

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute
in partial fulfillment of the requirements for the Degree of Bachelor of Science.

Proposing a New Digital Asset Management System for Glacier National Park

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Abstract

Digital asset management (DAM) systems are software that allow for the archiving, managing, and retrieval of digital assets, like photographs and historic documents. Glacier National Park's museum and archiving department needs a new system to protect its digital assets and increase the efficiency of organizing and sharing their many images. Moreover, the lack of a DAM system meant that archival documents were handled more frequently and at increased risk of damage. We interviewed archivists who work with DAM software and identified sixteen DAM systems. We evaluated them using the six criterion most essential to the Park. We found three systems, Razuna, Preservica, and ResourceSpace, that could meet the Park's needs and help preserve the Park's digital images.

Digital Asset Management: Securing the Future

Photography and imagery are invaluable to society. The famous photo Migrant Mother taken by Dorothea Lange captures the suffering and desperation of many people living in the era of the Great Depression (Figure 1). It helps those learning about the Great



Figure 1. Migrant Mother by Dorothea Lange

Depression understand and sympathize with the plight of these people through the pain in the woman's face. During the Great Depression, Lange's Migrant Mother and similar photos she took of impoverished people helped to humanize "the poor" to those who did not see them as real people deserving of respect (Gunderman, 2020). The preservation of such photos is a crucial part of educating society about important social, political and scientific matters.

When working to preserve physical photos, archivists face two main obstacles. First, oils from the archivist's hands can cause photos to degrade quicker than they would if left untouched in storage. Second, sorting large amounts of photos in a way that is easily navigable is difficult, especially for a small team (Tabbert, personal communication, 2021). Archivists have worked around these



Figure 2. Capabilities of a digital asset management system

obstacles through technology; by digitizing photos (Smith, 2007). After digitizing, archivists store the digital assets in a type of software called a digital asset management (DAM) system (Figure 2). DAM systems are made specifically to preserve and organize digital assets and their use has become increasingly prevalent, especially among archivists (Kaplan, 2009). Digital archives prevent potential damage to photographs or artifacts by eliminating the need to physically handle fragile assets. Digital archives, in addition to working as a backup of the physical archives, also have the potential to increase the accessibility of historic assets e when they are well designed.(Navarrete & Owen, 2011). The availability of digital assets is crucial for researchers, especially those studying issues such as climate change and conservation, who can use digital images to compare the state of a specific area over time, a research method known as repeat photography (Ide & Oguma, 2010). Using repeat photography at Glacier National Park, researchers have been able to assess the effects of climate change on the Park (Figure 3).



Figure 3. Repeat photography of Chaney Glacier in Glacier National Park

By comparing a photo taken in 2007 to a photo taken in 1910 in the same place, researchers were able to reveal extreme glacial recession and increased presence of trees which thrive in warm environments (Butler & DeChano, 2001). Repeat photography provides evidence for researchers to conduct studies on how the landscape is changing overtime. For example, the photographs above could warrant a study on how climate change is causing glacial recession in the Park. Historic digital images allow studies to be conducted and would not be able to happen without the preservation and accessibility.

However, with new technology comes new challenges: 1) Some users may find the software system difficult to use. 2) An archive may not be able to financially support both a digital and physical collection. 3) The software system may become obsolete or may stop being supported by the archive's network. 4) There may be problems with securing the copyrights needed to share the digital assets. (Bandi, Angadi, & Shivarama, 2015). These challenges can make it difficult for archives and museums to digitize their collections or to manage them once they are digitized. The Corning Museum of Glass faced difficulties implementing a new DAM software when the staff found the software unfriendly to use; the features were not explained well enough to understand (McGovern, 2013). Researchers at the University of Michigan found, while studying the implementation of DAM systems in various institutions, that copyright issues were some of the most prevalent issues faced in the implementation (Kim et al., 2007).



Figure 4. Scan of photograph taken in GLAC

Glacier National Park (GLAC) in Montana has approximately 600,000 assets that they store in their archives, many of which are images that are rich in history, display the magnificence of the Park, or are incredibly valuable to researchers (Figure 4). Many of these are images and photographs that were converted from physical copies to digital copies around 2002 to be stored, distributed, and tracked online (Glacier National Park, 2018). While having such images in digital form is very

convenient, having thousands upon thousands of them in unorganized storage can make finding a specific item very challenging and time consuming.

GLAC is facing a significant challenge with maintaining its digital archive. In late 2019, The U.S Federal Government stopped supporting Microsoft Access, which left the GLAC museum curator staff without a dedicated DAM software system. In place of this, the Park is putting their image data on an Excel spreadsheet. With just under thirteen thousand images recorded in this sheet, the process of finding images is tedious and inefficient. (Tabbert, personal communication, 2021).

Excel does not have search functionality, therefore searching and retrieving images is very time consuming for the Park archive staff. For example, it is difficult for GLAC to preserve and share its history using its digital collection because of the access restrictions for employees and researchers, which is essentially the opposite of a DAM software system's purpose. The Park's archive staff bear the brunt of the inconvenience caused by the lack of an efficient DAM software system because they interface directly with the original print photos when retrieving them for an image request. (Tabbert, personal communication, 2021).

There are several important design considerations to a digital management system which helps solve issues like these. The most important to consider are the following: 1) structure, 2) security, 3) compatibility, 4) ease of use, and 5) costs (Table 1).

Structure is an important aspect of digital archives. The structure of a DAM software system is how the data itself is stored and organized. The structure of the digital archives is crucial for accessibility of the files. Allowing for files to be tagged and sorted with specific, custom keywords helps keep large digital archives organized. Some software systems have the ability to automatically add related tags to an asset using artificial intelligence, but those software systems are typically expensive. An organized structure makes it easier for users to search for the digital assets they're looking for. Metadata is a set of data that

describes the content of other data. For example, the metadata of an image can include the title, photographer, date taken, and more. The management of this metadata is also an important aspect of maintaining the archive's structure (O'Brien & Smid, personal communication, 2021).

Another important aspect of the structure of a digital archive is the storage type of the DAM software system. Having all of the data for a collection of digital assets in one single storage base is useful for standardizing and easily adding new assets (Halfawy & Figueroa, 2006). Most DAM systems allow for this, but if the collection is too big then some systems may not be able to handle all of the assets. Cloud based storage, as opposed to local storage, allows for the digital collection to be shared with staff outside the museum, as well as outside organizations and people. This takes away the need for archive staff to fulfil all of the retrieval requests themselves, as outside people can simply retrieve the digital assets by themselves (Mara et al., 2020).

Third, compatibility is an important aspect of a DAM system to consider due to the problems that

may occur if the DAM system does not work with universally accepted operating systems and file storage. Compatibility refers to the capability of a software system to work with multiple operating systems such as Mac or Microsoft and transfer from multiple types of data files such as Excel. If the software system is not compatible with an organization's operating system, then the DAM system will not be able to run at all. Along the same line, if the system cannot run on computers with specifications that an organization's computers have, then the system will not be able to be used on an organization's computers (Mara et al., 2020).

Compatibility with outside applications and diverse file types is also important. A system which is compatible with Microsoft Office can allow for transferring of data from applications such as Excel to the system (and vice versa). Extra compatibility is helpful in transferring and analyzing data in the digital collection. Allowing for many different data types allows for all digital assets to be added to the digital archive, whether

Table 1. Important Design Considerations for a Digital Asset Management System (Broomfield, 2009, Halfawy & Figueroa, 2006, Lambert, Campbell, & Burkart, 2002, "Managing digital images as records", Mara et al., 2020, n.d., Mollnow et al., 2012, & O'Brien & Smid, 2021)

| Organization | Security | Compatibility | Ease of Use | Costs |
|--------------------------|---------------------------|---|---------------------|------------------------------|
| Standard Keywords | User Permissions | Compatible with Organization's OS | Intuitive Interface | Upfront Cost is Feasible |
| Sortable Metadata Files | Digital Rights Management | PC/Mac Compatibility | Multi-User Access | Recurring Costs are Feasible |
| Centralized Data Storage | Privacy Controls | Microsoft Office Plugins | Smart Search Tools | |
| Custom Tagging | | Can Run on Computers with Organization's Computers' Specs | User Guide Provided | |
| Auto-Tagging (AI) | | Support of Different File Types | Training Provided | |
| Cloud Based Storage | | | | |

they are photos, videos, or something else entirely (Lambert, Campbell, & Burkart, 2002).

Ease of use in DAM systems can range from very involved to simple & intuitive. The more intuitive the interface, the easier it is for users to quickly navigate the system, allowing them to fulfil their responsibilities in a time efficient way. An intuitive interface means that any given person can use a software system without having to think too much about what buttons mean or how to navigate it (Broomfield, 2009). To supplement the software system, having a user guide for the system helps when a user has a question about how to use the system, or if they just want to learn about what features the system has (Lambert, Campbell, & Burkart, 2002). Also, training the staff on the system helps to keep the system up and running, as well as improve the efficiency of the user by familiarizing them with procedures. The staff must be familiar with the software system to be able to troubleshoot and know the ins and outs to be most efficient. Some DAM companies provide this training themselves (Mara et al., 2020).

Additional features, such as multi-user access and smart search make DAM software systems easier to use. Allowing for multiple users to use the system at the same time helps to increase the efficiency of the system, as multiple retrieval requests can be fulfilled at once as opposed to just one (Mollnow et al., 2012). Features such as search autofill and being able to organize search results by date, title, or how closely they match the search query help users to find the results they are looking for without having to scroll through many unrelated results (Mara et al., 2020).

Finally, the feasibility of different possible solutions can rely heavily on a price tag. The cost of DAM software systems range widely. Commercial software subscriptions can range from twenty dollars a month to upwards of five-hundred dollars a month. Open-source software systems are usually free, but unexpected costs can come up when working with them, as they do not typically come with maintenance or customer service agents (Kaplan, 2009). The upfront cost of a system can include consultations, installation, configuration, and software licensing. If the cost of all of these together is not feasible for an

organization, then the system is most likely not a best fit. The recurring costs of a system can include maintenance/technical support, hosting fees, and software updates. If the cost of all of these together is not feasible for an organization, then the system is not a good fit (Mollnow et al., 2012).



Research Methods: Proposing a New DAM System

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The goal of our project was to identify, evaluate, and propose a new Digital Asset Management (DAM) software system for Glacier National Park (GLAC) that accommodates their needs, so that GLAC would be able to make an informed funding request for the new system going forward. We accomplished our goal through 4 objectives which are detailed below.

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Objective 1

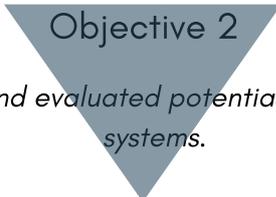
Identified criteria for the new system.

To accomplish our first objective of identifying the essential criteria for GLAC's new DAM system, we conducted online searches and interviews. Having a set list of criteria allowed us to objectively judge and comparatively analyze systems (Mara et al., 2020).

To ensure our research was valid, we developed interview questions to follow during our interviews. The interviews were semi-structured and sometimes branched off from prepared questions. Although these interviews were conversational, we made sure not to express any biases or judgements during them in order not to influence the participants' answers. To ensure our research was completed ethically, we made some changes to our approach. All interviews were hosted in a private location to protect the confidentiality of the interview participants. Before interviewing anyone, we first read them the study's consent form, which can be found in appendix 1, and allowed them time to review it and ask any questions. Once we were sure they understood the study and their participation in it, we asked them for their verbal consent to be interviewed.

The group conducted interviews with the project's sponsor, Jean Tabbert, Glacier National Park's Museum Curator, as well as with Worcester Polytechnic Institute's access archivist, Amy Smid, digital repository and metadata librarian, Emily O'Brien, Librarian, Anna Gold, and assistant director of archives, Arthur Carlson. In these

interviews, we asked interviewees about their experiences with DAM software systems and if there were any software systems that they would recommend. These interviews helped us to decide on which criteria were most important in GLAC's new DAM software system.



Objective 2

Identified and evaluated potential DAM software systems.

After identifying the important criteria of a DAM system, we then identified potential DAM software systems to be evaluated. The systems identified were through interviews and online research. The DAM software systems were then evaluated based on the six criteria for the Park. The DAM software systems were accessed via free trials and methodically evaluated by either completing or assigning a metric to each identified criterion. These criteria were organized in a table that allowed us to easily compare the different systems (Table 2).



Objective 3

Presented DAM software systems that meet criteria to sponsor.

We then used all of the gathered information from the first 2 objectives to narrow down the list of potential systems to 3 viable options for the Park. This was done by comparing how each performed relative to the others on all the criteria from our checklist. After reviewing the pros and cons of each system, we explained why we chose each system for final consideration. Our team then

Table 2. Part of the criteria checklist used to evaluate the DAM software

| Importance | Criteria | Canto | Razuna | Extensis Connect | Preservica | ImageKit | PhotoShelter | Bynder | Filecamp | ResourceSpace | | |
|--|---|---|--|---------------------|---|--|---|---|--|---|--------------------|---|
| | Demanded By | Jake | Lucy | Calum | Robert, Jake | Lucy | Lucy | Lucy | Calum | w/ Wendy Essery | Key: | |
| The price of the system is obviously a big factor in a final choice | Cost | Likely around \$300/month, quote needed | \$49/month - \$199/month has Batch upload | \$300/user/year | \$200/month - \$400/month | Starting at \$49/month | \$25/month - \$45/month | Quote needed | \$29/month | \$354/month \$4365/year | Very Important | |
| Matching excel / csv metadata to uploaded assets saves so much time and does not waste the efforts of the team | CSV Uploading / Batch Upload Metadata | Y | Y, with upgrade | N | Y, with upgrade | N | N | N | N | Y | Somewhat Important | |
| Options that match what GLAC uses + more useful options | Good Selection of Metadata options (1-10) | | 10 | 10 | 3 | 8 | 5 | 5 | 6 | 5 | 9 | Not as important / Not hard to achieve |
| Being able to jump in immediately without the help from IT is heavily preferred, how intuitive is it | Navigability (1-10) | 7, very casual theme. Everything labeled well and easy to find. Most features are in the settings tab | 8, Features are clearly labeled, Interface is simple | 7, intuitive to use | 5, Contains some pointless menus. Most surface level functions are well labeled | 3, On the surface is easy to use, but you have to have some knowledge of coding to use it meaningfully | 7, some features could be clearer, but pretty easy to use overall | 5, Interface is pretty busy, purpose of some features are unclear | 7, pretty easy to navigate, lots of personalization and themes as well | 8, a bit cluttered just because of the many features, but otherwise navigable | | Others researched: Brandfolder, Capture, IBM Object Storage |
| Time with ease of use, will help with lack of IT dept. | Tech Support | Y | Y, Yearly subscription based | Y | Y | Y, can email them, but chat support has to be paid for | Y, can submit help form on their website | Y | Y | Y | | |
| Important to allow Jean + team to remain in control while allowing access to other GLAC staff | User Roles | Y | Y | Y | N | Y | N | Y | Y | Y | | |

allowed our sponsor to ask any questions or concerns.

Objective 4

Developed recommendations for implementation of the new DAM software system.

Following our presentation of the 3 viable DAM systems, we developed recommendations for the Park's implementation of their new DAM system. We accomplished this objective by talking to Glacier's IT lead about the approval process for software systems in National Parks. We also wrote in depth descriptions of the pros and cons of each recommended system, so that our sponsor would be able to review them and decide on one.

allowed our sponsor to ask any questions or concerns.

Results and Recommendations

The following section discusses the results from our objectives; identified important criteria for a DAM software system at GLAC, Proprietary and open-source software systems, and evaluation of DAM software systems through comparative analysis.

DAM System Criteria for Glacier National Park

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DAM systems can vary widely in their functionality. GLAC's primary use for a DAM system is archiving; preserving assets, organizing assets, and retrieving requested assets for outside parties. Park archival and library staff are the main users of the DAM system. Their primary tasks are retrieving asset requests, scanning historical assets, and attaching the requisite metadata to assets (Tabbert, personal communication, 2021, & Helsel, personal communication, 2021). Their current DAM system is tedious to use, and they lack the time and support to find a better system.

Based on input from interviews with Park staff and other experienced DAM users outside the Park, the following six criteria were derived: cost, batch metadata editing, metadata options, navigability, troubleshooting support, and user permissions for the Park's new DAM system..

The **cost** of the DAM software system should be affordable. The cost of different DAM software systems can range widely depending on what features and tools they offer. Some packages can be as low as \$29 a month, such as Filecamp, and some as high as \$500 a month, such as Canto. Typically, more expensive DAM software systems have more features such as AI image tags than less expensive DAM software systems. If GLAC cannot afford a more expensive DAM software system, then there are more affordable options available (Carlson & Gold, personal communication, 2021).

The DAM software system should allow for **batch metadata editing**. Batch metadata editing is an important functionality for the staff. Most of GLAC's metadata is stored within an Excel spreadsheet, separate from the asset files. Batch

metadata editing allows an Excel spreadsheet to be uploaded to the software and match metadata with the uploaded assets that have a corresponding file name. This functionality is necessary for a feasible DAM software system startup because the staff does not have time to input metadata fields for thousands of images (O'Brien & Smid, personal communication, 2021).

The DAM software system should have a wide variety of **metadata options**. A wide selection of metadata options allows for a smoother organization and archival process of assets. Having several ways to search for specific images through fields such as file names, photographer, and keywords make this process more efficient. Some systems offer features such as custom fields, where a user can create their own subject to search by, or smart tagging, which lets an artificial intelligence examine an image and automatically create keywords based off of what it recognizes. All of these tools help users create a controlled vocabulary of tags and keywords for simple categorizing. A controlled vocabulary is a term to describe the standardized set of keywords and tags that allow for accurate retrieval of assets in a system (Tabbert, personal communication, 2021).

The DAM software system should allow for **intuitive navigability**. A system that is navigable would allow the staff to become familiar with the software faster, shortening the system startup time, and allow staff to make use of all the software functionalities. An intuitive and navigable system should have clearly labeled and organized menus, and a minimal number of clicks to carry out certain functionalities (Tabbert, personal communication, 2021).

The DAM software system should have accessible **troubleshooting support**. The IT staff at GLAC have limited resources to help library and archival staff troubleshoot the DAM software. Therefore, an informative user manual and or help forum on the company's website is a necessary resource the staff need to effectively operate the system. These resources answer any questions about where a feature is or how it works in the

software. Some systems may offer a live tech support service (Tabbert, personal communication, 2021).

The DAM software system should allow for **user permission** functionalities. User permissions allow admins to customize the capabilities that certain groups or individual users have with managing or accessing assets. GLAC has assets they do not have the copyright for and want their assets managed with consistency. Therefore, user roles are an important aspect to the functionality of their DAM software system (Tabbert, personal communication, 2021).

The six DAM software system functionalities above consolidate what Jean's staff needs for efficiently managing, retrieving, and accessing the Park's digital assets. These six functionalities; Cost, batch metadata editing, metadata options, intuitive navigability, troubleshoot support, and user permissions will allow the staff to spend less time searching for digital assets and will preserve the fragile physical ones.

Proprietary vs. Open Source Systems

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According to Jean Tabbert, **the small team of archival and library staff at GLAC will not have technical support from the Park's IT department after approval and installation of the DAM software system.** Therefore, our sponsor expressed the need for implementing a software system with an online technical support forum (Tabbert, personal communication, 2021). Because the Park's IT department lacks the resources to troubleshoot and maintain a DAM software system for the library and archival staff, we determined that Glacier National Park implement a proprietary DAM software system.

Proprietary and open source software can have many of the same functionalities, but require a different setup and updating process and offer different levels of IT assistance. Proprietary systems are software that are bought from a separate third party company and open source systems begin as code that its copyright owner allows users to build into their own software for free. The decision between whether to search for proprietary software systems, open source

systems, or both, is often determined by the amount of IT support available at an organization. Proprietary software is best for organizations that do not have a robust IT department because the supplier supports the setup and maintenance of the system. An open source software requires IT department assistance to configure the system with all the functionalities the organization needs for their DAM system as well as any updates to maintain the system. Furthermore, both Anna Gold, WPI University Librarian, and Arthur Carlson, WPI University Archivist, explained the utility of proprietary systems. They shared that hosted companies often have an active support community for troubleshooting. (Carlson & Gold, personal communication, 2021).

Comparative Analysis of Different DAM Software Systems

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We assessed sixteen different digital asset management (DAM) software systems. They were selected based on recommendations from interviews with people who have experience using DAM systems and preliminary internet research. We determined seven of these software systems were not viable considerations because they were open-source systems, and therefore, would not meet the IT support requirements of Glacier National Park (GLAC) archive staff, or the system did not allow access via a free trial to analyze the software further. With the remaining nine options, Canto, Preservica, Razuna, Extensis Connect, Bynder, ImageKit, Photoshelter, Filecamp, and ResourceSpace, we compared each system to the six criteria: cost, batch update capabilities, metadata options, ease of navigation, troubleshoot support, and user permissions. The evaluation of these DAM software systems allowed our team to comparatively analyze the systems to identify the best options for GLAC archival staff (Table 3) (see supplemental materials for more).

We created a tiered list of price ranges for DAM software. Higher end software (\$300+ per month) has many capabilities, the middle tier software (\$150-\$300 per month) has a good selection of capabilities, and the lower end

software (free-\$150 per month) has basic capabilities. Higher end software is often used for robust databases. Middle tier software and lower end DAM software have basic capabilities, but different software can have the specialized basic capabilities needed. For example, ImageKit is intended for selling photos, and does not meet many requirements needed for managing a digital archive. The more expensive DAM software systems such as Canto and ResourceSpace, satisfied all the important capabilities the Park desired.

Batch metadata editing, an important functionality for the archival staff, was an uncommon capability among DAM software systems. Nearly all higher end systems include this feature, but it was challenging to find in less expensive software options. Due to its importance, we determined the following software systems would not meet GLAC's needs for lacking batch metadata editing functionalities: Extensis Connect, ImageKit, PhotoShelter, Bynder, and Filecamp. Taking advantage of free trials, we evaluated the remaining four systems that have batch metadata editing functionalities, specifically: Canto, Razuna, Preservica, and ResourceSpace.

Metadata options varied heavily with who the

system's intended audience was. While some systems are designed to be used by any organization or users, many are specifically designed for particular types of organizations. For example, ImageKit and Photoshelter are designed more towards users who wish to store and then sell their images, thus metadata options are lacking more in those choices. While most choices offered at least a decent selection of metadata options, the more expensive choices tended to have a wider selection, such as Bynder, Canto, and ResourceSpace. However, those designed more towards an archiving perspective also offered a broad selection of metadata despite having a noticeably lower price, these being Preservica and Razuna.

Intuitive navigability is in some regards a subjective factor, but there are certain features that objectively make a system more intuitive for the user. These features can include: clearly labeled menus, an understandable organization of folders and settings, and a minimal number of clicks to complete different tasks. From our research and comparative analysis, there was no major correlation between a system's navigability and its price. Some systems offered some personal customization of their software, such as color templates, places to insert logos, and

Table 3. Comparative Analysis Table of Digital Asset Management Systems

| DAM System Name | Costs | Batch Metadata Editing? | Metadata Options | Intuitive Navigation | Troubleshoot Support | User Permissions? |
|------------------|-------------------------|-------------------------|------------------|----------------------|----------------------|-------------------|
| Bynder | Quote Based, ~\$400/mth | No | Good | Fair | Excellent | Yes |
| Canto | Quote Based, ~\$500/mth | Yes | Excellent | Excellent | Excellent | Yes |
| Extensis Connect | \$25/user/month | No | Poor | Good | Fair | Yes |
| Filecamp | \$29/month | No | Fair | Excellent | Good | Yes |
| ImageKit | \$49/month | No | Fair | Poor | Poor | Yes |
| PhotoShelter | \$45/month | No | Fair | Good | Fair | No |
| Preservica | \$200/month | Yes | Excellent | Fair | Good | No |
| Razuna | \$100/month | Yes | Excellent | Excellent | Poor | Yes |
| ResourceSpace | \$364/month | Yes | Excellent | Good | Excellent | Yes |

Recommended Digital Asset Management Systems for Glacier National Park

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relocating certain features. These options can make the system's navigability more personalized and therefore easier for the user. Systems with software customization were Filecamp and ResourceSpace. Systems with overall satisfactory navigability, measured by the number of clicks to complete a task, included: Filecamp, ResourceSpace, Canto, and Razuna.

Troubleshooting support along with intuitive navigability can ensure systems are easier to use. Proprietary software systems often provide a technical support team that a user can contact to assist them with the workings of the software. The availability of these support teams can vary, and are sometimes only accessible through a separate subscription cost. The more expensive options, Bynder, Canto, and ResourceSpace, included accessible support teams within their software subscription. Each of the systems we analyzed included either a software manual or knowledge base that a user could use for troubleshooting. In a similar way, these manuals also varied in their usefulness with some going into detail about features the software provides while others only provide an overview of major tools.

User roles are a standard feature in DAM systems that allow more than one user per account. There are slight differences between each systems' approach to including this feature. Some allow administrators to sort different users into groups that are assigned a specific set of permissions while others let administrators choose exactly what each separate user is capable of. Both Photoshelter and Preservica have a limited number of users available for certain pricing packages, neither exceeding five users, and thus choose to allow each of their users to have full administrative control. Preservica specifically also has public "portals" that allows any person with a link to view selected assets and folders determined by an administrator. This is a unique option that allows a few users to have full control while many others can simply view.

Glacier National Park's (GLAC) current system of using both excel spreadsheets and file explorer to manage 12,800 images is unsatisfactory for the work they are accomplishing and we recommend that it be replaced. We offer GLAC a tiered list of digital asset management (DAM) software systems to manage their digital archives. The three options satisfy the six criteria we outlined: cost, batch update capabilities, metadata options, intuitive navigation, customer troubleshoot support, and user roles/permissions. We separated our recommendations into three categories based on price, ensuring the Park is able to choose the best system regardless of available funding.

The least expensive system that we recommend is Razuna. At \$100 per month, this system is one of the more affordable options. It contains all of the required features for the Park's needs. Razuna has batch update capabilities, controlled vocabulary asset tags, is easy to use, as each feature is clearly labeled and explained, and the interface is simple to navigate. Razuna also allows for administrators to set roles for different users or groups of users. One of the main downsides of Razuna is that its free technical support is unsatisfactory in that online knowledge bases are inactive, and to have access to troubleshoot support a user must pay for an additional subscription for \$7,750 a year. The Razuna website, however, does have extensive documentation for the software system. We found this information through our own testing of the software system using our criteria checklist.

The middle tiered software system we recommend is Preservica, at \$200 per month. This DAM software system was recommended to us by Worcester Polytechnic Institute's digital archivist, Arthur Carlson. This system is designed around the archival and preservation of images. While simplistic in form, it has the capabilities the Park needs, as defined by the six criteria. Preservica can handle batch metadata updates and uploads. The main downside to this system, however, is that it does not have keywords and tags, which makes

the use of a controlled vocabulary more difficult. The use of Dublin Core XMP metadata format, a variation on the standard metadata format, allows for some tagging alternatives as well as custom metadata templates. The user interface is very simplistic, making Preservica intuitive to use. The menus are generally well labeled, and it is easy to navigate the page quickly with minimal clicks. However, this ease of navigation is due to the fact that there are not many extra features to supplement the user's needs. The help center is supportive for figuring out topic specific problems. We also personally assessed Preservica using our criteria checklist.

The high-end tiered software system we recommend is ResourceSpace, which costs \$364 per month. We were recommended this DAM software system by Wendy Essery, the Worcester Historical Museum's librarian and archivist, who has worked with this system for around seven years and spoke very highly of the system and its capabilities. This system is designed for museums to sort and store their assets, as well as for making the collections publicly available to a wide audience. The system is capable of batch updates and uploads through comma separated value (CSV) file metadata imports, which is the standard way of accomplishing this with an excel spreadsheet of metadata. The custom metadata fields would allow for the archivists and librarians to make and maintain a controlled vocabulary. All user interface features are well labeled, making the functions of the software intuitive. Default fields each have a description of what they are used for. However, the abundance of options can make navigation somewhat difficult to inexperienced users. This system offers many extra features and options, such as usage statistics and logs, as well as elements designed to improve workflow. Troubleshoot support is included with the software package and is very reliable according to Wendy Essery. Each user can be individually added, invited, and set to have custom permissions regarding which assets can be viewed, edited and downloaded. The use of custom collections and featured collections presents a simple hierarchical system, and allows the easy sorting of assets. Custom Resources, as

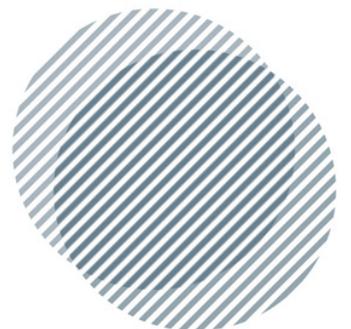
well as Metadata Fields allow the librarians and archivists the flexibility needed to ensure all of the information needed can be stored in the file. Additionally, the automatic creation of different sized previews and screens allows the easy acquisition of images at any size required. There are additional features that the Park may find useful, even if they aren't required. For example, Resourcespace makes the use of Geotagging, allowing the association of a geographical location with a certain asset (Essery, personal communication, 2021). This could be useful for the Park by mapping images on an interactive map. One of the main drawbacks of ResourceSpace is that its vast amount of features can be overwhelming. We personally assessed ResourceSpace using our criteria checklist as well.

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Conclusion

Glacier National Park's museum and archive department needs a new DAM system to organize their images. Through one of our recommended systems, we hope that it will save the time and energy that this team puts into upkeep of their current processes. Also, because we've recommended multiple DAM software systems, if GLAC's chosen software system ever stops being supported, then they could potentially be able to transition to one of the other recommended software systems. If none of these other options are viable, then the GLAC archival team could be able to use our recommended design features to find a new software system. The photographs that GLAC handles are incredibly valuable. Their digitization prevents their physical deterioration, and thus having a new system sustains the preservation and management of these photographs. With a functional way of having these images safe and retrievable, the stories and events behind them can be shared to keep their historical and cultural importance for generations to come. Digital archives not only preserve physical assets from being damaged, they also allow for more accessibility to researchers and educators. Implementing these software systems to National Parks, museums, and libraries all over

the world can preserve fragile assets of cultures,
history, lands, and organizations.



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