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Assessing large-scale digitization using web analytics

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Abstract

Purpose

The purpose of this study is to assess the use of digital collections created via the large-scale digitization of archival collections. The large-scale digitization method specifically examined is the reuse of archival description from finding aids to create digital collections that consist mainly of compound digital objects, equivalent to a folder of items, minimally described at the aggregate level. This article compares web analytics data for two large-scale digital collections and one digital collection with rich, item-level description.

Design/methodology/approach

This study analyzed one year of web analytics for three digital collections. The main research question of this study is: Are digital collections of minimally described compound objects used less than digital collections of richly described single objects?

Findings

This study found that the large-scale digital collections analyzed received less use than the traditional item-level collection, when examined at the item-level. At the object-level, the large-scale collections did not always receive less use than the traditional item-level collection.

Originality

This article is unique because it employs web analytics to compare the use of large-scale digital collections to the use of traditional boutique digital collections.

Research limitations/implications

This study is limited to three different digital collections from one institution. Web analytics also represent a limited interpretation of “use.”

Practical implications

This study presents a method for other institutions to assess their own large-scale digitization efforts, and contributes to the profession's understanding of the impact of large-scale digitization.

Introduction

Large-scale digitization allows archives and special collections to provide online access to more materials than traditional item-level approaches to digitization. This means that there is less need for researchers to travel to physical reading rooms, and more people are able to use archives. Digitization also increases the potential for the use and reuse of these materials: digital surrogates can be easily downloaded and shared; optical character recognition (OCR) software can create searchable text transcripts; and digital surrogates can also be compiled into datasets that can be analyzed computationally.

This article defines large-scale digitization as the whole process of efficiently creating large amounts of digital surrogates, encompassing not just digital capture, but all steps, from selection and preparation to description and access. For users, the biggest difference between boutique and large-scale digitization projects is often how the digital objects are accessed and described. The “More Product, Less Process” (MPLP) approach to processing facilitates large-scale digitization by encouraging arrangement and description at the file or series level (Greene, 2010). The result is a digital object that represents multiple physical items, and is described as a whole group (sometimes referred to as a compound, complex, or aggregate digital object), rather than at the item-level. However, if large-scale digitization creates a different kind of digital object than traditional digitization approaches, with less description, will it be harder for users to find these digital objects, and the items within them? Does that mean researchers will use these large-scale digital collections less? In that case, is it even worth it for institutions to undertake large-scale digitization, or should they stick to traditional item-level digitization? These are some of the questions that archives may ask themselves about large-scale digitization.

In order to contribute to the overall assessment of large-scale digitization, this article looks specifically at the questions: *How much are large-scale digital collections used? Are they used less than traditional item-level collections?* This study employs web analytics to compare unique pageviews in a year for three different digital collections from the University of Nevada, Las Vegas Special Collections and Archives (UNLV SCA). Two of the digital collections analyzed were created using large-scale digitization methods that produce mainly compound objects with aggregate minimal description. The other digital collection was created using the traditional “boutique” digitization approach of rich, item-level description. The sample size of this study is small, and the collections analyzed contain different items and formats, and cover different topics, resulting in an imperfect comparison of large-scale vs. item-level collections and limiting generalizability. This study aims to analyze the outcomes of large-scale digitization at one institution by leveraging a data collection method (web analytics) that many institutions already employ. In doing so, it surfaces some important considerations and practical strategies that

other libraries and archives can apply to their own assessment efforts, and that the profession can use to develop an understanding of the impact of large-scale digitization.

Literature review

This article is unique because it utilizes web analytics to assess large-scale digitization. Existing literature about large-scale digitization mainly addresses implementation rather than user-focused assessment (Erway, 2011; Moore, 2014; Harkema and Avery, 2015; Yolkowski and Jamieson, 2016; Lampert, 2018; Lapworth *et al.*, 2019). One type of implementation of large-scale digitization is to describe digitized archival materials in aggregations rather than individually. Greene (2010) suggested this method as an extension of the More Product Less Process (MPLP) approach, which was originally presented as a way to scale up archival processing. The Digital Public Library of America (DPLA) Archival Description Working Group (2016) codified this method with their guidelines for describing and representing aggregated digital objects. Studies that assess large-scale digitization have addressed costs and usability, but not any measures of use (Ranger, 2008; Jackson, 2012; DeRidder *et al.*, 2012).

Employing web analytics to assess the use of special collections and archives websites and digital content is a well-established research and assessment method. Prom (2011) noted that web analytics “used in conjunction with other, more traditional methods of studying user behavior... can force us to ask new questions about users and their information-seeking behaviors” (p.163). The Digital Library Federation Assessment Interest Group Analytics working group (Bragg *et al.*, 2015) authored a “Best Practices for Google Analytics in Digital Libraries” guide, and the SAA-ACRL/RBMS Joint Task Force on the Development of Standardized Statistical Measures for Public Services in Archival Repositories and Special Collections Libraries (2017) outlined standardized measures and metrics for online interactions, which include unique pageviews.

Some implementations of large-scale digitization provide access to digital surrogates via finding aids. Multiple studies have utilized web analytics to understand the use of online finding aids (Krause and Yakel, 2007; O’English, 2011; Lee *et al.*, 2016). Custer (2013) analyzed unique pageviews via Google Analytics in order to identify the most viewed finding aids at East Carolina University. He found that the 20% of online finding aids with the most unique pageviews accounted for over 70% of all unique pageviews. Custer introduced the term “mass representation” to refer to “any percentage of values within a set range that far exceed the set range’s proportionate share of coverage” (p.486). Khoo *et al.* (2008) also cautioned that “Web sites, as Internet nodes, exhibit many of the power law distributions typical of the Internet, characterized by a small number of data with high frequency counts at one end of the distribution, and a large number of data with low frequency counts at the other end” (p.383). This is important to keep in mind when assessing digital content, and when setting expectations for its use.

Other studies have employed web analytics to gauge the use of digital library and digital special collections and archives materials (Khoo *et al.*, 2008; Szajewski, 2013). Biswas and Marchesoni (2016) utilized Google Analytics to identify which CONTENTdm digital collections from Hunter

Library at Western Carolina University were viewed the most. The authors compared digital collections by calculating the number of item views for a collection as a percentage of the total number of views for all collections, and the number of items in a collection as a percentage of the total number of items in all collections. Beesley (2012) compared digital collections of different sizes by dividing the number of pageviews by the number of items and by the number of pages for each collection. As this article will show, comparing collections of different sizes that also have different types of digital objects (single objects and compound objects) requires additional analysis.

Khoo *et al.* (2008) warned that because web analytics record only user actions, and not thought processes, attitudes, or intentions, one must not make inferences about intentions from web analytics without triangulating with other data, such as usability testing, field studies, interviews, and focus groups. The author of this article also conducted interviews with users to find out more about their attitudes and preferences related to large-scale digitization; a separate article about these interviews is forthcoming.

Research methodology and approach

UNLV Digital Collections, a department of UNLV Special Collections and Archives, employs Google Analytics to collect web analytics for its CONTENTdm website, which provides public online access to digital objects. Unique pageviews data for 2019 for three digital collections was analyzed and compared to see if there were significant differences between two collections that were created via large-scale digitization methods and a collection that was digitized and described using a more traditional item-level approach.

To users, the two main differences between the large-scale and traditional item-level approaches are 1) the amount of descriptive metadata and 2) whether items are presented individually, as single objects, or if items are grouped together, as compound objects. The large-scale digital collections, *Entertainment* and *Culinary Workers Union Local 226 Photographs*, consist of mainly compound objects that group multiple items together, and the compound objects are described as a whole at the “parent” level. The item-level digital collection, *Photograph Collections (1 of 2)*, presents and describes items individually as single objects with rich metadata. Full screen captures of example digital objects from each collection are available in the appendix, and the collections are briefly described below.

Table I. Summary of the UNLV digital collections analyzed

Digital collection name	Photograph Collections (1 of 2)	Entertainment	Culinary Workers Union Local 226 Photographs
Shortened collection name	Photo	Entertainment	Culinary
Descriptive metadata	Item-level; rich	Object-level; minimal, with subject headings	Object-level; minimal, no subject headings

Number of single objects	21,575	288	55
Number of compound objects	504	1,444	1,012
Total number of digital objects	22,079	1,732	1,067
Total number of items	25,340	46,718	37,530

The *Photograph Collections (1 of 2)* digital collection consists of about 100 archival photograph collections from UNLV SCA. The archival collections were described at the item level in inventories, and those inventories were repurposed to create item-level metadata for the digitized photographs. The digitized photographs were uploaded individually into CONTENTdm as single objects. There are some compound objects in this collection, but they are usually one single physical item, such as the front and back of a postcard or a multi-page photo album. This digital collection covers a wide range of topics related to the history of Southern Nevada, gaming, and the University of Nevada, Las Vegas. Rich descriptive metadata was added to these digital objects, including narrative descriptions, dates, subject terms, place names, graphic elements, genres, and person and group names. This digital collection has not been specifically promoted but it has been online since 2012 and it is often recommended to users by Public Services staff. Individual items from the collection have also been promoted on social media over the years.

The *Entertainment* digital collection consists of four archival collections documenting the history of entertainment in Las Vegas: the Sands Hotel & Casino Public Relations Records, the Jerry Jackson Papers, the Donn Arden Papers, and the Ffolliott "Fluff" LeCoque Papers. The *Entertainment* digital collection is composed mainly of compound objects that are equal to an entire file described in the archival finding aid. Some items (such as costume drawings) were described individually in the finding aid, so the description was reused and the digital surrogates were also presented and described individually in CONTENTdm as single objects. The item and file titles from the finding aids were reused, with some enhancements, such as adding format information (e.g. "Jane Powell act at the Fairmont Hotel, San Francisco, California: script, notes"). Compound object child items were not assigned any metadata besides a digital identifier that includes the parent digital identifier (e.g. ent001187-001, the first child item of compound object ent001187). At the parent level, unique descriptive metadata was added, including archival hierarchy, date, subject headings, and controlled person, group, and place names. Staff worked from a list of prioritized names and subject headings to streamline the metadata creation process and to ensure consistency within the collection. Narrative descriptions were not added to these digital objects. The collection includes photographs, drawings, and text documents. Optical character recognition (OCR) software was used to create transcripts to allow for full text searching (although the computer generated transcriptions were

not manually corrected). The *Entertainment* collection was a grant-funded project that was promoted via UNLV SCA blog posts and social media.

The *Culinary Workers Union Local 226 Photographs* digital collection consists of a single digitized archival collection of the same name. It is composed of photographs documenting various activities of the Culinary Union, from the 1950s to 2006, including strikes, pickets, marches, parades, rallies, and demonstrations from the late 1980s to early 2000s. The archival collection is described at the file level, and many of the files listed in the finding aid consist of multiple physical folders. A compound object was created for each digitized physical folder, instead of each intellectual file described in the finding aid, in order to limit the number of items in a compound object. The file titles in the finding aid were repurposed for the compound objects, with contextual and folder information added, e.g. "Photographs of New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9)." Compound object children were titled sequentially based on the compound object parent title, e.g. "New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 1." Minimal unique metadata (date, genre, and archival hierarchy) was added at the parent level and repeated at the child level. Due to time constraints, subject terms, person and group names, narrative descriptions, and other descriptive metadata were not added to the majority of digital objects. Three compound objects in this collection were described at the item level, but they were removed from the data set for this study. The collection was promoted via UNLV SCA blog posts and social media, and promoted by the Culinary Union itself on social media.

Most of the digital objects in the *Culinary* (95%) and *Entertainment* (83%) collections are compound objects, meaning a digital object consisting of two or more child items (digital files). Most of the individual items in the *Culinary* (almost 100%) and *Entertainment* (99%) collections are within compound objects, meaning that those child items do not show up on their own within CONTENTdm search results. Compound objects only appear at the parent level in search results. When clicking on a compound object from search results, the user is usually taken to the webpage of the first child item. In the CONTENTdm website, each compound object child item is its own webpage, and there is no separate parent-level webpage (screen captures in appendix). The parent-level metadata and navigation buttons are displayed on each child item page. Other child items cannot be accessed directly from the search results except when a search term shows up within the child item rather than the parent-level metadata. This scenario is less likely for the *Culinary* and *Entertainment* collections since most of the metadata is at the parent level, except for full text transcriptions.

Only one year of data was used: web analytics from 2019. The *Entertainment* collection was fully uploaded in 2018 and the *Culinary* collection was fully uploaded in 2017. The *Photograph* collection was made available online around November 2012, and was added to regularly until April 2018. 2019 was the first year that the *Entertainment* and *Culinary* collections were online in their entirety for an entire calendar year, and the *Photograph* collection was not being added to. The analysis was conducted in 2020, as UNLV Digital Collections prepares to migrate from CONTENTdm to a new digital asset management system that will display compound objects differently.

UNLV Libraries' Google Analytics account was set up and is managed by the Library Technologies division. UNLV Digital Collections department, which this author is part of, has access to the account to view the data. Staff IP addresses and known bots are filtered from the Google Analytics data for the UNLV Digital Collections CONTENTdm website. OCLC's guide to Google Analytics for CONTENTdm

[https://help.oclc.org/Metadata_Services/CONTENTdm/Get_started/Google_Analytics_in_CONTENTdm] was consulted and OCLC Support staff provided additional information via email about the CONTENTdm settings for Google Analytics.

Pageviews are a commonly collected statistic, and record the number of times a page was loaded. If a user loads the same page multiple times during a session, then those pageviews count as only one *unique* pageview. (A session includes everything a user does on the website during one single defined time frame. If the same person viewed the same digital object on a different day or a different device, it would be a new, additional session and unique pageview.) There is no separate webpage for compound object parent records in the CONTENTdm website, instead the parent metadata and navigation options for the entire compound object are displayed on every child page. Each compound object child has its own page, so viewing three different compound object child items would result in three unique pageviews. Unique pageview data was accessed via the "Behavior" > "Site Content" > "All Pages" section of Google Analytics.

In Google Analytics pages can be filtered by their URL or by their title. The URLs for all items in a hosted responsive CONTENTdm Website are structured the same and use the digital collection's assigned alias. For example, "<http://d.library.unlv.edu/digital/collection/ent/id/28409/rec/4>" contains the collection alias "ent" for the *Entertainment* digital collection. Filtering page URLs using the collection alias and "/id" (e.g. "/digital/collection/ent/id") includes all single object and compound object item pages in the collection but it excludes the digital collection's landing page and search pages. However, testing this method and viewing some of the URLs showed that in some cases a single page had multiple different URLs that showed up separately in Google Analytics, so filtering by page title was used instead.

The CONTENTdm page title for items is constructed using the item title and the digital collection title. For example, an item in a compound object in the *Entertainment* digital collection has the page title "ent001187-001 - Entertainment - Welcome to UNLV's Digital Collections." "ent001187-001" is the item title and "Entertainment" is the digital collection title. Pages from this digital collection could be filtered by using part of the page title "Entertainment." However, filtering by page title "Entertainment" may also include items from other digital collections with the word "Entertainment" in their title. It also includes the collection's landing page. To filter only for the item pages in the digital collection, pages were filtered using dashes on either side of the digital collection name, as they appear in the item page title structure, e.g. "- Entertainment -". However, filtering by "- Photograph Collections (1 of 2) -" did not work because of the parentheses in the collection title, so in Google Analytics "- Photograph Collections" was used to filter page titles, and then the data was exported into Microsoft Excel for further filtering to make sure that only item pages from that specific digital collection were included.

Page title dimension data for all three digital collections was exported into Microsoft Excel and Google Sheets for further filtering and analysis. The compound object child items in all collections were titled in a consistent format that enabled text filtering to be used to separate data for single object pages and compound object child item pages. The titles were also consistent enough to identify child items belonging to the same compound objects.

This study analyzed and compared the number of unique pageviews, and the number of pages viewed, for three different digital collections using the page title filtering method described above. Since the sizes (the number of digital objects and items) and the composition (number of single objects and compound objects, and size of compound objects) of the digital collections vary, averages and percentages were calculated to facilitate comparison.

Findings

This study looks at unique pageviews web analytics data in two different ways: 1) the number of pages viewed at least once, and 2) the number of unique pageviews. The number of pages in a collection that were viewed at least once in 2019 show *how much of that collection was used*, while the number of unique pageviews show *how much use* that collection received. This study also analyzes the unique pageview data in different ways: at the item level and at the object level, and by looking at single objects and compound objects separately. All data is for the year 2019 only.

All items

A starting point for analysis is to look at all of the items in each collection. An item can be presented in CONTENTdm as either a single object or a compound object child. (A compound object as a whole, or at the parent level, is not an item.) The first question answered here is: *How much of each digital collection was viewed at least once?* To calculate this, the number of pages in a collection that had at least one unique pageview was determined, as previously described, by filtering by page title. Then, that number was divided by the total number of item pages in the collection, to determine the percentage of the collection that was viewed at least once. In this article, page and item are interchangeable terms, since only pages that represent digital object items are included in the data. The second question answered here is: *What is the average number of unique pageviews per item in each collection?* This was calculated by dividing the total number of unique pageviews per collection by the total number of items in each collection.

Table II. All items

	Photo	Entertainment	Culinary
Number of items with at least one unique pageview	11,958	8,469	2,748
Percentage of items in the collection	47%	18%	7%

viewed at least once			
Total number unique pageviews	41,256	16,273	3,378
Average number of unique pageviews per item	1.63	0.35	0.09

These results suggest that there might be a relationship between the amount of description and the percentage of items viewed; the *Photo* collection has the most description and it has the largest proportion of its collection (47%) that was viewed at least once, and the largest number of average unique pageviews per item (1.63). *Entertainment* and *Culinary* contain mostly compound objects that are not described at the item level, but *Entertainment* has subject headings and names at the parent level, and *Culinary* does not. *Photo* also has the widest topical coverage and about 100 different archival collections, whereas *Entertainment* is four archival collections about a single topic, and *Culinary* is only one specific archival collection. Based on this small sample, more description and/or a wider variety of topics represented in a digital collection might mean that a larger proportion of its items are viewed, and that it gets more use per item.

At first glance, as little as 7% of a collection being viewed online, and as few as 0.09 average unique pageviews per item may look highly discouraging to anyone considering large-scale digitization. However, one must keep in mind that this data is only for a single year. Digital collections can remain online for many years, and the highest costs are often the initial digitization costs, not the ongoing maintenance costs.

The digital collections examined also appear to be subject to the same patterns of use as the rest of the Web, as described by Khoo *et al.* (2008): a small percentage of items have a high number of unique pageviews, and the majority of items received zero or one unique pageviews in 2019. The table below shows what percentage of items in each collection received x number of unique pageviews in 2019.

Table III. Percentage frequency distribution table: unique pageviews per item

Number of unique pageviews	0	1	2-9	10-49	50-99	100+
Photo	52.81%	17.33%	27.34%	2.45%	0.05%	0.02%
Entertainment	81.87%	11.27%	6.65%	0.20%	0.01%	0.00%
Culinary	92.68%	6.31%	1.00%	0.01%	0.00%	0.00%

The number of compound objects in each collection, and the size of those compound objects, are also factors that influence the results of this simple cross-collection comparison. As

explained already, child items within compound objects are not as directly accessible in CONTENTdm as single objects. Also, the compound objects in the large-scale collections are described only at the parent-level, meaning they are mainly discoverable at the parent level. This may also explain why more items in the *Photo* collection were viewed than in the *Entertainment* and *Culinary* collections; the *Photo* collection has many more single objects than *Entertainment* and *Culinary*, which consist almost entirely of items that are within compound objects. Further research would be required to examine the description, arrangement, and topic variables independently. For example, would the same items with the same description be used less if they were within compound objects rather than displayed as single objects? The folder-level arrangement and description method of large-scale digitization also means that the highest costs are incurred at the parent level, not the item level. If an archives was conducting a cost-benefit analysis of this method, then an assessment of use at the item-level is not as useful as object-level assessment. Comparing a digital collection of mostly single objects and some small compound objects (*Photographs*) with large-scale digital collections of mostly large compound objects (*Entertainment* and *Culinary*) benefits from a more detailed look at the data.

Object-level analysis

From a user perspective and a cost-benefit analysis perspective, it makes sense to assess the use of large-scale digital collections at the object level. A large cost of digitization is description, and when that occurs at the parent compound object level in large-scale digitization, it means that costs are mainly incurred at the object level. Compound objects are also mainly discoverable and accessible to users at the parent object level also.

In this case compound objects are analyzed at the parent level, meaning that even if multiple child items in a compound object were viewed, it only matters that the compound object was viewed at least once. In the data, compound object item pages were identified and separated from single object pages, and then regrouped at the parent level, using a semi-automated process that took advantage of the consistent structure and format of the item titles and did not require cross-referencing with the full digital object metadata.

First, all digital objects (both single objects and compound objects) are analyzed together. Two questions are asked here: *What percentage of digital objects in a collection were viewed at least once?* (this was calculated by dividing the number of digital objects with at least one unique pageview by the total number of digital objects in the collection) and *What is the average number of unique pageviews per digital object?* (this was calculated by dividing the total number of unique pageviews per collection by the total number of digital objects in each collection).

Table IV. All digital objects

	Photo	Entertainment	Culinary
Number of digital objects with at least one unique pageview	10,678	1,062	320

Percentage of digital objects in the collection viewed at least once	48%	61%	30%
Average number of unique pageviews per digital object	1.87	9.40	3.17

Here the percentage of digital objects viewed per digital collection does not directly correspond with the amount of description or topical scope of the collection. Based on this metric and this small sample set, the proportion of digital objects in a large-scale collection that are viewed at least once in a year is not always less than that of a traditional item-level collection. This analysis suggests that a large-scale digitization approach does *not* always mean that less digital objects will be viewed, although as previously shown, it may mean that fewer items will be viewed.

The average number of unique pageviews per digital object is skewed and misleading because the *Entertainment* and *Culinary* collections contain large compound objects and *Photo* does not. In CONTENTdm there is no separate page for compound object parents, and there are more child item pages available to click on per digital object than in the *Photo* collection. In this case it is more useful to analyze the data for single objects and compound objects separately.

Looking only at single objects, the question *What percentage of single objects in a collection were viewed at least once?* can be answered by dividing the number of single objects with at least one unique pageview by the total number of single objects. The average number of unique pageviews per single object is calculated by dividing the number of unique pageviews of single objects by the total number of single objects.

Table V. Single objects

	Photo	Entertainment	Culinary
Number of single objects with at least one unique pageview	10,503	133	28
Percentage of single objects in the collection viewed at least once	49%	46%	51%
Number unique pageviews of single objects	36,994	326	60
Average number of unique pageviews per single object	1.71	1.13	1.09

The percentage of single objects viewed does not seem to depend on the amount of description or variety of topics, and is around 50% for all three collections. The average number of unique pageviews per single object is also similar, but does correspond to the amount of description/variety of topics. Although single objects may not be common products of large-

scale digitization, based on this data it could be hypothesized that different levels of description and variety of topics may not have a significant effect on the percentage of single objects viewed in a collection or in the average number of unique pageviews per single object.

Next, compound objects from the *Photo*, *Entertainment*, and *Culinary* collections are compared. The first question asked is: *What percentage of compound objects in a collection were viewed at least once?* This is calculated by dividing the number of compound objects with at least one unique pageview by the total number of compound objects. The average number of unique pageviews per compound object is calculated by dividing the number of unique pageviews of compound objects by the total number of compound objects.

Table VI. Compound objects

	Photo	Entertainment	Culinary
Number of compound objects with at least one unique pageview	175	929	292
Percentage of compound objects in the collection viewed at least once	35%	64%	29%
Number unique pageviews of compound objects	4,262	15,947	3,318
Average number of unique pageviews per compound object	8.46	11.04	3.28

Separating single object data from compound object data, and looking at compound objects at the parent object level, rather than the child item level, the differences between these collections are less stark. The percentage of compound objects viewed at least once also does not appear to directly correspond to the level/amount of description or variety of topics.

The average number of unique pageviews per compound object is still skewed by the number of compound object children in each collection. The number of unique pageviews per compound object is increased by each child item viewed; there is no compound object parent-level page in CONTENTdm to isolate for analysis. The *Entertainment* collection likely has more unique pageviews per compound object and digital object than *Photo* because it has more compound object children (pages) in the collection (on average, 32 children per compound object, versus 7). This reasoning does not hold for the *Culinary* collection though, which has an average of 37 child items per compound object, but the smallest average number of unique pageviews per compound object (3.28). This suggests that *Culinary* child items do have the least amount of use of the three collections, possibly because of the narrow topical scope of this collection, and/or the sparse description of the digital objects and items.

Compound object child items

Although less important for cost-benefit analysis of large-scale digitization, one can also look at the number of child items viewed per compound object. The average number of child items viewed per compound object was calculated by dividing the total number of compound object child pages in a collection that were viewed at least once, by the total number of compound objects in the collection that were viewed at least once. This can be analyzed alongside the average number of compound object child items per collection to give an idea of how much of a compound object was viewed, on average.

Table VII. What is the average number of child items per compound object that were viewed at least once in 2019?

	Photo	Entertainment	Culinary
Number of compound object child items with at least one unique pageview	1,455	8,336	2,720
Average number of child items per compound object viewed	8	9	9
Average number of child items per compound object	7	32	37

Here, the results of the three collections are very similar. Even though *Entertainment* and *Culinary* have a higher number of average child items per compound object (total number of compound object child items in the collection divided by the total number of compound objects in the collection) than *Photo*, they only have one more child item viewed per compound object on average. This could be because CONTENTdm displays ten child items at a time in a sidebar, and/or it could also be because users have a limit of how many items they want to, or need to, view per compound object.

Of the total number of compound object child items in each collection, how many were viewed at least once in 2019? This was calculated by dividing the number of compound object child items with at least one unique pageview by the total number of compound object child items in the collection.

Table VIII. What percentage of compound object child items were viewed in each collection in 2019?

	Photo	Entertainment	Culinary
Total number of compound object child items in the collection	3,765	46,430	37,475
Percentage of compound object child	39%	18%	7%

items in the collection viewed at least once			
--	--	--	--

Similar to the percentage of total items in the collection viewed at least once in 2019, the topical scope and/or amount of description appears to correspond to the percentage of compound object child items viewed. Since *Entertainment* and *Culinary* child items are not individually described, and *Photo* child items usually are, it is likely that the additional description contributes to more of the *Photo* child items being viewed. The smaller size of the *Photo* compound objects also likely contributes to the higher percentage of child items viewed. The difference in percentage of child items viewed between *Entertainment* and *Culinary* is likely due to the topical scope of the collections.

Finally, *what is the average number of unique pageviews per compound object child item?* This is calculated by dividing the total number of unique pageviews of compound object child items by the total number of compound object child items in the collection.

Table IX. Average number of unique pageviews per compound object child item

	Photo	Entertainment	Culinary
Number of unique pageviews of compound object child items	4,262	15,947	3,318
Average number of unique pageviews per compound object child item	1.13	0.34	0.09

Most of the items in *Entertainment* and *Culinary* are compound object child items, but these items get less use than the compound object child items in *Photo*. This is likely due to the topical scope of the collections, the lack of item-level description, and the size of the compound objects.

Conclusion

Web analytics data can be utilized to assess digitization projects and also to conduct cost-benefit analysis. The initial cost of digitization is normally the most expensive, and large-scale digitization is much less expensive than item-level. The ongoing costs to store, preserve, and provide access to the digitized materials year after year are less than the initial digitization, and each year is an opportunity for the materials to be viewed and used. The cost of digitization, including large-scale digitization, is a topic covered in professional literature, but the benefits of large-scale digitization to users are less explored.

Web analytics can be employed to analyze these benefits, and specifically explore the questions: *How much are large-scale digital collections used? Are they used less than*

traditional digital collections? Looking at the page-level data in a variety of ways can help provide a realistic picture of how much digitized archival materials are viewed. It can also give practitioners an idea of exactly what metric is most helpful for their own specific assessment. Compound objects in CONTENTdm represent only two levels of hierarchy, yet their structure complicates the analysis of web analytics for digitized collections. If web analytics are also going to be utilized for born-digital materials with multiple levels of hierarchy, how can repository architects and archivists plan ahead to gather useful data that is as straightforward as possible?

Comparing large-scale digital collections to traditional digital collections can be difficult, as shown in this study. There are many metrics to explore. Collection managers should set their own benchmarks for what is considered successful. As previous studies show, only a small proportion of content on the web receives the bulk of use, or pageviews. In that case, calculating how much of a collection is viewed at least once (in a year, or other timespan) might be more helpful than calculating the average number of pageviews per item.

In this study, the percentage of all items in the collection viewed at least once, and the average number of unique pageviews per item, corresponded to the amount of description, the scope of the collection, and the proportion of the collection's items that are within compound objects rather than presented individually as single objects. The collection (*Photo*) with the most description, the largest proportion of items that are single objects, and the widest topical scope received more use by these two measures than the large-scale collections (*Entertainment* and *Culinary*).

Object-level analytics may be appropriate for cost-benefit analysis when the costs are mainly incurred at the object level. It can be useful to compare the percentage of objects viewed between large-scale and traditional digital collections, but the average number of unique pageviews per compound object or per digital object is a misleading measure for digital collections displayed in a CONTENTdm website, since there are no compound object parent pages.

In this study, the collection with the largest percentage of digital objects in the collection viewed at least once (61%) was the large-scale *Entertainment* collection. This suggests that just because a digital collection is created using large-scale digitization methods, it won't necessarily get less use than traditional item-level collections, at least when looking at use on the object-level, not the item-level. However, the *Entertainment* collection did benefit from subject headings, controlled names, and transcription; the *Photo* and *Culinary* collections lacked transcriptions (they are mainly photos), and *Culinary* does not have any subject headings. Clearly, there are many different factors that impact the use of a collection.

Looking at compound object child items specifically, this study does suggest that child items created via large-scale digitization (which are less described and part of larger compound objects) are viewed less than child items in traditional digital collections (which have more item-level description and are in smaller compound objects). However, when also comparing the costs of those two digitization methods, perhaps less use is an acceptable result, if the cost to produce the items was also significantly less.

This study suggests that there may be a consistent average number of child items viewed per compound object, regardless of the size of the compound object. The average number of child items viewed per compound object was almost the same for all three collections analyzed (eight to nine items), even though the average sizes of compound objects in the large-scale collections were 32 and 37 child items, compared to seven child items in the traditional digital collection. Further testing could help determine if that is because CONTENTdm only shows ten child item thumbnails at a time in the sidebar, or because users only want or need to view eight or nine items per compound object.

It is likely that the topical scope of the collections analyzed in this study influenced the results, and it was a coincidence that the amount of description aligned with the scope of the collections. The *Culinary* collection had the least amount of description, the narrowest subject matter of all three collections analyzed, and almost 100% of its items are within compound objects; across the different measures it showed the lowest amount of use. There are other factors that may have influenced the results (amount of time available online, amount of promotion, etc.) and the data for this study only represents one year of web analytics.

This study is limited by a small sample size, but it presents some interesting data about the use of large-scale digital collections, and it also provides a framework for further assessment. Research that assesses the variables of description and arrangement/display (specifically, single vs. compound objects) independently would be especially useful to digital libraries. Web analytics data could inspire changes to large-scale digitization methods, or the systems that are used to present these collections online. Continued assessment and analysis via web analytics and other methods can help ensure that institutions are maximizing their resources to provide researchers with discoverable and usable digital archival materials.

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Further Reading

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Appendix

Figure 1. Screen capture of pho022760, a single object from the *Photograph Collections* (1 of 2) digital collection.

Home > Photograph Collections (1 of 2) > Postcard of Goldfield Consolidated Mill, Goldfield (Nev.), 1911

Postcard of Goldfield Consolidated Mill, Goldfield (Nev.), 1911

Item Description

Digital ID	pho022760
Title	Postcard of Goldfield Consolidated Mill, Goldfield (Nev.), 1911
Description	New Consolidated Mill atop the hill in Goldfield, Nevada. Goldfield mining boomed after 1897 and the town's mining and overall size increased for some time afterwards.
Source	Image ID: 0117 030
Original Collection	Giles-Barcus Collection
Original Date	1911
Subject (FAST Topical)	Mines and mineral resources Miners Mining districts Mining machinery
Spatial Coverage (TGN)	Goldfield (inhabited place), Esmeralda (county), Nevada (state), United States (nation)
Graphic Elements (TGM)	Mills Grasses Dirt Buildings
DC Type	Still Image
Genre (TGM)	Photographic postcards Cards Postcards
Language	eng
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Digital Publisher	University of Nevada, Las Vegas University Libraries
Digital Collection	Photograph Collections

Metadata for pho022760:

Item Description

Digital ID

pho022760

Title

Postcard of Goldfield Consolidated Mill, Goldfield (Nev.), 1911

Description

New Consolidated Mill atop the hill in Goldfield, Nevada. Goldfield mining boomed after 1897 and the town's mining and overall size increased for some time afterwards.

Source

Image ID: 0117 030

Original Collection

Giles-Barcus Collection

Original Date

1911

Subject (FAST Topical)

Mines and mineral resources

Miners

Mining districts

Mining machinery

Spatial Coverage (TGN)

Goldfield (inhabited place), Esmeralda (county), Nevada (state), United States (nation)

Graphic Elements (TGM)

Mills

Grasses

Dirt

Buildings

DC Type

Still Image

Genre (TGM)

Photographic postcards

Cards

Postcards

Language

eng

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Digital Collection
Photograph Collections

Figure 2. Screen capture of ent001187, a compound object from the *Entertainment* digital collection.

Home > Entertainment > Sands Times magazine spreads

Sands Times magazine spreads

ent001187-001

Transcript

memorandum from
CHAS. A. WHITE, JR.
May, 1965
Dear Sir:
It is a pleasure to send you the enclosed, descriptive material on our product.
You expressed interest in it as a result of a mention in a recent issue of IDEAFILE.
If you need anything additional in the way of information, or material, I hope you won't hesitate to let me know.
Sincerely,
Sales Manager

Object Description

Digital ID ent001187
Title Sands Times magazine spreads
Description Series VII: Sands Hotel Interior and Exterior
Physical extent 1 file
Collection Identifier MS-00417
Original Collection Sands Hotel & Casino Public Relations Records
Collection Guide <http://ojs.library.unlv.edu/peccoresearch/>
Date 1955, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965
Subject (FAST Typical) Photographs
Swimming pools
Records and correspondence
Hotels
Casinos
Periodicals
Individual as Subject Freeman, Al
Group as Subject Sands Hotel and Casino
Site Name Sands Hotel and Casino
Spatial Coverage (TON) Las Vegas (Inhabited place), Clark (county), Nevada (State), United States (Nation)
DC Type Image
Text
Language eng
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Digital Publisher University of Nevada, Las Vegas University Libraries
Digital Collection Entertainment Collections
Conversion Specifications Original material captured with DT 100mm reprographic camera and 10180 80 megapixel digital back with Schneider Kreuznach 72mm lens mounted on DT R10340 reprographic system
Object Archival Resource Key <http://ojs.library.unlv.edu/peccoresearch/>

Item Description

Title ent001187-001

Metadata for ent001187:

Transcript

miora
ndum from

• •

CHAS.

A.

WHITE, JR.

May,

1965

196£

Dear

Sir:

It is a pleasure to send you
the enclosed, descriptive material
on our product*

You expressed interest in it as
a result of a mention in a recent
issue of IDEAFILE*

If you need anything additional
in the way of information, or
material, I hope you won't hesitate
to let me know*

Sincerely,
Sales Manager

Object Description

Digital ID

ent001187

Title

Sands Times magazine spreads

Description

Series VIII. Sands Hotel Interior and Exterior

Physical extent

file

Collection Identifier

MS-00417

Original Collection

Sands Hotel & Casino Public Relations Records

Collection Guide

<http://n2t.net/ark:/62930/f1mw5j>

Date

1956; 1957; 1958; 1959; 1960; 1961; 1962; 1963; 1964; 1965

Subject (FAST Topical)

Photographs
Swimming pools
Records and correspondence
Hotels
Casinos
Periodicals

Individual as Subject

Freeman, Al

Group as Subject

Sands Hotel and Casino

Site Name

Sands Hotel and Casino

Spatial Coverage (TGN)

Las Vegas (inhabited place), Clark (county), Nevada (state), United States (nation)

DC Type

Image
Text

Language

eng

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Digital Publisher

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Digital Collection

Entertainment Collections

Conversion Specifications

Original material captured with DT RCam reprographic camera and IQ180 80 megapixel digital back with Schneider Kruznach 72mm lens mounted on DT RG3040 reprographic system.

Object Archival Resource Key

<http://n2t.net/ark:/62930/d14d4r>

Item Description

Title

ent001187-001

Figure 3. Screen capture of cwu0437, a compound object from the *Culinary Workers Union Local 226 Photographs* digital collection.

Home > Culinary Workers Union Local 226 Photographs > Photographs of New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9)
Photographs of New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9)
New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 1

1 of 96

Object Description

Digital ID	cwu0437
Title	Photographs of New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9)
Source	PH-00382, Series I. Demonstrations, Subseries I.B. Other Demonstrations and Strikes
Original Collection	Culinary Workers Union Local 226 Las Vegas, Nevada Photographs
Collection Guide	http://n2t.net/ark:/62930/f16g7f
Original Date	1997-05-30
DC Type	Still Image
Genre (TGM)	Pictures Photographs Photographic prints
Rights	The Culinary Workers Union Local 226 retains copyrights to materials in this collection. Materials may be used for nonprofit purposes, including educational, teaching, scholarship, research, or other academic use. All for-profit use of copyrighted materials must receive permission in advance from the Culinary Workers Union Local 226. For more information, please see the UNLV Special Collections policies on reproduction and use (https://www.library.unlv.edu/speccol/research_and_services/reproductions) or contact us at special.collections@unlv.edu .
Digital Publisher	University of Nevada, Las Vegas University Libraries
Digital Collection	Culinary Workers Union Local 226 Las Vegas, Nevada Photographs

Item Description

Digital ID	cwu0437-001
Title	New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 1
Source	PH-00382, Series I. Demonstrations, Subseries I.B. Other Demonstrations and Strikes
Original Collection	Culinary Workers Union Local 226 Las Vegas, Nevada Photographs
Collection Guide	http://n2t.net/ark:/62930/f16g7f
Original Date	1997-05-30
DC Type	Still Image
Genre (TGM)	Pictures Photographs Photographic prints
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Digital Publisher	University of Nevada, Las Vegas University Libraries
Digital Collection	Culinary Workers Union Local 226 Las Vegas, Nevada Photographs

Search this record

Result 1 of 1

Back to results

Download Print

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 1

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 2

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 3

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 4

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 5

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 6

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 7

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 8

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 9

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 10

1 2 3 ... 10

Metadata for cwu0437:

Object Description

Digital ID

cwu0437

Title

Photographs of New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9)

Source

PH-00382, Series I. Demonstrations, Subseries I.B. Other Demonstrations and Strikes

Original Collection

Culinary Workers Union Local 226 Las Vegas, Nevada Photographs

Collection Guide

<http://n2t.net/ark:/62930/f16g7f>

Original Date

1997-05-30

DC Type

Still Image

Genre (TGM)

Pictures

Photographs

Photographic prints

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Digital Collection

Culinary Workers Union Local 226 Las Vegas, Nevada Photographs

Item Description**Digital ID**

cwu0437-001

Title

New York, New York ARK rally, Culinary Union, Las Vegas (Nev.), 1997 May 30 (folder 2 of 9), image 1

Source

PH-00382, Series I. Demonstrations, Subseries I.B. Other Demonstrations and Strikes

Original Collection

Culinary Workers Union Local 226 Las Vegas, Nevada Photographs

Collection Guide

<http://n2t.net/ark:/62930/f16g7f>

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DC Type

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Genre (TGM)

Pictures

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