

# Toward a definition of digital object reuse

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## Abstract

**Purpose** – The purpose of this paper is to present conceptual definitions for digital object use and reuse. Typically, assessment of digital repository content struggles to go beyond traditional usage metrics such as clicks, views or downloads. This is problematic for galleries, libraries, archives, museums and repositories (GLAMR) practitioners because use assessment does not tell a nuanced story of how users engage with digital content and objects.

**Design/methodology/approach** – This paper reviews prior research and literature aimed at defining use and reuse of digital content in GLAMR contexts and builds off of this group's previous research to devise a new model for defining use and reuse called the use-reuse matrix.

**Findings** – This paper presents the use-reuse matrix, which visually represents eight categories and numerous examples of use and reuse. Additionally, the paper explores the concept of “permeability” and its bearing on the matrix. It concludes with the next steps for future research and application in the development of the Digital Content Reuse Assessment Framework Toolkit (D-CRAFT).

**Practical implications** – The authors developed this model and definitions to inform D-CRAFT, an Institute of Museum and Library Services National Leadership Grant project. This toolkit is being developed to help practitioners assess reuse at their own institutions.

**Originality/value** – To the best of the authors' knowledge, this paper is one of the first to propose distinct definitions that describe and differentiate between digital object use and reuse in the context of assessing digital collections and data.

**Keywords** Content reuse, Content use, Digital collections assessment, Digital object reuse assessment, Reuse definition, Use definition

**Paper type** Conceptual paper

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## Introduction

As knowledge and memory organizations increase access to their collections by making them available online, digital library practitioners are increasingly tasked with assessing the value of their digitized and born-digital cultural heritage objects, institutional repository items, research data, learning objects, and more. An awareness of use cases for digital objects facilitates stronger digital collection building through a more nuanced understanding of how and why users interact with digital objects. Quantitative access statistics, like downloads and clicks, begin to show some indication of significance to users. But qualitative data showing how these materials are used and repurposed may be of greater value to digital library practitioners in building user-centric digital collections that are responsive to user needs and demonstrably valuable to stakeholders. The differences between access and repurposing of digital library objects can also be framed as a distinction between the consumption of a digital library object for its initially envisaged purpose and its recontextualization and repurposing. One method of differentiating between access and repurposing of digital objects is to focus on their use and reuse. Despite wishing to conduct more reuse assessment of their digital collections, digital library practitioners have expressed that the lack of an accepted methodology for gathering and/or interpreting reuse data is a major barrier in doing so (O’Gara *et al.*, 2018). An integral factor of best practices for assessing use and reuse must make clear to practitioners how to discern use from reuse. But what differentiates use and reuse?

In 2019, the Content Reuse working group of the Digital Library Federation (DLF) Assessment Interest Group (AIG) was awarded an Institute of Museum and Library Services (IMLS) National Leadership Grant for Libraries to build the Digital Content Reuse Assessment Framework Toolkit (D-CRAFT). This toolkit will “...contain resources, recommended practices, and use cases for sustainably measuring and evaluating the reuse of digital assets held by cultural heritage knowledge organizations” (Thompson *et al.*, 2019). The purpose of the project is to facilitate the assessment of digital repository content beyond traditional metrics such as clicks, views or downloads, as these metrics are insufficient for clearly demonstrating the impact of how digital content and objects are reused after viewing or downloading. Since practitioners cannot rely on traditional usage statistics for assessing *reuse*, this begs the question: what is in scope for assessing *reuse*? At this point in time, there are no community accepted definitions for *use* or *reuse* of digital content, of what differentiates them and of how their assessment methods and approaches differ. If assessing reuse is important to digital library practitioners, then digital object reuse must be clearly defined to facilitate the creation of said assessment toolkit (Kelly *et al.*, 2018; O’Gara *et al.*, 2018; Thompson *et al.*, 2019).

In this article, the researchers propose answers to these three questions:

- Q1. What defines *use* and *reuse* of digital content held by galleries, libraries, archives, museums and repositories (GLAMR)?
- Q2. What differentiates *use* and *reuse*?
- Q3. What constitutes instances, examples and indications of *use* and *reuse*?

The paper will present a review of prior research and literature aimed at defining *use* and *reuse* of digital content in GLAMR organizations, provides and builds on a review of findings of six focus groups conducted by Developing a Framework for Measuring Reuse of Digital Objects (Thompson *et al.*, 2017), propose definitions for *use* and *reuse* of digital content held by GLAMR institutions, present the use-reuse matrix, unpack the concept of

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“permeability” and its bearing on the model and conclude with next steps for future research and application.

### Literature review

Few attempts to define or differentiate between the concepts of digital object *use* and *reuse* exist in scholarly literature. More often than not, the terms *use* and *reuse* are applied interchangeably rather than as distinct concepts. Nevertheless, examples of digital *use* and *reuse* abound, and both theoretical papers and research studies reflect a range of impacts shown by different types of digital object practices, from reading or downloading to incorporating into teaching materials and creating new media works. This review focuses on literature and reports published during the past decade, with the inclusion of additional older, prominent articles when relevant. Some common themes in the concepts of *use* and *reuse* can be found in the areas of knowledge management, media studies and GLAMR. Differences in how these terms are applied in these fields as well as in relation to different digital content types (image, music, research data, learning objects, etc.) also surface. The following research provides some background as well as a basis for comparison with the definitions and examples of *use* and *reuse* proposed later in this paper.

From a library-focused perspective, *use* is not a singular concept but instead contains multiple facets manifested in different ways throughout library resource and service analysis (Fleming-May, 2011). Fleming-May’s typology breaks *use* into four major concepts including abstraction (vague notions such as “student library use”), implement (the library as entity, establishment or symbol and/or library information and resources as tools), instance (quantitatively measured transactions like circulation or door counts) and process (an individual’s use of the library to achieve a goal, such as writing a doctoral thesis) (Fleming-May, 2011, pp. 308–309). The concept of *use* becomes further muddled when evaluating usage of digital resources; while librarians may think it is obvious that online access to information resources provided by the library enables *use*, remote information seekers may not even realize they have “used” the library (Fleming-May, 2011, p. 316).

Image *use* is defined somewhat more definitively, with Beaudoin differentiating between “tangible use,” as in “lectures, presentations, articles, and artwork” and “intangible use,” as in “thematic illustration, intellectual reflection or inspiration” (Matusiak et al., 2019, p. 9). In attempting to differentiate between image *use* and *reuse*, Matusiak et al. (2019, pp. 495–497) further define image *use* as “an image is used in the context it was originally created or presented,” for example, a photograph or chart created by a student for the purposes of fulfilling an assignment. If a student then modifies their own photographs to create artistic content, this too is characterized as *use*. Fidel (1997) divides image needs into two types – illustration and information. Illustrative *use* involves including an image to depict what is in accompanying text, while informational *use* may instead lead to further analysis of the content of the image to better understand what is in it (McCay-Peet and Toms, 2009, p. 2420). Pasquetto et al. (2017) define data *use* as actions done by data creators, either when first compiling a data set to answer a specific question or returning to a previously created data set to replicate, reproduce or generate a new study. They further note that when that data set is contributed to a repository, retrieved by someone else and deployed for another project, it usually would be considered a *reuse*. Data *use* comprises a number of complex facets, including computation, aggregation, linkage, analysis and inferencing (Tempini, 2017).

Prior to the D-CRAFT project, the DLF AIG was awarded an IMLS grant for Developing a Framework for Measuring Reuse of Digital Objects (LG-73–17-0002–17) which, in addition to conducting a formal needs assessment of the Digital Library community to determine desired functionality for a future *reuse* assessment toolkit, explored the concepts of *use* and

*reuse* (Kelly *et al.*, 2018). The Measuring Reuse project conducted six focus groups with digital library practitioners from across the GLAMR landscape. Participants discussed the grant team's definitions and examples for *use* and *reuse* alongside their own institution's efforts to gather data in those categories. The project team derived the following definition for *use*: discovering and browsing objects in a digital library, often described as “clicks” or “downloads,” without knowing the specific context for this use (Kelly *et al.*, 2018).

Use can perhaps best be encapsulated with the term “consumption,” especially as it relates to digital library collections. Tanner (2011) argues that consumption includes both the “entertainment” enjoyed by a user engaging with digital content as well as personal value accrued as a result of participating in a *use* community. From the perspective of media studies and, in particular, music remixes, Borschke (2017, p. 8) also defines *use* as “consumption practices.” Initial consumption of a digital object, such as downloading it, may count as *use*, while incorporating that object into future projects may count as *reuse*; for example, medical images downloaded from a repository (*use*) and then consulted to inform new product development (*reuse*) (Herman, 2014). Original creation and ownership of the digital object may also help differentiate between *use* and *reuse*, with creation of a scientific data set for novel analysis categorized as *use* and the analysis of an open data set created by someone else categorized as *reuse* (Pasquetto, 2019). Using digital objects as teaching aides in a face-to-face or online classroom may also qualify as *use* of digital objects (Dallmeier-Tiessen *et al.*, 2014; Tanner, 2011; Terras, 2015).

Assessing *use* of digital objects tends to be quantitative and relatively straightforward; examples of digital object *use* assessment metrics include views, viewing time, clicks, downloads, sessions and other web analytics; printing; altmetrics (e.g. downloads, saves in citation managers, recommendations and shares); video coding and annotation; and clones of code or data (Baughman *et al.*, 2018; Carpenter *et al.*, 2016; Faniel and Yakel, 2011; Fouseki and Vacharopoulou, 2013; Frank *et al.*, 2016; GitHub and Various Contributors, 2018; Ladd, 2015; He and Han, 2017; Perrin *et al.*, 2017; White *et al.*, 2018; O'Gara *et al.*, 2018; Kelly *et al.*, 2018).

Defining *reuse* proves to be as challenging as defining *use*, and attempts to do so in the literature vary in complexity. Situated among the more theoretical standpoints, Markus (2001) focuses on the *reuse* of knowledge. The author finds that knowledge *reuse* is completed with the “successful knowledge transfer” between two agents and outlines “a typology of different knowledge reuse situations” (Markus, 2001, pp. 59–60). Others, while not engaging in the theoretical composition of *reuse* to the same degree as Marcus, also emphasize the transactional nature that helps one identify the *reuse* of knowledge or information. Frank *et al.* (2016, pp. 3–4) claim that drawing upon information repeatedly signifies *reuse*, in addition to using information in a space other than where it was originally obtained. Pasquetto *et al.* (2017) state that data *reuse* occurs when a data set is retrieved by a researcher who was not the original creator and incorporated into a new, distinct study. In contrast, Donker (2016, p. 21) suggests that *reuse*, beyond accessing, downloading and “invoking” content must include feedback or input opportunities “for co-generated information.” An analysis of scholarly works that included both “reuse” and “data” in the title, triangulated with the study of the etymology of the word “reuse,” led van de Sandt *et al.* (2019) to deduce that there was no difference between applications of *reuse* and *use*. They determine that previous attempts to differentiate between *use* and *reuse* were based on the idea that an originating researcher uses their own data and any subsequent research involving that data is *reuse*. This interpretation of *use* and *reuse* is based on a paper-centered, linear research model, whereas contemporary, data-driven research is more complex and dynamic. Van de Sandt *et al.* (2019, p. 14) therefore define “(re)use” as “the use

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of any research resource regardless of when it is used, the purpose, the characteristics of the data and its user.”

While completing the Measuring Reuse project, the team also developed a definition of *reuse* based on focus group discussions. They articulated *reuse* as “how often and in what ways digital library materials are utilized and repurposed. In this definition, we do know the context of the use” (Kelly *et al.*, 2018). By establishing working definitions for *use* and *reuse*, the Measuring Reuse project team essentially qualified the differences between the two concepts. *Use* is the initial access of an item. Nothing is known about how that item is used after it is initially accessed. *Reuse* is how the item is used after the initial access (Kelly *et al.*, 2018).

Important themes emerge in the literature dedicated to digital object *reuse*. Thompson and Reilly (2017) and Matusiak *et al.* (2019) emphasize the need for a digital image to be recontextualized, including changing the virtual location or intellectual meaning, for *reuse* to occur. Thompson and Reilly explain recontextualization as “using a digital image in a new setting that is not its original platform, purpose, or context” (2017, p. 2264). Matusiak *et al.* suggest *reuse* occurs when “an image is selected from a different source and is repurposed” and when “the visual content of an original image is used in a different context” (2019, p. 495). Eschenfelder and Caswell (2010, para. 11–16) align digital collections *reuse* with access levels and permissions. They cite three *reuse* categories: “virtual display case,” which makes content as accessible as is ethically possible; “regulated access/cultural property,” which monitors “access and use of culturally sensitive materials to protect the source group that generated the material”; and “cultural remix,” which encourages the *use*, *reuse* and distribution of knowledge without restrictions. Drawing from the field of media studies, Borschke (2017, pp. 33–39) articulates a remix as “a diverse range of activities of reuse and recombination” and “a new arrangement, an alternative mix of a composition.” She notes the pervasiveness in which the term is used to describe all “creative, unauthorized reuse that flourished with the mass uptake of digital technologies and is facilitated by broadband Internet access” (p. 48).

Scholars writing on the *reuse* of research data highlight the important role data plays in verifying existing knowledge and advancing new discoveries using combinations of existing research data. Curty and Qin (2014, p. 1) state, “not only data reuse helps address the issues of quality assessment and verification in science, but also allows for transforming outcomes from previous studies into new research.” Yoon (2017) broadens the practice of data *reuse* by suggesting that it is a “social process” that requires researchers to be engaged with one another and the public to communicate findings, processes and lessons learned.

Examples of *reuse* are diverse and expansive within the literature. Various studies focus on the *reuse* behavior of specific audience types. Thompson and Reilly (2017) document how general users download digital objects to repurpose as artwork or decoration in physical format and how social media users choose objects in GLAMR digital repositories to share across social media platforms. Johnston and Köntges (2016) and Terras (2015) articulate the need for GLAMR institutions to make bibliographic metadata, described by Terras as “open cultural data,” available to researchers to reconfigure and repurpose. Other investigations focus on the *reuse* patterns of educators and students interacting with digital objects in classroom settings (Tanner, 2011; Frank *et al.*, 2016). Matusiak *et al.* (2019, pp. 497–499) identified types of *reuse* used by students when completing class assignments. Some examples include *reuse* as: “sources of information” when integrating digital images into a presentation “with the intent of communicating a concept related to the topic of their presentation” and “transformative reuse” when combining elements of multiple photographs to generate a different, unique image that “has new meaning and purpose.”



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Borschke (2017, pp. 48–49) includes: “cut/copy/paste technologies” (Navas, 2010, p. 157; Schütze, 2003), social networking (Davis *et al.*, 2010; Markham, 2013), user-generated content (Lee, 2008), “commons-based peer production” (Benkler, 2006, p. 60), participatory media (Jenkins, 2009), distributed authorship (Logie, in Navas *et al.*, 2015, p. 296–309) and a variety of concepts, descriptions, neologisms, and buzzwords associated with networked culture at the turn of the twenty-first century as examples of remix, itself an extension of *reuse*.

There is also an emerging body of literature focused exclusively on research data *reuse* examples. He and Nahar (2016) and Pasquetto (2019) identify various types of research data *reuse*, including: testing existing study results through replication, comparing the results of one version of a study to a previous version and conducting a “meta-analysis” of previous studies’ results. Peters *et al.* (2016, p. 724) suggest that citations of data sets or published research using data sets are markers of *reuse* because they show impact. Pasquetto *et al.* (2019, p. 4) argue that “data reuse is a process that occurs within knowledge infrastructures that evolve over time, encompassing expertise, trust, communities, technologies, policies, resources and institutions.” They propose a typology of data reuses ranging from comparative to integrative. Comparative data reuse requires enough expertise about the data to assess their quality and value for a specific comparison. The integrative involves the ability to perform the action, such as reusing data in a new experiment. An example of a more sophisticated method for tracking use and reuse to help evaluate the value of their collections is seen in the Inter-university Consortium for Political and Social Research (ICPSR) Bibliography of Data-related Literature, “a frequently-updated database of thousands of citations for publications that analyze data held at ICPSR [1].”

The literature also surfaces wide-ranging benefits for the practice of *reuse* among scientists. Faniel and Yakel (2017) note how the availability of research data and the opportunity to adapt it to fit the needs of various disciplines can make the work of a researcher more efficient. The availability and adaptability of data can also generate new research avenues and questions. However, others are quick to articulate the limits that some disciplines identify when observing *reuse* behavior, with Pasquetto (2019, p. 2) noting a preference in biomedicine for researchers to use personally collected data rather than to harness existing data for reuse.

Researchers and GLAMR practitioners use a variety of methods to assess *reuse*. He and Nahar (2016), for instance, evaluate publicly available research data *reuse* through citation analysis. A growing body of literature shows that practitioners use Web tools to identify instances of digital library content being placed on personal and commercial websites, social media platforms and online image galleries. Kousha *et al.* (2010), Kirton and Terras (2013), Kelly (2015) and Reilly and Thompson (2017) leverage reverse image lookup technology to locate images posted across the Web. Kelly (2018a) conducts a case study tracking *reuse* via Google Alerts. Ladd (2015) and Kelly (2018b) investigate the ways that placing content on popular third-party sites (Flickr and Wikipedia/Wikimedia, respectively) can increase the exposure of digital collections.

This paper complements and expands the scholarly conversation on the notions of *use*, *reuse* and their assessment. Following the lead of Matusiak *et al.* (2019) and the findings of the Measuring Reuse project (O’Gara *et al.*, 2018; Kelly *et al.*, 2018), this paper posits that there is a difference between digital object *use* and *reuse*. Echoing many of the thematic examples found in the *use* and *reuse* literature, including the acts of consuming, recontextualizing and transforming digital objects, this paper is the first to articulate a continuum of behavior indicative of *use* or *reuse*, and to situate this continuum in an assessment framework that digital repository practitioners can draw upon to demonstrate the impact of digital objects.

### Defining use and reuse

The complexity of defining *use* and *reuse* is due largely to a sizable void in the field's collective understanding of patron engagement with digital materials. For most GLAMR institutions, the focus in data collection has been primarily on *use* – the access of material provided by the institution. What users subsequently do with the materials they have accessed has not been a large part of how GLAMR institutions described their value until more recently. Outputs such as gate counts, checkouts or the number of visitors a year have traditionally been the measure of value for GLAMR institutions – primarily because these metrics are similar to metrics gathered for analog material in the past and provide a measure of consistency. However, access to an item does not equate value or impact so much as it indicates a measure of discoverability. As GLAMR institutions move toward efforts to measure outcomes instead of outputs, it becomes vital to understand what a user does with materials they have accessed and their impact.

As noted in the literature review above, in the previously completed Measuring Reuse grant, the research team conducted primary research of their own, discussing the concepts of use and reuse with digital repository practitioners across the GLAMR community (Kelly *et al.*, 2018). The data uncovered through that process set the stage for the theory that underlines D-CRAFT. The Measuring Reuse grant work found that practitioners agreed that *reuse* should be an indicator of impact. *Reuse* metrics should provide contextual information that helps GLAMR institutions determine who their users are, where digital objects are being reused, what users do with digital objects, and most importantly, why those digital objects are meaningful to users. However, the consensus of *reuse* as an indicator of impact did not lead to a more robust understanding of how to define *reuse*. It became clear that the definition would need to be expansive with the metrics defined broadly enough to reflect how value is considered differently by institutions and communities.

While there was no clear consensus on the difference between *use* and *reuse*, two ways of viewing *reuse* emerged from discussions with practitioners: *reuse* as any action outside of the initial repository or exposure point; and *reuse* as a transformative act, either involving the object directly or its surroundings.

The clear break between *use* and *reuse* is the setting of the user's ensuing actions. Any action that happens within the initial location of discovery is *use*. Such actions might include accessing, viewing, downloading, listening or reading the content of the digital object within the repository where the object is held. Any action that happens to the digital object outside of the repository is considered *reuse*. Examples provided by practitioners include social media sharing, printing a copy of the digital object or aggregation of genealogy data. Some discussion of the methods for measuring *reuse* with this definition noted that many impacts are not measurable, either because the *reuse* can happen offline or because it does not resolve in a tangible format. Practitioners reflected that *reuse* is not always visceral, such as a collection of protest material that inspires others to political action.

An alternative view of *reuse* that emerged from talking with practitioners was the concept of transformation or interpretation; the object is changed in some manner or given a meaning or nuance beyond its original intent. The difference between *use* of an object and *reuse* goes beyond the context or location of the action and addresses whether there is added value. Examples of this ranged from merely relocating the object to a new context, such as aggregating digital objects into a curated collection that could lend to reinterpretation of the object, to a complete transformation into a new object, such as a mashup of images. In these cases, practitioners noted that context might not be the most appropriate definition for *reuse*

because the added value or transmutation of the object into a new object was the primary evidence that the original object was *reused*.

Digital repository practitioners' nuanced views that reuse could be either the context of how/where interaction with a digital object occurs or the output of that interaction did not clarify a concrete expectation for the researchers to model in D-CRAFT. Therefore, the researchers aimed to incorporate these nuances into a Spectrum of Engagement that centered user engagement to better reflect the multi-dimensional way that GLAMR practitioners might understand *reuse*.

### The matrix and the use-reuse spectrum of engagement

The subtlety in differentiating between *use* and *reuse*, as well as the distinctiveness of various *use* and *reuse* examples within different institutional contexts, only further emphasized how difficult it is to concretely define and distinguish between the two concepts. Members of the D-CRAFT and Measuring Reuse research teams have debated internally what constitutes *reuse* of digital materials and how that differs from *use* of digital materials for over two years now. While some areas of dispute have been resolved, others have been uncovered. This section will review the evolution of the team's conceptualization of *use* and *reuse*.

The researchers needed to determine what would actually be evaluated when measuring *reuse* of a digital object, as well as the purpose of *reuse* assessment. Examples of *reuse* that GLAMR professionals had expressed interest in tracking in the Measuring Reuse focus groups have been discussed elsewhere (Kenfield *et al.*, 2019, Slide 17).

As described above, the researchers posit that there is no clear-cut distinction between *use* and *reuse*. For this reason, the researchers determined that *use* and *reuse* exist on a spectrum and should not be considered discrete binary choices. Figure 1: Use-Reuse Engagement Spectrum (the Spectrum) depicts a series of activities arranged by "level of engagement." On the *use* end of the Spectrum are activities that involve the least amount of interaction to perform, while at the other end of the Spectrum are activities that involve the highest degree of interaction with a digital object. The levels of engagement were defined as:

- *Access*: To come into contact with a digital object.
- *Consumption*: To view, read or listen to the intellectual content of a digital object.
- *Reformatting*: To change the medium or delivery of a digital object.
- *Enhancement*: To add functionality or accessibility to a digital object.



**Figure 1.**  
Use-reuse engagement spectrum



- *Sharing*: To propagate the intellectual content of a digital object by distributing a means of access.
- *Recontextualization*: To alter the surroundings or space that affect the meaning, purpose or intent of a digital object.
- *Transformation*: To alter or change a digital object in such a way that results in the creation of a new, distinct entity.

While modeling *use* and *reuse* as a spectrum was a step in the right direction, it was not nuanced enough because it did not adequately highlight how the middle tier levels such as enhancement, sharing and recontextualization could encompass actions that are sometimes *use* and other times *reuse*. The Spectrum, shown in [Figure 1](#), was then re-envisioned as a matrix, shown in [Table 1](#). There were several iterations of the use-reuse matrix model, only the final version is presented, in [Table 1](#), and discussed here. For the curious, the other revolutions of the matrix model are available for viewing elsewhere [\[2\]](#).

The use-reuse matrix model builds on the Spectrum of Engagement by mapping it to a grid structure. The Spectrum is rotated so that it runs vertically along the *y*-axis with a similar continuum of “Simple Engagement” to “Complex Engagement.” *Use* and *reuse* become distinct variables that intersect with each level of the Spectrum.

[Table 1](#) represents the final version of the use-reuse matrix model. The definitions for *use* and *reuse* were revised to emphasize that significance to users is the primary differentiation between *use* and *reuse*. The definition of *reuse* was simplified to “active use that indicates an interest or value to the user.” As in [Figure #1](#), Transformation is the final activity on the Complex end of the Spectrum.

The researchers also added “Reproducibility” as a level of engagement. In this model, Reproducibility is defined as “to draw upon a digital object or data set to validate or verify a previous study’s methods and/or results.” Positioning Reproducibility as its own level emphasizes the uniqueness of validating previous studies, which is dissimilar to reformatting or enhancing data, and also acknowledges the likelihood that this type of engagement will only become more prominent as various academic fields grapple with the “reproducibility crisis” impacting scholarly research. Influenced by the work of [Pasquetto et al. \(2017, p. 4\)](#), who state that reproducibility is “an example of independent reuse of a dataset,” the researchers position reproducibility toward the *reuse* side of the Spectrum.

As can be seen in [Table 1](#), the row for Sharing on the Spectrum is unique. On all of the other rows, the columns for *use* and *reuse* are separate and distinct. Only in the row for Sharing has the delineation between *use* and *reuse* been removed. This indicates the permeability of *use* and *reuse* in Sharing; that is to say, Sharing cannot be confined solely to *use* or *reuse*.

Throughout the revisions of the matrices, Sharing has moved along the Spectrum of Engagement, sometimes appearing as high level and other times as low level. Examples of Sharing contain a mixture of active and passive interactions and do not line up neatly with “transformation.” In the early matrices where the definition was determined by whether the action “added substantive, interpretive or transformative meaning,” Sharing actions such as posting a digital object on social media fell distinctly under *use* because they did not necessarily add meaning or interpretation. In the later matrices where the definition of *use* and *reuse* was determined by a demonstration of interest to a user, the same action could be considered an example of *reuse* because the simple act of reposting a digital object showed interest in a clear, measurable way that practitioners could potentially track. Nevertheless, as noted at the beginning of this article, not everything that demonstrates value can be measured, and the method of measuring for value often falls short. Similarly, the evidence of

	Use	Reuse
Use, Reuse	<i>Passive interaction with a digital object that indicates potential interest and/or value to an external user</i>	<i>Active interaction with a digital object(s) that demonstrates an interest or value to an external user</i>
Simple Engagement	<p><b>Access</b> <i>To come into contact with a digital object</i></p> <p><b>Consumption</b> <i>To view, read, listen or expose oneself to the intellectual content of a digital object</i></p> <p><b>Reformatting</b> <i>To change the medium or delivery of a digital object without changing the content itself</i></p> <p><b>Sharing</b> <i>To expose others to the intellectual content of a digital object by distributing a means of display or access, such as a link or doi</i></p> <p><b>Reproducibility</b> <i>To draw upon a digital object or data set to validate or verify a previous study's methods and/or results</i></p> <p><b>Enhancement</b> <i>To add functionality or accessibility to a digital object</i></p>	<ul style="list-style-type: none"> <li>• Browsing digital repositories for content</li> <li>• Clicking a link for a digital object</li> <li>• Downloading digital objects</li> <li>• Accessing a web archive</li> <li>• Watching a video online</li> <li>• Reading an article</li> <li>• Viewing a photograph</li> <li>• Listening to a song</li> <li>• Printing digital objects</li> <li>• Scanning a document</li> <li>• Displaying digital collection materials on social media or e-mail</li> <li>• Citing a digital object in a scholarly article without adding interpretation</li> <li>• Citing a digital object in a Wikipedia article without adding interpretation</li> <li>• Publishing/reposting content in online or print publication without adding interpretation</li> <li>• Incorporating digital images into documentaries or movies without adding interpretation <ul style="list-style-type: none"> <li>• Confirming a journal article's results by using an existing data set to reproduce its methods and conclusions</li> <li>• Verifying a research study's methodology by replicating its process using a different data set</li> <li>• Annotating an image or document</li> <li>• Translating the text of a digital object from one language to another</li> <li>• Transcribing a digital object</li> <li>• Creating closed captioning for a video</li> <li>• Adjusting lighting or coloring of digital items to faithfully represent the original object</li> <li>• Charting a dataset in a graph or infographic to communicate with others</li> </ul> </li> <li>• Recording a book to make an audio book</li> </ul>
Spectrum of Engagement		

(continued)

**Table 1.**  
Use-reuse matrix

Use, Reuse	<p><b>Use</b> <i>Passive interaction with a digital object that indicates potential interest and/or value to an external user</i></p>	<p><b>Reuse</b> <i>Active interaction with a digital object(s) that demonstrates an interest or value to an external user</i></p>
Complex Engagement	<p><b>Recontextualization</b> <i>To alter the surroundings or space that affect the meaning, purpose or intent of a digital object</i></p>	<ul style="list-style-type: none"> <li>• Aggregating metadata in a discovery tool</li> <li>• Curating sets of digital material such as People of Color in Medieval European Art History, doi: <a href="https://medievalpoc.tumblr.com/">https://medievalpoc.tumblr.com/</a></li> <li>• Curriculum planning K-12 education, e.g. DocTeachs, LOC Teaching with Primary Sources, etc.</li> <li>• Creating a Pinterest board of digital objects</li> <li>• Citing a digital object in a scholarly article and adding interpretation</li> <li>• Citing a digital object in a Wikipedia article and adding interpretation</li> <li>• Publishing/reposting content in an online or print publication that adds interpretation</li> <li>• Incorporating digital images into documentaries or movies while adding interpretation</li> <li>• Creating “then and now” photographs for an exhibit, doi: <a href="https://publicdomam.nypl.org/fifth-avenue/">https://publicdomam.nypl.org/fifth-avenue/</a></li> <li>• Painting, drawing or otherwise artistically representing a digital object</li> <li>• Combining two or more datasets for analysis</li> <li>• Creating a GIF or meme from digital objects</li> <li>• Revising an existing OER object with new content</li> <li>• Overlaying a map with data points</li> <li>• Adding color to a black and white photo or video to add artistic value to the original object</li> <li>• Combining datasets from multiple sources and disciplines to produce a new result, intellectual framework or model</li> </ul>
	<p><b>Transformation</b> <i>To change or alter a digital object substantially, resulting in a new, distinct entity, including, but not limited to recreations, versions and mashups</i></p>	

interest also does not equate with value to a user. The presence of thought and involvement with a digital object, such as citing a digital object in a scholarly article or Wikipedia entry that examines and interprets the item, may be more in line with what an institution wants to consider to be *reuse* because the value to the user can be determined more reliably. In choosing to show Sharing as spanning both *use* and *reuse*, the authors of this paper argue that the context for making that designation may be best left to the institution.

In the following section, the researchers will expand on the complexities of Sharing, the concept of permeability and why this is significant for the Matrix.

### Embracing permeability

First articulated by philosopher and legal scholar Cornell (1991), permeability invokes alternative voices, ideas and frameworks to dissolve the current limits of a system. Information studies scholars like Hope Olson (2001, p. 659) contend that permeability is a fitting paradigm for GLAMR standards because it offers practitioners the ability to “develop an ethical relationship with the other” – to engage with diverse audiences and allow those groups to help (re)shape the construct. Olson (2001, p. 661) offered several ways of promoting permeability in cataloging, including by “using systems designed for multilingual catalogs to allow more than authoritative headings for a topic” such as “women, wimmin, womyn, femmes, Frauen, and so on, would all retrieve the same collection of documents without an intervening instruction to ‘USE Women’.”

Formulating and building consensus around the final iteration of the matrix surfaced several internal debates among the researchers. These debates forced them to acknowledge the limits of their ability to outline all aspects of the Use-Reuse Spectrum. In part, this reckoning emerged from literature grounded in permeability. The researchers draw upon one element in the matrix, the process of sharing a digital object over social media, as a lens to illustrate these internal discussions and the influence that permeability has on their evolving construction of the matrix and the spectrum.

Examples of sharing digital objects over social media in the literature reinforce the complexity of sharing and how challenging it is for a practitioner to classify where Sharing falls. The researchers cited documented instances of Sharing that suggested the act fell into the *reuse* category because of the recontextualization of an object’s meaning or the transformation of an object itself. Examples include instances of users:

- Placing content from an online lesson plan dedicated to immigration into a Pinterest board focused on denim fashion (Thompson and Reilly, 2019).
- Repurposing an image of railway workers on the Union Pacific Railroad to illustrate minimum wage advocacy (Kelly, 2019).
- Remixing digital objects from the United Kingdom’s National Gallery as part of an “update art” initiative (Kirton and Terras, 2013).

As the conversation progressed, it became clear that the specific circumstances surrounding a sharing event would determine passive/active and *use/reuse* status. It was also evident that they could not, and should not, neither try to anticipate every type of example that might encompass sharing nor should they attempt to categorize hypothetical sharing events as passive/use or active/reuse. Instead, the researchers elected to embrace the idea of permeability to allow for other perspectives to inform the boundaries of sharing over time.

Professional, educational, cultural, ethical and legal variables will all challenge the current limits of the matrix. As such, practitioners who use the spectrum to assess *use* and

*reuse* will continue to interrogate the definitions, examples and positioning of engagement types along the Spectrum. The researchers' commitment to a permeable matrix allows for the adaptation of the framework beyond the goals of their current project and the collective imagination of the team members. This admission presents long-term project sustainability questions that the researchers have not fully processed: as the matrix filters into the GLAMR professional discussion, and as practitioners identify ways to adapt, revise and reshape the framework, how will the researchers keep the matrix updated? How are permeable contributions represented in a matrix and in a future assessment toolkit? As diverse perspectives interrogate the matrix, who will be responsible for making decisions on what is and is not included in the model? While the concept of permeability has freed the researchers to move forward with a level of ambiguity built into the matrix, it still presents challenges for long-term maintenance. Despite the challenges, the team believes a permeable framework offers the most potential for an assessment tool that is flexible and adaptable enough to serve the diversity of needs and interests of the GLAMR profession.

### Conclusion

This article posited the following questions:

- Q1. What defines *use* and *reuse* of digital content held by galleries, libraries, archives, museums, and repositories (GLAMR)?
- Q2. What differentiates *use* and *reuse*?
- Q3. What constitutes instances, examples and indications of *use* and *reuse*?

To address these queries, the researchers introduced the use-reuse matrix. The use-reuse matrix includes new, refined definitions for *use* and *reuse*, as well as the levels of engagement, which aims to provide further nuance when defining use and reuse. Examples of activities in either the *use* or *reuse* columns for each of the levels of engagement are presented as well. By articulating levels of engagement for *use* and *reuse*, the researchers make one of the first attempts to devise categorical types of *use* and *reuse* as well as to construct boundaries that can help practitioners classify *use* or *reuse* on a case-by-case basis. The researchers' adoption of permeability also invites other perspectives to inform and shape the future composition of the use-reuse matrix and its implementation.

Collectively, these efforts are important building blocks to establishing a foundation for D-CRAFT: an open access, collaboratively-developed toolkit that offers guidelines on assessing *reuse*. D-CRAFT will centralize documentation, templates and existing tools to assist GLAMR practitioners in the entire lifecycle of *reuse* assessment. The integration of the use-reuse matrix into D-CRAFT's design and intellectual framework aims to help GLAMR practitioners identify *reuse* and use vetted assessment methods to evaluate the value and impact of their collections.

### Notes

1. [www.icpsr.umich.edu/web/pages/ICPSR/citations/](http://www.icpsr.umich.edu/web/pages/ICPSR/citations/)
2. [https://osf.io/jr6n2/?view\\_only=051615eb39064426bf7b3a6c9d5e5af5](https://osf.io/jr6n2/?view_only=051615eb39064426bf7b3a6c9d5e5af5)



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**Further reading**

Thompson, S. and Reilly, M. (2018), "Embedded metadata patterns across web sharing environments", available at: <https://uh-ir.tdl.org/uh-ir/handle/10657/3072>

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