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Abstract

Digital asset management and its systems (DAMs) have been a revolving topic in the museum industry for a few decades, including best implementation practices and how to find systems that connect with the needs of the museum field. Decades of research and a current survey of museum professional respondents working with digital asset management systems uncover issues that have and continue to plague the use of these systems in the field: most notably interconnectivity issues, outdated systems, and a general lack of focus in the development of those systems on the unique needs of museums that need in order to implement a DAMs successfully. The results of this study illustrate that museums are still searching for a DAMs that will answer their questions and tackle the digital asset management issues they seek to solve. Until accessible museum-specific systems are created, the same issues will keep museums from taking full advantage of their digital assets and media to support their missions.
Introduction

Digital Asset Management is becoming recognized as an integral part of a museum's function and preservation goals. While generally, when one thinks of preservation and museums, one thinks of collections management and physical objects. Digital assets are digital objects that are organized and stored through a unique system, often a digital asset management system. As Museums expand their online presence and invest more in the digitization of objects, more digital assets will be created and will need proper organization for future access and use. Other pre-existing digital assets such as advertising, events media, and other stored assets will also need to be managed for their own uses.

Digital asset management systems have crossed over into Cultural Heritage Management fields as digital assets have grown but presented their own unique challenges and needs. Digital assets can rival in size to physical collections but may be scattered across hard drives, USB drives, external storage devices, and cloud systems. Organizing these files into an accessible and comprehensible format is a daunting task, but one that needs to be done. Like Collections Management Systems, a Digital Asset Management system is not a one-size-fits-all solution but needs to fit the needs of Museums that other users of DAMs may not have. The use of multiple systems for similar tasks is one irritation for museum staff, as interconnectivity between systems is lacking. Selecting a DAMs may not even result in long-term use of the system due to the rapidness of changing technologies and needs. One also needs to address the factors that will benefit the museum when selecting a DAMs, which may or may not include accessibility, usability, and value.
Problem Statement

In this paper, the following questions will be explored:

1. How are museums implementing Digital Asset Management Systems?

2. What factors are influencing the “success” of a Digital Asset Management system?

3. What factors are required when considering implementing a Digital Asset Management system?

Digital asset management and digital asset management systems (DAMs) are an overlooked topic that is becoming central to the continued functioning of museums. Evidence that will be explored shows the development of the need for a digital asset management system to manage growing digital asset collections, but current systems are not built to fit the needs of museums and other similar institutions that implement them. Determining how a system is selected, how to make it work for the long term, and how exactly museums are implementing digital asset management systems are discussed and analyzed in this paper. Each museum has its own set of problems, resources, and skills to bring to the table regarding each topic.

Methodology

A review of literature and a survey were conducted to research the topic and answer the presented questions. Historical literature from the last three decades was researched to track the use of and discussions around digital asset management within museums, followed up by a survey conducted in April 2021 with 15 participants. The survey asked current museum staff involved with digital asset management systems to
voice their opinions and concerns on how the systems are if at all, benefiting their museum.

This paper will follow a chronological meta-analysis format, with literature reviews being split between a period of years based on their publishing year. This captures the sentiment towards digital asset management and systems during those periods. The development of digital asset management and digital asset management systems as a cornerstone of museums evolved across different roles, departments, and institutions. Not every museum had the same approach or followed the same timeline. This illustrates how central digital asset management systems have become, starting as an outsider software to one that needs museum-field-based improvements to function on a useable level.

**Literature Review**

**2002-2004**

One issue with this period of time is the lack of literature on how exactly museums evolved into managing their own assets and invoking digital asset management systems. There really is not a single point that can be identified as the "start" of digital asset management in museums. It could be the introduction of computers or the first collections management system, or the first open-source system in general that organized museum data. Early literature focused on collections-based digital assets, and it is not an uncommon topic in later literature as physical collections are what the public thinks of when they think "museum." Based on the available literature, the argument here is that the museums' foray into the internet created new skills that were needed, particularly those at the time not traditionally considered part of
the museum world. There was a great leap into digital preservation, but such a leap was taken on an individual and institutional level. Some museums invested in digital asset management early but for others, it is a more recent development. Overall, the same issues appear and re-appear regardless of the time period, location, or funding.

With the internet came new ways for museums to display their collections and reach audiences. But this also came with file formats and new ways to preserve, collect, and share data that had not previously been considered. Museums on the internet also brought about the need for a new skill set and one that was traditionally not a part of museums - computer science or information science skillsets. Museums going online required access to certain skills, new hires, and new departments. "Not only has this transition required new skills and abilities to cope with new technologies, but it also has required a change in mindset for both museum Webmasters and other museum employees as they grapple with the ramifications of interactivity" (Marty 2004 para 37). Interactivity and interconnectivity are something that reoccurs in digital asset management-focused literature. Digital asset management covers so many different departments, at times, that it cannot be kept all in one place. Collections management systems may have been able to be published to the web but publishing to the web also meant those objects needed photographs to be taken that had to be edited, stored, and organized in an accessible manner for both in-house staff and visitors. While "Webmaster" is not a term used today, those skills are still found within museums in digital asset managers, digital archivists, and so on. Though it may seem like it, the information they managed was not always limited to collections-based assets as these assets can include advertising information, event photos, and video, and eventually live-
stream. "Over the past few years, the skills and responsibilities of museum Web masters have changed dramatically as more museums seek to provide online access to organized, structured information about museum resources" (Marty 2004 21). Born-digital information would begin to accrue as museums, and their resources went online, born-digital objects and data being their own issue to wrangle. However, this did not keep museums from having the same issues as before. The information would still be lost or misplaced. A computer could wipe, files would get deleted, back-ups on hard disks were never found. A conference attendee stated as much under anonymity that even digital assets were not safe from "lost in collections" occurring:

One commentator pointed out that it was only the largest libraries that are proceeding as pioneers with digital preservation, implying that smaller museums had best find a large partner with which to work. Another confessed that material gets lost (especially when personnel change and when there is no file-naming protocol) and another commented that often institutions only know whether or not they have lost a digital image when they go to use it. Serious digital asset management and institutional re-organization is key (Greene 2004 para 16).

Sharing images and information through the internet did not (and still does not) mean that the original files are safe. What is online is not the original file, more like a backup but one that has likely been changed to fit whatever file size requirements were needed to upload those files. The digital asset management issue starts to look a lot like a collections management issue, except instead of catalog cards getting lost or being under-informed, we have digital assets hiding in unrelated folders or not having the needed metadata to be useful. File and general digital asset preservation require its
own set of rules, though ones not unlike physical objects. You need established naming conventions and protocols to

During this same time, systems were being created to meet the needs and demands of museums with these new additions and issues. A case study of the Dallas Museum of Art explained a partnership with eForce and Stellent Inc that targeted the issues that would continue to haunt museums wading into digital asset management and digital preservation. "The companies are currently devising a single product architecture that is designed to offer Web content management, document management, collaboration, records management, and digital asset management functionalities" (Ignjatovic 2004 8). Even during this time frame, it was already apparent that interconnectivity was going to be a key feature in management software regardless of use and field. However, these interconnected systems are rarely mentioned again, if at all.

2005 -2009

During the National Museum of the American Indian's move to their site in Washington DC, the author noted that it all would have been pointless if they had not opted to use a digital asset management system to organize their images. "This mass of images would have been virtually useless without the implementation of a digital asset management system, a database that facilitated organization and allowed the association of data to ensure the images are searchable and retain their context for future use" (Kaplan et al 2005 31). Moving a large number of physical objects and having to go through the hoops of reinstating your technological systems to manage your digital objects is not an easy task. But an open-source digital asset management
system makes the process easier. Those images are safe in the DAMS. If they were moved on physical hard drives, there might not have been time to organize them with naming conventions or other methods to make the transition easier. Moving physical hard drives also increases the risk of damage and loss of data. Not to mention, those hard drives need to have a computer and software that can read those files, and those systems may take time to install and update to a useable state. It is stated that even though larger scale talks were being held highlighting the importance of metadata management and digital asset management in museums, a museum as large as the Smithsonian had not given it much thought outside of the NMAI’s move:

Presentations on the topic of documentation in the general session of the 2005 annual meeting of the American Institute for Conservation served to underscore both the growing acceptance of digital imaging within the conservation field and accompanying concerns not only about storage and accessibility but also about managing digital images and accompanying metadata. By the time that meeting was held, Digital Asset Management systems (DAMs) were becoming commonplace. However, during the course of the move, neither NMAI nor the Smithsonian had yet committed to a comprehensive DAM system (Kaplan et al 2005 34).

2005 was shaping up to be the year that digital asset management was being recognized as the next big step museums needed to take, but not always in the context of a collection. Museums capture and track so much more information than what is found in the collections department, and all information must be managed. Though photographing collections created digital assets, so did advertising, so did tracking
visitor numbers, and so on. Like in the previous sections, it was becoming more apparent that interconnected or integrated systems were needed to share information more efficiently:

At some point, most of these systems will need to communicate with each other in order to have an efficient means for cataloging, researching, producing, advertising, distributing, archiving, accounting, rights verification, revenue projection, licensing, and communication, both internally and externally (Davis 2005 21).

Using multiple systems or hardware was the only option for many institutions, and for many, it still is. A digital asset management system needs to allow access to assets across different departments by supporting multiple formats, organization methods, and naming conventions. If you needed information about an object's provenance and its advertising images for a recent exhibit, they might not be found in the same system. A repository or repository-like system would be needed to store, track, and preserve assets. This need became apparent as storage needs grew:

A digital repository houses objects and applications to enable users to discover and use the resources it contains. The architecture of the repository, which may be a commercial or open source digital asset management system (DAM), will integrate storage and creation utilities with web-based applications for presenting the metadata and objects in the repository to users (Agnew 2005 375).
The struggle with digital asset management is the need for a system that can do everything within a certain scope, a business-focused management system made for cultural heritage institutions and their specific needs.

When the MET implemented their digital asset management system, they started in the same place as many museums before them - collections-based assets. "In implementing a DAMS at the Met, we began with two main ingredients: records in our collections management system for objects in the museum's permanent collection and several thousand digital images of and related to those objects" (Oberi 2008 17).

Though, as previously stated, digital assets can have a wide range of uses, the pattern seems to begin with collections. Like museums before them going online for the first time, they found themselves with a large number of photographs, catalogs, and other information that needed to be stored but also made accessible on a searchable scale. However, this did not mean all images were going to be ingested. Also, like other museums, there was no set methodology for implementing DAMS and how exactly museums were meant to use them on a daily basis. This led to shortened project scopes until more information could be gathered. “While all images will eventually be ingested into the DAMS, we decided to deal with those images at a later date, after understanding more precisely how museum staff actually use the system" (Oberi 2008 18). One really cannot know how these systems will be used in museums until they are actually in use. Ideals do not always work out, and every museum is different: from policies to staff, staff roles, collections, and so on. Like other museums, the MET also faced the issue of the interconnectivity of systems within the museum and how to best bring all this information together in an accessible manner. “Making the connections
between different sets of data - object information, images of those objects and image information - was one of our greatest challenges in implementing a digital asset management system” (Oberi 2008 18). Consider the previous example of looking up information regarding an object in collections, but also need an image or video used in advertising an exhibit staring the object. All that information is connected but may not be kept in the same system. The Met goes into even more detail on how exactly reconciling all this information is becoming difficult to manage:

For example, object information needed to be pulled from TMS, while image information such as 'photographer' and descriptions of the image views (such as whether it was overall or detail) was recorded in Photo Studio Workhorse, our legacy ColdFusion application for ordering photographs. Finally, the contents of CDs and DVDs created in the photo studio before the introduction of the Filemaker database were recorded in Excel spreadsheets (Oberoi 2008 18-19).

Photographs edited in certain software may now have file extensions that can only be opened by that software or other similar programs. They may no longer be accessible in the same fashion as before the editing process. CDs, DVD's VHS tapes, and other legacy hardware have their own file formats, which are becoming increasingly difficult to store. First, you need something that can rip the files into either a computer or hard drive, and that rip must be accessible.

The Museum Victoria ventured down a similar road, with first noticing that as they created more exhibits, their assets piled up. "Each development saw an increased need for the creation and use of image and audio-visual material, as it was becoming increasingly important in the display techniques MV was incorporating into its
exhibitions" (Broomfield 2009 116). Every museum is different, and the needs of every museum are going to vary, but one constant has been the growth of digital assets and the need to manage them in a more sustainable fashion. Like with Collections Management Systems, there is no one-stop-shop or system that can do it all. Accessibility is the key, along with "common sense," or ways to make assets accessible to the people and departments that need them, along with the appropriate metadata. "From a user perspective, MV IMAGES enables the organization of digital assets in logical or popular groupings via categories and mini-collections, which will allow various staff groups and the public to have easy access to certain images" (Broomfield 2009 119). The organization of assets is another key issue. Metadata tagging can be found in collections management, content management, and digital asset management systems but what is built around that is what can make a choice difficult. Museum Victoria, in particular, has information that can be sent and harvested by other digital asset management systems as needed. "Rights and other descriptive information can travel with the assets and be supplied to third-party users such as the media, whose own DAMS should be able to harvest this information" (Broomfield 2009 121). Access to data is another key issue to think about, as well as who is receiving that data and what they will do with it. This works great for inter-museum or company (events, advertising, etc.) sharing but not quite for in-house as Museum Victoria still reaches the same issue all museums come to interconnectivity or compatibility. "We identified the need to integrate with the tools and software used across the museum and particularly in the production environment" (Broomfield 2009 121). Once again, interconnectivity and integration are highlighted as key features required for museums to be able to use a
digital asset management system to its fullest potential. Having a system that acts completely separate to another museum-wide system would only make basic tasks more difficult.

The Hong Kong Maritime Museum's article is different in that it is a proposed action plan rather than a look at implementing a digital asset management system, but a look behind the scenes at what is involved in proposing and selecting a digital asset management system is just as important as using one. The Hong Kong Maritime Museum staff goes into great detail about what they need and how they need it to work:

DAMs feature powerful search engines that are designed to make locating assets easier. These search engines rely upon two key aspects: the metadata attached to each asset, such as description, creator, and copyright holder, and keywords, which provide associative terms to classify or label each asset (Cunningham et al 2012 11).

One topic that has not been directly addressed is the search function of a digital asset management system. It has been couched in other terms like "searchability" and "discoverability" or "tagging," but the actual search function had yet to be brought up. A search function is not uncommon in other similar systems (collections management and content management systems), but the results that are pulled are going to be different because a digital asset management system is tracking for different purposes. However, going from physical hardware to a system changes the game when one has access to a in-system search engine. "HKMM staff members currently transfer assets using external storage devices or by sending each other emails with the file's name and
location" (Cunningham et al 2012 12). This workflow used by the museum is one that is not uncommon if using an external storage device or hardware. Windows and other computer systems have their own search engines but not nearly to the extent of a dedicated system. Similarly, the issue of interconnectivity and compatibility also came up for the Maritime Museum. Having a thorough search engine function could improve both of those issues but is not an overall solution. "In terms of HKMM's digital assets, shareability is the ability of staff members to share assets with each other and work collectively on the same files, as well as to share their assets with outside sources" (Cunningham et al 2012 11). Throughout this timeline, it became apparent that this issue has grown beyond collections-based assets and into other museum departments.

The Corning Museum of Glass highlighted this by involving every asset-using department in their museum. This gives us a look at the level of detail needed to track a variety of assets across a variety of roles and departments. It has grown a lot since the "Webmaster" days. "The team was made up of 12 staff members from different departments, including the Rakow Research Library, Information Technology, Curatorial, Finance, Photography, and Marketing" (McGovern 2013 237). For larger museums, a number of departments can be involved in the process or have assets in the system. The Corning Museum goes into greater detail on how different departments or roles are involved and how exactly they were chosen to choose and implemented a digital asset management system. "Besides IT, the most relevant departments were those responsible for requesting digitization or digital photography (Curatorial, Marketing, and the Library), digitizing (Photography), and paying for digitization and software (Finance)" (McGovern 2013 237-238). Earlier in this paper, there was a focus
on a shift within the Information Technology community and their roles within museums. Over time, IT has become integral to digital asset management rather than a possibility within the museum.

The San Francisco Museum of Modern Art has also implemented a Digital Asset Management System over a period of years. Out of the gate, they highlight the need for connected systems in order to better serve the public and the museum. "Large museums like SFMOMA operate a complex patchwork of digital systems and channels for organising information relevant to a specific artwork in their collections" (Barok et al 2019 478). Circling back to the discussion of collections information, SFMOMA illustrates that even for large museums, the sheer variety of information brought about through digital assets cannot be managed under a single system. However, large museums may have the tools or skills required to invest in multiple systems. It is not uncommon for museums to go through multiple systems to find the right fit, as it is explained:

Photographs and visual documentation are collected on shared drives from where it is meant to be copied further to 'Digital Garden,' the digital assets management system (DAMS) the museum has been running since 2013. Contrary to EmbARK, Digital Garden comes with a clean and easy to use interface and it is available through a web browser (Barok et al 2019 479).

With new systems come new possibilities for interconnectivity and a greater focus on better workflows as needed in cultural heritage institutions. However, one issue they bring up that has not been directly addressed but has come up peripherally is staff turnover and skills. You need staff that either knows how to run these systems or can
learn on the job and stay in the role long enough to contribute. It is shown that knowledgeability is another long-term issue:

Introducing another system into this framework demands addressing justified concerns over creating redundancy and further scattering of documentation. Another concern is that learning and maintaining a wiki requires a special lasting effort from the members of the staff. Hence its embedment in the information space needs to be negotiated (Barok et al 2019 479).

A wiki would be a time-intensive project, even if it seems like the answer. A digital asset management system is not going to have everything, even for large museums. Training for completely separate systems would take time, especially involving projects that include both a collections management and a digital asset management system if they lack interconnectivity. Finding solutions to this issue ends up creating more work to fill the gaps. On top of that, the metadata captured by digital asset management systems can be insufficient compared to a collections management system, thus creating more gaps to fill. "Digital assets management systems (DAMS) are highly adequate for handling large quantities of multimedia content such images and video however they fall short of structuring and describing context around artworks" (Barok et al 2019 480). DAMs are capable of capturing and storing certain metadata but can fall short in terms of metadata that is more museum specific. DAMs may also have easier accessibility than a collections management system but are unable to capture all the information that a collections management system can hold. Thus, the issue at large.

Survey Results
A survey was conducted between April 16th and April 30th to gauge the current
feelings towards and uses of digital asset management systems in museums. This survey was dispersed through Google Surveys to a number of digital asset and digital heritage LinkedIn and Facebook groups, as well as museum-based Facebook and LinkedIn groups. The survey was also sent out to the Microsoft Computer Network Listserv. The response total was 15 participants.

Most of the responses came from large museums, but there was a good variety in staff size and museum size overall. This means the data is not skewed in one direction. However, the results skewed heavily towards history museums though a "history" museum can vary from local history museums, specific topics, and specific regions. Most responses came from art or history museums, with those being the broader definitions of museums. In terms of how long each museum has had their system, about half had it for at least five years, with 1-4 years making up a little more than half of the rest of the museums.

9 of 15 of the responders said they either did not like their digital asset management system or were not sure how they felt about it. One particular survey response, which can occur with inherited systems, stated, "I didn't get to choose and am just trying to cope with the jerry-rigged system we inherited." Digital asset management systems are not all cookie-cutter and can have a number of different uses, but those uses may not always fit the needs of particular museums. As demonstrated in the literature review, when and why museums implemented a digital asset management system varied quite a bit. There was no established timeline or domino effect of acquiring these systems. Ease of use, cost, and interoperability were other important factors outlined in the survey responses.
When asked how a digital asset management system has benefited the museum, the responses were just as varied, with both highly informative and very negative responses. "LightRoom allows for easy tagging and metadata management integrated with image processing. Relatively easy to learn and customize for our uses. The shared drive is even easier to use and is accessible to all employees." Ease of use and access are both key factors, and tagging is going to be a central asset to the discoverability of assets both within the system and through web publishing.

Other responses fell more neutral or negative about the overall benefits of the current system these museums use. "It is insufficient, and we're looking to replace it" and "It's a burden" are two particular standouts because they are both succinct with a similar perspective. Both find their respective systems are not doing the job it needs to do or is not able to meet the needs of their respective museums. An older system bloated with assets and out-of-date procedures could, in fact, be a burden on a museum. Having to scrap everything and start over would be a huge undertaking and one that may not seem worth it if a system that meets all their needs simply does not exist or exist even in the capacity that they will consider a switch. Insufficiency, so far, has been the greatest downside to digital asset management systems and has appeared in both the literature review and the survey. There is no system that makes everyone happy, and this could go back to the roots of digital asset management as a commercial product that did not expand out to different kinds of assets with different functions beyond a commercial scope.

When asked what additional functionality they would like to see in a digital asset management system, the results had specific topics that homed in on what each
museum was facing. Integration and interconnectivity were ones that come up more than once in the survey responses. A responder gave particular DAMs used as an example:

Integration with CMS such that image files can be automatically added (or at least added in batches somehow?) to their corresponding records in Past Perfect. And instead of using LR and the shared drive separately, I'd prefer a single DAMS that combines Lightroom's metadata tools with the shared drive's accessibility (currently, only the desktop that LR Classic is installed on can access its database).

This particular answer mentioned Adobe Lightroom, a digital asset management system. Integration in such a way that connects with their collections management system, along with a single system for photos and then publishing them to the collections management system, is a topic that has come up before. "CMS interoperability; cloud-based with secure back-up/storage; ability to push assets to web" was another response mirroring the sentiment that interconnectivity between systems is crucial for museums and is a topic that was reflected in the literature review. For a digital asset management system to be worthwhile in the long run, it needs to be able to adapt to the broad needs of museums, like a stable system that can connect or double with a collections management system. Though it is more common for a digital asset management system to include departments beyond collections, there is no reason this should prevent digital asset management from foraying into the cultural heritage sector. Another answer to the functionality question addressed the function of the system as a whole and how it was incompatible with the museums' workflows and digital
preservation methods:

The DAMS treats all files as fully individual. We have had to create workarounds/workflows for TBMA pieces that are packages of interdependent files. We have not found a good way to store digital archives in the DAMS yet as a complete package without foldering and zipping/ingesting it as a disk image. So right now it individualizes 'Cores'- Image, Audio, Video, Art, but it would also be good to have some sort of functionality that I could tell it "archive" and it maintains folder structure, and other things that may be important to digital archives. I also don't like that our system doesn't understand counting- it will display ‘10, 11, 12,13,14,15,16,17,18,19,1,20,21, etc’ rather than counting natively.

Not being able to produce a folder hierarchy system in the DAMS itself is a big issue, and one that may not seem like one from the outside, but when trying to organize images by type, the most basic and often simplest method would be by folder. Being unable to group images would be an infuriating task, especially with the addition of not being able to rely on the system to tag and count the images. Another survey response to general satisfaction with the system echoed the more negative sentiments on digital asset management system use and implementation. "We need to start over." Starting from scratch or with a system built from the ground up to bridge the gap between a collections management system and a digital asset management system may be the best option for the field. Retro-fitting a system not built for the quirks of cultural heritage management may bring more compounding problems than long-term solutions.
Another issue, similar to compatibility, is the storage of files from legacy (outdated) hardware. One responder mused on what they would like to see in future digital asset management systems. "Migration of 1980s software formats like floppy disk images, and easier storage of video formats with metadata." Even if files can be migrated into the system, they still cannot always be retrieved. Lacking support for older file formats is an issue that will haunt digital asset management systems as they need to improve to meet the demands of future file formats and still support legacy formats. Accessibility is a factor that needs to be addressed, both in-house accessibility and accessibility with researchers and potentially the general public. Increasing accessibility was another comment shared by a responder. "Sharing portions in the cloud with researchers - increase accessibility." There may be information that is not needed to be shared with everyday visitors, but those researching specific topics or objects may find use from this information. If we consider the earlier addressed issues of hierarchy and organizational issues within the system itself, it could be said that privacy and sharing of assets may not be up to par either. While tracking copyright legalities is a part of digital asset management, it does not mean the function to share assets exists in a meaningful way.

In-house access, especially from those who do not work with the system on the day-to-day, is another factor to consider. Making your system easy to use and easy to retrieve is going to be a challenge because all the variables that go into the system, particularly metadata schema and standards, may not be obvious to some. One response to asking about a user's ideal DAMs involved better accessibility. "More easily accessible for non-users and easier management of metadata." Some systems may
have a built-in metadata schema, and others may allow you to make your own tagging system. Both could work best depending on the needs of that specific museum, but that does not mean they are accessible. The issue with both is that those outside the system, like researchers, may not understand how to access certain assets if the tags are not intuitive. In-house systems may also have this issue internally with connecting records within the system (not necessarily a cross-system interconnectivity issue).

Another responder wanted DAMs to be able to have more functionality. "More easily cross walk records and upload images." If you cannot connect records within the singular system itself, you have a problem. Context is key in every factor of museum management and being able to connect records and assets within the system keeps that context intact.

Discussion
Throughout this paper, we have looked at the implementation and use of digital asset management systems both historically and currently. The final two questions remain: What factors are influencing the "success" of a digital asset management system and what factors are required when considering implementing a digital asset management system. Success is meant to look at the long term since, like collections management systems, they are meant to grow and met the needs of museums and their collections. Though the survey got a small response, it skewed towards the negative in terms of satisfaction which lined up with views illustrated in the literature review. A DAMs was considered both necessary but also a burden due to its clunky implementation. A digital asset management system should include interconnectivity with other systems, like a collections management system, or push content into a open-
source content management system (which is connected to a collections management system). A DAMs can be great at organization, but it really has no use if that is all it offers. There are collections and content management systems that offer metadata tagging, profiles, etc.

When asking what factors are required when considering a Digital Asset Management system, the answer falls back onto the usual suspects: funding, ease of use, and compatibility between systems. Think of how Collections Management Systems have evolved from being only usable on local machines to open-source cloud-based systems. Cloud-based systems allow for greater ease of use and increase accessibility. Collections management systems have been built and tweaked for a specific purpose and have expanded to meet that purpose with the flexibility to do a little more (web publishing, for example). Digital Asset Management Systems need to be built with GLAM (Galleries, Libraries, Archives, and Museums) in mind. The future of digital asset management may be to scrap the system and rebuild from the ground up so it meets the needs of museums and other institutions in the cultural heritage sector. Rather than forcing something to work that is not meant to work, it may be better to start from scratch, looking to the development of collections management systems for inspiration.

Digital Asset Management systems have been a part of the museum world for at least 20 years. Their use and presence vary from museum to museum, but they are opted for under a similar need - preservation, and organization of assets. Museums had to grow beyond the collections mindset and realize that all assets are important to the success of a museum, and keeping those assets organized for better access was going
to be key. The big challenge across the board has been connecting systems and connecting sets of data.

This paper has shown that the implementation of digital asset management systems has not changed much since the beginning, neither has the factors one needs to consider selecting one or the factors that determine the long-term success of a system within a museum setting. On reflection, many of these processes were insular or in-house and were meant to be tailored to singular museums rather than the industry as a whole. It may be that a system encompassing the basics that all museums share needs to create, but also one that is heavily customizable or simplified enough that it meets the unique circumstances and needs of museums. Just like how collections management systems vary from museum to museum, a digital asset management system originally created for businesses may not be what museums need. Plug-ins to collections management systems or an expansion of their capabilities may be needed to meet the demands. The survey results show that older systems bring nothing but frustration for staff and do more harm than good.

More research is needed on the subject, with a particular focus on newer systems that attempt to merge collections management and digital asset management. Current systems are either entirely separate or dated in such a way they become more trouble than they are worth. Further research could break down the development of digital asset management systems built solely for museums and other cultural heritage institutions. How users are responding to these newer systems, as niche as they are, can help narrow the future of DAMs in the field by finally figuring out what works. Implementing a DAMs seem inevitable for growing museums, but the perfect system
may not yet exist.
Appendix

Survey Questions
A. Please identify the size of your professional museum staff, not including volunteers:
   - Small (1-9)
   - Medium (10-49)
   - Large (50 or More)
   - Other:

B. Please identify the type of your museum:
   - Art
   - History
   - Science / Natural History
   - Other

C. Please identify your role (Job title or Department). If you are willing to participate in a brief follow-up interview to provide additional details on your museum’s preservation strategy, please provide your name and contact information

1. What strategies or systems are currently in use for digital object management/preservation? Check all that apply:
   - Digital Asset Management Systems
   - Content Management Systems
   - External Storage Devices
   - Off-Site Repositories
   - Other

2. How many of each system do you have (see question 1) and what percentage
of assets are part of each system? (Note: Total % may be more than 100% if there is overlap among storage systems)

3. Do you have an annual budget for digital preservation?
   - Yes
   - No
   - Don’t Know

4. How does your Digital Asset Management System share data with your Collection Management System?
   - It Doesn’t
   - Integrated/API’s
   - Not Sure
   - Other

5. Are you satisfied with your Digital Asset Management System?
   - Yes
   - Somewhat
   - Not at All
   - Other
6. What factors do you consider the most important when choosing a Digital Asset Management System?

7. How has your Digital Asset Management System benefited your museum?

8. What additional functionality would you like to see in a Digital Asset Management System?

9. How much experience do you have with Digital Asset Management?
   - Less Than One Year
   - 1-2 Years
   - 3-4 Years
   - 5+ Years

10. How long have you had your current Digital Asset Management System?
    - Less Than One Year
    - 1-2 Years
    - 3-4 Years
    - 5+ Years

11. Is your DAMS a commercial system, open source system, or custom system?
    Who provides support for this system?

12. Please provide any further comments or information you would like to share about your DAM system or overall digital preservation strategy:
References


