEN data
7. Publishing best practices and lessons learned

The Collaborative chose the CIDOC-CRM as its ontology because it is the most comprehensive and expressive reference model for cultural heritage documentation. The project workflow has checks and balances built into it to ensure that the mapping of the data to the ontology make sense to each institution, and to ensure that the CIDOC-CRM concepts are used consistently across all the partners. To help ensure sustainability, the AAC's organizational structure will follow a federated model whereby each institution in the Collaborative is responsible for updating and maintaining its own collections LOD.

Fink spoke briefly about the AAC partners' rationale for working together on this project. The driving force was the ability to learn about LOD as a group, experience the process of conversion, and see the resulting applications. But other factors played a role as well. The partner institutions want to be sure that they are the ones to produce LOD for their collections and not some unaffiliated group. They also were interested in how LOD would allow them to search across all the AAC members' collections.

Putting the AAC project in context, Fink summarized how art museum documentation and digital curation is changing and becoming more collaborative. Cultural heritage institutions have moved from one type of linear structure (e.g., card catalogues), to something more structured for databases (e.g., MARC), to structures that now are more platform independent (e.g., XML). The AAC partners are now moving toward a platform that allows for more expressiveness (via RDF). This change will allow for cross-domain connections with art collections, and with other domains interested in related holdings.

[DISCUSSION POINTS]

More on AAC's startup and logistics

The idea for the AAC emerged from an in-house LOD project underway at the Smithsonian American Art Museum. Fink wondered if a larger project with more partners might make for a better test case of LOD in museums. She contacted various museum directors and other professionals in the field and received enough positive feedback to pursue the idea. The partners came together rather organically through various forms of outreach. She helped pull together a mix of museum types (large/small, standalone/academic, urban/rural) to explore a fuller range of issues than might be apparent with a more homogenous group of institutions. The partners decided to focus on American art collections for the testbed because they all have some holdings in this area.

Because the extensive planning process helped the partners coalesce as a team and come to a common understanding of LOD, no new members will be added to the Collaborative until the testbed project is completed. However, the AAC does foresee other institutions joining afterwards, even if only for mentoring and educational purposes. In the meantime, the Collaborative is being as transparent as possible, placing all its training material online for other institutions to use.

The AAC is heading into an implementation phase that will be carried out over the next 19 to 20 months. The partners will meet in January of 2016 to participate in a CIDOC-CRM workshop. Partner data then will be converted/reviewed/checked, and development will begin on the linked curation tool. There will be a meeting with the Getty to identify how the AAC will mesh its work with the Getty Vocabularies (which are LOD), and there will be discussions and a workshop with members from the International Image Interoperability Framework (IIIF) community. As they work through specific tasks and milestones, the AAC partners will be talking about long-term sustainability of the data, particularly hosting and storage. An important point for discussion will be the idea of hub sites. Will larger museums be willing to host the LOD data of the smaller museums? What is involved in doing so? What are the alternatives? Answering these kinds of questions will be key for ensuring a pathway to sustainability for the project and for other projects of this type.

Standards

Discussions about the multiplicity of standards in the cultural heritage community arose again in the context of collaborations like the AAC. How do diverse groups and institutions agree to use a common standard like CIDOC-CRM? For the AAC there was no other choice: it is the only ontology for expressing cultural heritage data in RDF. As AAC partners learned more about the ontology, they realized it was a disadvantage not to use it. The challenge that lies before them now is mapping their local standards to the CIDOC-CRM ontology.

This kind of mapping challenge is not specific to the AAC. The entire museum community has a poor understanding of the importance of mapping in-house standards across institutions and communities. One participant suggested comparing standards mapping to language dialects. A culture may communicate among itself using one dialect, but when it needs to communicate with other cultures, it must do so in a shared dialect. CIDOC-CRM plays the role of a shared dialect. It respects local knowledge (i.e, one culture's dialect) and offers an expressive way to expand it to incorporate concepts from other dialects.

In the larger cultural heritage arena, the inability to harmonize standards is a key impediment to progress.

The challenges are cultural, as different institutions and professions have distinct needs that are expressed in different ways. Given this fact, one role for a digital curator may be that of an "interpreter or translator of dialects" between the many constituencies who are charged with getting museum data out to the world. This kind of translation is critical. As one participant noted, cultural heritage professionals need to be "less like a dictionary and more like a thesaurus" if their institutions' digital assets are to be discovered and used.

Building LOD into the curatorial workflow

If LOD is to gain widespread acceptance across the museum community, the LOD conversion process will need to be incorporated into acquisition and curatorial workflows. Open sources tools such as CollectionSpace[40] might offer an experimental platform for testing how this could play out. Thinking even further ahead, it is not unrealistic to expect that LOD conversion will become more of an automated, backend process.

PRESENTATION 7: INTERNATIONAL NETWORKS

Monika Hagedorn-Saupe, Deputy Director at the Institut für Museumsforshung in Germany, spoke about digital curation issues in international collaborations. She presented baseline information about the structure of the German museum community as a stepping-stone for a discussion of the challenges faced by Europeana,[41] the digital library for cultural heritage collections across Europe.

In Germany, the responsibility for cultural institutions is distributed among each of the 16 German states, with a few instances of oversight at the federal level. Her organization serves the dual role of documenting activities taking place in German museums and connecting this work to cooperative cultural heritage activities throughout Europe. Hagedorn-Saupe serves on the Board of the German Digital Library and participates in many other European working groups and committees, including the Board of Europeana.

When Europeana was founded in 2008, it was envisioned as a digital library that would serve as a single access point to the cultural heritage of Europe. It began as a political undertaking, with several heads of European states appealing to the president of the European Commission to lead the effort. Today, Europeana is a foundation established under Dutch law. Its interface is available in 23 European languages, and cultural organizations from the 27 European Union member states have contributed holdings to it. As Europeana has grown, its goals have expanded. The organization now works to attract attention and improve access to cultural heritage in Europe, to enable reuse of that heritage, and to support the educational tasks of public institutions.

Hagedorn-Saupe identified several challenges that arise in an immense collaboration such as Europeana. Sustainability, for example, is a key concern. Europeana is financed on a project basis, which is not a viable business model in the long-term. Another challenge is enabling access to a collection that now numbers over 40 million objects. This critical mass of cultural materials makes for a rich resource, but it can be difficult to find particular items in such a large volume of materials. To help address this problem, Europeana is creating content 'channels' that bring together materials around a central topic. Europeana recently created a channel on WWI in Europe,[42] and is planning new channels for fashion, music, works of art, and more.

Copyright presents another challenge. There are no fair use provisions in European copyright laws, so Europeana has asked data providers to clear or license rights for their contributions. They also asked data providers to contribute their metadata under a CC0 license (Creative Commons "all uses"). Museum curators pushed back on this request, fearing that users will misuse their deeply researched and carefully written descriptive information or use it without attribution. Europeana has since modified its stance, and now allows data providers to contribute metadata under different CC licenses. They hope this change will bring in materials with richer metadata, even if those materials have more limits on use.

Other challenges occur with standards and with the multilingual nature of Europeana. Many of Europeana's contribut-

ing countries use the Art and Architecture Thesaurus (AAT)[43] because it is available in different languages and as linked open data. However, there are workflow challenges in keeping the various language versions of the AAT aligned with one another, and with new, ongoing translations. On a positive note, Hagedorn-Saupe identified one standard that has gained traction among Europeana's contributors: LIDO (Lightweight Information Describing Objects),[44] a schema that data providers use to deliver object metadata to Europeana. LIDO is now compatible with CIDOC-CRM and is maintained by CIDOC (the documentation committee of the International Council of Museums (ICOM)).[45]

Hagedorn-Saupe urged participants to become more familiar with the important work taking place within various CIDOC working groups.[46] Many of these groups (e.g., digital preservation, documentation standards, CRM, etc.) address issues that have arisen over the course of this Summit.

[DISCUSSION POINTS]

Harmonizing copyright

In response to a question about aligning the copyright laws of the different European Union states, Hagedorn-Saupe mentioned that the President of the European Commission has made copyright harmonization one of the major efforts of his administration. His impetus for doing so lies in industry concerns, but the effects will filter down to cultural heritage. Europeana has a working group that is looking at the issue, and has published guidelines encouraging cultural heritage organizations to use CC licenses to clearly identify how materials can be used.[47] Europeana also is working with the Digital Public Library of America (DPLA) to develop joint guidelines that will enable easier access to cultural material.[48]

One participant asked if the Budapest Open Access Initiative[49] had any influence in discussions with Europeana members. This Initiative often is cited by open access proponents in the cultural heritage community to reinforce the importance of making cultural materials more available to the public with minimal restrictions. Hagedorn-Saupe believes that this effort and others like it (such as the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities)[50] are important and helpful, but that the movement toward more open access in European cultural heritage institutions is a process that will require cultivation and reinforcement from many different fronts.

Sustainable funding model

Hagedorn-Saupe was asked about the current Europeana funding model and long-term sustainability of the collaboration. Europeana's legal incorporation as a foundation under Dutch law is problematic because many member states cannot – under the laws of their own country - contribute to a foundation in another country. Europeana's project-by-project funding model also is risky. The European Commission (EC) and its member states currently fund Europeana projects, with the EC contributing approximately 85% to 90% of all funding. Contributions from member states are voluntary, and some (like Germany) are pulling back on their contributions.

Hagedorn-Saupe believes Europeana's precarious funding model requires a political decision. Europe does not have the tradition of endowments, foundation support, or donor funding, so these are not likely to be viable funding options. Ultimately the resource will have to be publically funded on a permanent basis or it will not be sustainable.

GROUP BREAKOUT SESSIONS

Participants were assigned to one of four groups to discuss ways to move digital curation forward in art museums, and to identify aspects of internships and research projects that could help promote this agenda. The groups were encouraged to draw from earlier presentations and discussions, but asked to move their conversations from broad discussions of issues to a more focused and constructive set of recommendations. To help in this effort, each group considered the same three questions:

- **What next steps can the art museum community take to move digital curation forward in their institutions?**
- **What are key principles of digital curation internships in art museums, and what are the roles and responsibilities of all the partners involved in these internships?**
- **What research projects might students and interns undertake that will contribute to digital curation and advance a museum's mission?**

QUESTION 1: WHAT NEXT STEPS CAN THE ART MUSEUM COMMUNITY TAKE TO MOVE DIGITAL CURATION FORWARD IN THEIR INSTITUTIONS?

RECOMMENDATION: RESOLVE THE AMBIGUITY THAT EXISTS AROUND THE TERMS "DIGITAL CURATION" AND "DIGITAL CURATOR"

These terms have different interpretations in different contexts, and thus are a source of confusion and misunderstanding. Their composite words - "digital," "curation," and "curator" - are shedding their traditional meanings and are being used in different domains and contexts. The position of 'curator," which in a museum context invokes a distinct set of professional duties and scholarly understanding, traditionally has not overlapped with the duties and skill sets of digital curators. However, this role will be changing. As more digital collections are acquired by art museums, and as the number of digital assets increase in use, some of the duties of the "traditional" museum curator and digital curator will coalesce.

Because so much ambiguity exists around terminology, the groups recommended the creation of a "statement of purpose" that outlines the importance of digital curation and what it entails in an art museum context. There are different ways this statement could be structured,[51] but certain key concepts should be included:

- Digital curation is a core function in an art museum, not an add-on. Caring for digital collections is as critical as caring for physical collections.

- Digital curation adds value to digital assets.
- Digital curation is more than "preservation." Its goals include enabling better visitor experiences across all platforms, and facilitating interactions between curators and other users of digital collections and assets.
- Digital curation encompasses practices that overlay all museum professions.
- A diverse workforce is key to accomplishing digital curation tasks. Different points of view ensure that digital assets are cared for and used in ways that serve the widest range of audiences.

RECOMMENDATION: CREATE AN ADVOCACY STRATEGY

The concepts embodied by digital curation need to be communicated across the art museum community in a strategic manner. Key organizations that represent professionals in art museums should be recruited in this effort.[52] The museum community also must work with digital curators in other communities (e.g., libraries, archives, etc.) to identify the skill sets needed among their staff, and identify how and where these skill sets can be brought into an art museum.

Professional development opportunities are needed to introduce digital curation to different segments of the art museum community. Low-barrier training opportunities such as THATCamps[53] and workshops held at professional conferences can achieve greater scale in conveying knowledge about digital curation to different professional communities.

On a local level, the pairing of an art museum curator with staff who have digital curation skills offers a more "hands-on way" to foster skill transfer within an institution. Identifying a digital curation "activist" *within* an institution also can help raise the awareness level among staff and help foster buy-in. Several Summit participants felt they should assume this role in their own institutions, and encourage their colleagues in other museums to do the same.

RECOMMENDATION: HIGHLIGHT DIGITAL CURATION WORK IN ART MUSEUMS

Resource materials and activities are needed to demonstrate the value of digital curation in a tangible way. The following documents will help build a 'library' of digital curation materials that support this goal:

- A compilation of "stories" that translate digital curation work in an easily understood and relatable context.
- "Myth busting" documents, white papers, or other reports that dispel misinformation about digital preservation, sharing of digital collections, and other "hot topics" in the community.
- A compilation of inventory of digital curation projects/programs in art museums and related organizations that museum professionals can reference.
- Awards or other means of formal recognition for projects or programs that demonstrate best practices in digital curation
- Meetings and lectures that engage digital curation leaders in discussing ideas and advice about buy-in, training, and best practices for engaging art museum staff in the digital curation enterprise.

QUESTION 2: WHAT ARE KEY PRINCIPLES OF DIGITAL CURATION INTERNSHIPS IN ART MUSEUMS, AND WHAT ARE THE ROLES AND RESPONSIBILITIES OF ALL THE PARTNERS INVOLVED IN THESE INTERNSHIPS?

RECOMMENDATION: CLARIFY PRINCIPLES OF DIGITAL CURATION INTERNSHIPS/RESIDENCIES IN ART MUSEUMS

With the exception of a few overall principles, the groups identified principles specific to different entities that should play a role in the internship process.

General

- Internships/residencies are more than individual training experiences. They are opportunities for professional development, outreach, and original research. The offer value to the intern/resident, the host institution, and a broader community of like institutions.
- Internships/residencies must clearly define and document the internship project, job description, partners, expectations, and working definitions. Ideally this information should be recorded in a document that constitutes a signed agreement.
- All partners in internship/residency programs – from student to host - are expected to conduct themselves in a professional manner.
- Internship projects should not be seen as opportunities to fill a resource gap in a host museum. They are new initiatives that that bring value to the museum and offer lessons for the larger community of art museums.

Host institutions (art museums)

- Should expect a valuable work product from the internship/residency experience.
- Should provide interns/residents with relevant staff level clearances (e.g., IT system access, storage area access, etc.) and space/equipment necessary to perform the work.
- Should provide interns/residents opportunities to participate in relevant staff meetings and staff-wide events.
- Should integrate each internship/residency into any formal internship/residency program they may have in their institution ("no outliers")

Museum Studies Programs

- Should examine internship/residency programs in related and unrelated sectors to identify best practices for their own programs.

RECOMMENDATION: IDENTIFY PARTNERS AND RESPONSIBILITIES IN ART MUSEUM INTERNSHIPS/RESIDENCIES

The following roles were identified for all the entities involved with the internship/residency process. Each role is followed by a list of relevant responsibilities.

The Academic Program (requiring the internship/residency)

- Reviews and vets internship/residency host sites
- Identifies new host sites
- Compiles a directory of supervisors/mentors at host sites and bring this cohort together to share information and clarify mentor/supervisor roles
- Creates (or enables use of) an open, online repository for intern/resident reports

- Creates opportunities (such as student forums; open public forums) for students to present their work to their peers, professional colleagues, academic staff, the public, etc.

The Faculty Advisor (in the Academic Program)

- Advises the student before, during, and after the internship/residency.
- Helps match student to host institution
- Ensures that the student's internship/residency project is appropriately scoped for the timeframe and particular host institution/mentor, and that it will result in an appropriate deliverable at the end of the project.
- Initiates contact with the host institution/mentor on behalf of the student to determine if the institution/mentor is interested and can accept an intern at a particular point in time.
- Ensures that the host institution gets a qualified student who can work independently within a team and can accomplish the project that all parties have agreed to.
- Conducts a final assessment of the student's work, taking the host institution's assessments into account.

Host Institution Roles

Note: Depending on the size of the host institution, the following roles may be assumed by one person or by multiple individuals. In instances where one person assumes these roles, participants suggest that the individual enlist the aid of outside colleagues or professional communities as a support framework for advice and information, as needed.

Institutional Internship coordinator

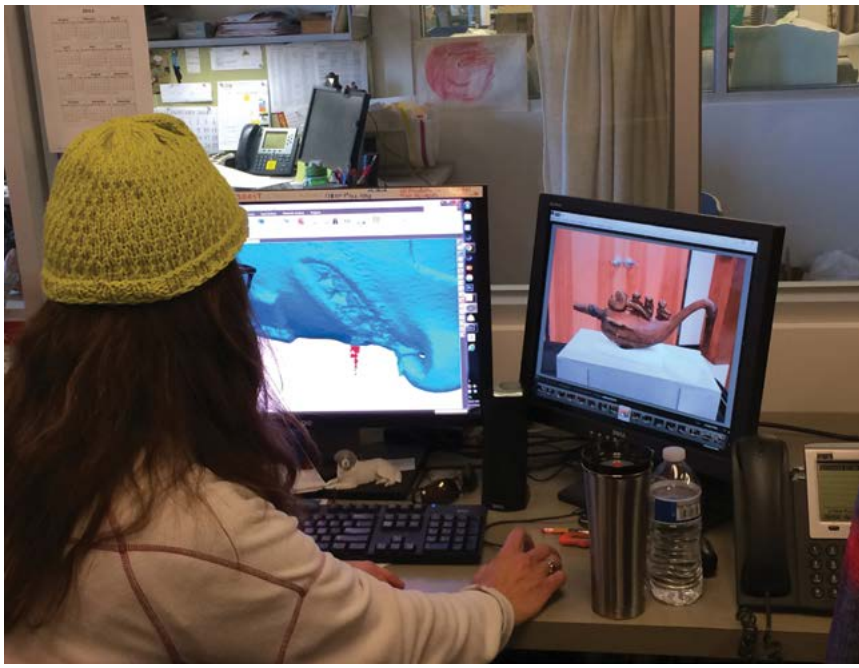
- Assists the intern in completing the administrative requirements of the position, such as institutional contracts and other paperwork
- Ensures the intern/resident fulfills any institution-wide training requirements

Supervisor

- Oversees the daily management of the intern/resident, including training with in-house systems and work processes.
- Assesses the intern's/resident's day-to-day work

Mentor

- Models best behavior and best practices in his/her work
- Inspires and strategizes with the student about how his/her work fits into the bigger picture of the institution
- Signs off on any formal student/resident reviews
- Evaluates student during, and at the end, of the internship/residency



Courtesy Smithsonian Exhibits

Other museum staff (e.g., registrar, librarian, collections manager, conservator, archivists, or other staff brought in as project and institutional advisor deem necessary)

- May train, assist, inform, temporarily oversee, or help assess the intern/resident

Intern/Resident

- Works with faculty advisor to develop the internship/residency project and identify institutions who might be appropriate host sites for the project

- Conducts the internship/residency project competently and professionally. This includes:
- Completing all project reporting requirements for host site, mentor, and academic program
- Maintaining appropriate levels of confidentiality about processes and people at the host site
- Meeting periodically with faculty advisor, host site mentors/staff as required
- Getting host site/mentor approval before releasing in-house work externally
- Taking advantage of opportunities to meet with staff across the host institution to build a professional network of contacts.

Student Cohorts

- Meet in person or online with other program interns/residents to share information and insights, and to provide a peer support network.

QUESTION 3: WHAT RESEARCH PROJECTS MIGHT STUDENTS AND INTERNS UNDERTAKE THAT WILL CONTRIBUTE TO DIGITAL CURATION AND ADVANCE A MUSEUM'S MISSION?

RECOMMENDATION: IDENTIFY INNOVATIVE DIGITAL CURATION RESEARCH PROJECTS THAT MIGHT BE UNDERTAKEN BY STUDENTS/INTERNS

Suggested Strategy for Identifying Internship Projects

- Invite relevant professional associations to frame innovative research questions that are of interest to their constituencies and that might be structured into appropriate projects for students and interns.

Suggested Internship Projects

- Explorations of different ways to conduct data triage when confronted with massive amounts of digital assets.
- Inventories (and cataloguing) of unprocessed, born digital, organizational collections such as AutoCAD files, files on older media (floppy disk drives), etc. (Museum collections are rife with these materials, which may contain valuable information of immediate relevance to a museum.)
- For students who possess subject or language expertise, projects that help a museum expand its controlled vocabularies and enable greater use of collections.
- Digitization of supplementary materials that support collections care, such as conservation notes, treatment reports, archives, etc. (These materials contain valuable information, but cannot be easily searched and linked to appropriate collections because they are not digitized.)
- Innovative use of collections data in ways that shed new light about the collections as a whole. (E.g., data aggregation projects, projects that use digital humanities approaches such as those undertaken on MoMA[54] and the Tate's [55] collections.)
- Audits of a museum's data extraction and sharing processes. Where are they falling short? What more could be done?
- Studies on how to document and preserve user experiences with technology.

- Studies of how to use data gathered from various visitor studies (such as studies that track visitor movement in galleries) to predict and create better user experiences.
- Reviews of the different digital practices and digital staff roles in a museum or group of museums. (This information could provide a baseline for comparisons and assessments in other museums.)
- Assessments of tools used in museums for digital curation tasks, with a focus on what is used now and what is needed.
- Studies of practices in museums around digital curation topics such as preserving software code (e.g., Cooper Hewitt's acquisition of the software code for Planetary[56]) or collecting time-based media metadata.

CONCLUSION

Digital curation is a nascent field whose definition, activities, and roles are evolving. Summit participants held spirited discussions about the meaning of digital curation (and digital curator), the activities involved in its undertaking, and ways to implement these activities across a museum. They also discussed gaps in digital curation awareness, training, tools, standards, and collaboration, and the role digital curation plays in changing established museum processes.

Summit participants proposed tangible ways to reinforce the support framework for digital curation through education and training programs and projects that add to resources in the field. The challenge now is to build a case for the importance of digital curation in the museum community and to act on it so digital curation becomes central to the mission of museums.

"Building the case" for digital curation is an achievable goal. The fragility of digital materials – be they digital collections or other museum assets in digital form - is apparent to everyone. So too is a tacit understanding that continuing with the status quo will result in unprecedented losses of cultural heritage in our institutions. The task for the museum community is to recognize, adapt, and move forward with changing notions about digital curation and the skill sets needed to support it. Best practices will emerge from these explorations, as will new models for collecting, caring, and sharing cultural heritage.

APPENDIX A: SUGGESTED RESOURCES

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APPENDIX B: SUMMIT ATTENDEES

Jane Alexander
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George Coulbourne
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Library of Congress

Emmanuelle Delmas-Glass
Collections Data Manager
Yale Center for British Art

Eleanor Fink
Manager
American Art Collaborative

Ben Fino-Radin
Associate Media Conservator
Museum of Modern Art

Anne Goodyear
Co-Director
Bowdoin College Museum of Art

Monika Hagedorn-Saupe
Deputy Director
Institut für Museumsforschung

Phyllis Hecht
Director, Museum Studies
Johns Hopkins University

Douglas Hegley
Director of Media and Technology
Minneapolis Institute of Art

Louisa Kwasigroch
Director of Development & Outreach
Council on Library and Information Resources

Adriel Luis
Curator (Digital & Emerging Media)
Smithsonian Asian Pacific American Center

Max Marmor
President
Samuel H. Kress Foundation

Joanna McCloud
Student
JHU Digital Curation Certificate Program

Alan Newman
Chief, Digital Imaging
National Gallery of Art

Trevor Owens
Senior Program Officer
Institute of Museum and Library Services

Chuck Patch
Cultural Information Management Consultant
Baltimore, Maryland

Joyce Ray
Coordinator, Digital Curation
Johns Hopkins University

Kristen Regina
Arcadia Director of the Library and Archives
(President, Art Research Libraries – ARLIS)
Philadelphia Museum of Art

Richard Rinehart
Director, Samek Art Museum
Bucknell University

John Ryan
Director of Interaction Design
Local Projects

Scott Sayre
Chief Digital Officer
Corning Museum of Glass

Koven Smith
Director of Digital Adaptation
Blanton Museum of Art

Thorny Staples
Director of the Office of Research Information Services
Smithsonian Institution

Rob Stein
Deputy Director
Dallas Museum of Art

Neal Stimler
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Metropolitan Museum of Art

Evan Towle
Librarian for Digital Collections & Services
Philadelphia Museum of Art

Jill Vucetich
Archivist
Walker Art Center

Don Waters
Senior Program Officer, Scholarly Communications and Information Technology
The Andrew J. Mellon Foundation

Diane Zorich
Meeting Facilitator and Cultural Heritage Consultant
Princeton, NJ

NOTES

[1]See "Johns Hopkins University Museum Studies." http://advanced.jhu.edu/academics/graduate-degree-programs/museum-studies/.

[2]See "Johns Hopkins University Digital Curation," http://advanced.jhu.edu/academics/certificate-programs/digital-curation-certificate/.

[3]Digital Curation Summit co-hosted by Johns Hopkins University's Graduate Museum Studies Program and the University of Arizona's Graduate School of Information Resources and Library Services and held in Washington, DC, February 8, 2013.

[4]Local Projects. localproject.net.

[5]The Cleveland Museum of Art Interactives. http://www.clevelandart.org/gallery-one/interactives.

[6]Designing the Pen. http://www.cooperhewitt.org/new-experience/designing-pen/.

[7]Local Projects. Projects – New York Hall of Science. http://localprojects.net/project/noticing-tools-for-ipad-2/.

[8]See "Github: Where software is built." https://github.com/.

[9]During this discussion, a Twitter back channel conversation took place with staff at Cooper Hewitt about the data gathered from users of the Pen. The museum is analyzing this information to determine its relevance to other in-house activities (https://twitter.com/cooperhewittlab/status/652207742829076480) but noted that their entire digital ecosystem has changed conversations about exhibit planning at the institution. (https://twitter.com/cooperhewittlab/status/652207894662901760).

[10]Slides available at http://www.slideshare.net/dhegley/digital-curation-technology-jhu-summit-october-2015.

[11]Jeonghyun Kim, Edward Warga, William Moen. "Competencies Required for Digital Curation: An Analysis of Job Advertisements," *International Journal of Digital Curation*, 2013, Vol. 8, No. 1, pp. 66-83.

[12]The work of Desi Gonzalez (an art historian) was cited as an exemplary illustration of how data analytics on museum collections can reveal new insights about collections. http://gonzalez.desi/post/67178874721/applying-digital-humanities-approaches-to-museum.

[13]See *FiveThirtyEight* at http://fivethirtyeight.com/.

[14]Roeder, Oliver. A Nerd's Guide to the 2,229 Paintings at MoMA. *FiveThirtyEightLife*. August 28, 2015. http://fivethirtyeight.com/features/a-nerds-guide-to-the-2229-paintings-at-moma/.

[15]For a presentation of MLB.com's work in this area see: Butler, Tab. "From DIAMOND to Archive: MLB Preserving its Past for Maximum Mining in its Future. (no date) http://www.digitalpreservation.gov/meetings/documents/othermeetings/07_butler.pdf.

[16]Slides available at: http://www.slideshare.net/BenFinoRadin/digital-curation-at-moma.

[17]The Schaulager. http://schaulager.org/en/index.php?pfad=aktuell.

[18]Archivematica. https://www.archivematica.org/en/.

[19]Arkivum. http://arkivum.com/.

[20]Fino-Radin, Ben. Open-Sourcing MoMA's Digital Vault. Blog post: Inside/Out. May 13, 2015. http://www.moma.org/explore/inside_out/2015/05/13/open-sourcing-momas-digital-vault/.

[21]RESTful API definition. http://searchcloudstorage.techtarget.com/definition/RESTful-API.

[22]See MetaArchive (https://www.metaarchive.org/) and Preservica (http://preservica.com/about-us/).

[23]http://hydrainabox.projecthydra.org/.

[24]A collaborative project between MoMA, the Tate, and the San Francisco Museum of Fine Art (SF MoMA) http://www.tate.org.uk/about/projects/matters-media-art.

[25]Time-based media art refers to artworks that may include video, film, audio or computer-based technologies. These works are referred to as "time-based" because they reveal themselves over a duration of time. See *Time-Based Media*. Guggenheim Museum blog. http://www.guggenheim.org/new-york/collections/conservation/time-based-media.

[26]See http://www.si.edu/tbma/about.

[27]See http://www.bowdoin.edu/art-museum/exhibitions/2014/1964-portrayal-revisited.shtml.

[28]Project teams included museum staff, post-docs, students, and social media specialists, and the college's IT, art history, and visual resources departments, and staff from its Digital and Computational Studies Initiative.

[29]The Collections-Sharing Initiative funded by the Andrew W. Mellon Foundation. See *http://artgallery.yale.edu/andrew-mellon-foundation-grant-launches-experimental-collection-sharing-initiative*.

[30]"Standards are like toothbrushes. Everyone agrees they are important, but no one wants to use yours." Source unknown.

[31]AAMD Policy on the Use of "Thumbnail" Digital Images in Museum Online Initiatives. AAMD. January 19, 2011. *https://aamd.org/sites/default/files/document/Thumbnail%20Images%20Policy.pdf*.

[32]See the College Art Association's Code of Best Practices in Fair Use for the Visual Arts. *http://www.collegeart.org/fair-use/*.

[33]Online Scholarly Catalogue Initiative. The Getty Foundation. See *http://www.getty.edu/foundation/initiatives/current/osci/*.

[34]See *http://www.digitalpreservation.gov/ndsr/*.

[35]See *http://americanartcollaborative.org/*.

[36]See *https://en.wikipedia.org/wiki/Resource_Description_Framework*.

[37]See *https://en.wikipedia.org/wiki/Ontology_%28information_science%29*.

[38]See *http://www.cidoc-crm.org/*.

[39]The IIIF provides a standard method for describing and delivering images over the web. See *http://iiif.io/*.

[40]See *http://www.collectionspace.org/*.

[41]See Europeana at *http://www.europeana.eu/portal/*. A report on public use of the resource (Annual traffic report and analysis, 2014) is available at *http://pro.europeana.eu/files/Europeana_Professional/Projects/Project_list/Europeana_Version3/Milestones/Ev3%20MS15%20Annual%20Traffic%20Report%20Analysis.pdf*.

[42]See Europe: 1914-1918. *http://www.europeana1914-1918.eu/en*.

[43]See *http://www.getty.edu/research/tools/vocabularies/aat/*.

[44]See *http://network.icom.museum/cidoc/working-groups/lido/why-lido/*.

[45]See *http://network.icom.museum/cidoc/*.

[46]See ICOM International Committee for Documentation (CIDOC) Working Groups. *http://network.icom.museum/cidoc/working-groups/*.

[47]See Europeana Rights Statements Guidelines. *http://pro.europeana.eu/share-your-data/rights-statement-guidelines*.

[48]Recent outputs from this collaboration include: *Recommendations for Standardized International Rights Statements*. *http://rightsstatements.org/files/151002recommendations_for_standardized_international_rights_statements.pdf* and *Requirements for the Technical Infrastructure for Standardized International Rights Statements*. *http://rightsstatements.org/files/151002requirements_for_the_technical_infrastructure_for_standardized_international_rights_statements.pdf*.

[49]See *http://www.budapestopenaccessinitiative.org/*.

[50]See *http://openaccess.mpg.de/Berlin-Declaration*.

[51]Suggestions included: 1) a "general principles" overview, with an appendix that identifies roles and responsibilities; 2) different statements geared towards - and using the vocabulary of - different museum professionals; 3) a manifesto document.

[52]Organizations identified by Summit participants include the American Alliance of Museums (AAM), the American Institute for Conservation (AIC), the Association of Art Museum Curators (AAMC), the Association of Art Museum Directors (AAMD), the Association of Registrars and Collections Specialists (ARCS), the College Art Association (CAA), and the Museum Computer Network (MCN).

[53]See *http://thatcamp.org/*.

[54]See Gonzalez, Desi. "Visualizing American and European Art in MoMA's Painting and Sculpture Collection. October 20, 2013 *http://gonzalez.desi/post/64590005176/visualizing-american-and-european-art-in-momas* and "Applying Digital Humanities Approaches to Museum Collection Data." November 16, 2013. *http://gonzalez.desi/post/67178874721/applying-digital-humanities-approaches-to-museum*.

[55]See Simon, Nina. "Visualizing the Tate's Collection: What Open Data Makes Possible." Museum 2.0 Blog. November 27, 2013. *http://museumtwo.blogspot.com/2013/11/visualizing-tates-collection-what-open.html*.

[56]*http://www.cooperhewitt.org/2013/08/26/planetary-collecting-and-preserving-code-as-a-living-object/*.

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