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Implementing a Quality Rating System for Legacy Digital Image Collections: A Case Study from the National Gallery of Art

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Abstract

The National Gallery of Art developed a systematic approach to evaluate and categorize its extensive digital image collection spanning 20 years of technological evolution. This study addresses the challenge of inconsistent image quality resulting from varying capture technologies and methodologies over time. A four-tier rating system was created based on comprehensive analysis of capture devices, technical specifications, and workflow documentation. The system enables efficient assessment of image suitability for different applications while providing clear guidance for re-digitization decisions. The implementation includes integration with the institution's digital asset management system, offering a practical framework that other cultural heritage institutions can adapt for managing legacy digital collections while maintaining current quality standards.

Current Challenges in Digital Collections

Digital imaging departments in museums are struggling with a thorny problem: how to evaluate thousands of images created over decades using different technologies and standards. At the National Gallery of Art, we found ourselves asking hard questions about our legacy digital files. Which ones are good enough for today's needs? Which should we reshoot? And critically - how do we communicate image quality to curators, conservators, and other colleagues who shouldn't need a degree in imaging science to understand if an image will work for their project? By digging into our collection of more than 125,000 digital assets, we developed new approaches for tackling these questions. Our imaging program, like many others, evolved from scanning slides and transparencies to using sophisticated digital cameras. Through this research, we created practical methods for assessing legacy files and clear ways to share this information with non-technical users. This paper presents our findings and offers solutions that other institutions can adapt to evaluate their own digital collections, improve quality control, and better serve their users - technical and non-technical alike.

Resolving Image Suitability Questions

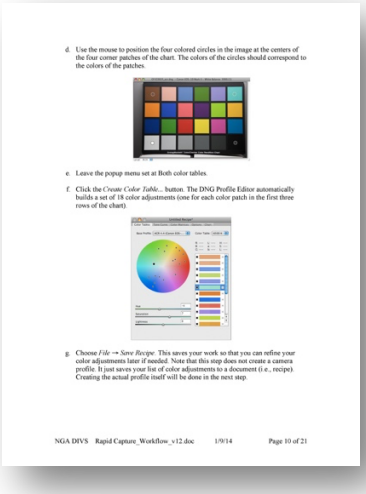
The primary challenge was the lack of a standardized method to evaluate and communicate the quality and usability of digital images for their intended use cases created over different technological eras. Early digitization projects produced thousands of images that often fail to meet current standards. Here at the National Gallery of Art, we found our users - curators, conservators, and public affairs staff - struggling to make informed choices about image files. Without clear quality indicators, they faced constant uncertainty about which files would work for their publications, presentations, and research. Our imaging team also lacked efficient ways to identify which artworks truly needed new photography versus which legacy files remained suitable. This gap between technical quality assessment and practical usability sparked our investigation into better methods for evaluating and communicating about our digital image collection.

Methodology

To effectively evaluate and classify the extensive collection of digital images created over two decades, it was essential to first establish a systematic method of assessment. This required careful consideration of both historical and current imaging practices, technical specifications, and workflow processes. The methodology needed to account for evolving technologies while providing consistent evaluation criteria across all image types. The following steps were developed to create a comprehensive evaluation framework:

Documentation Analysis

We cataloged all capture techniques used since the program's inception. This included documenting the transition from film scanning to digital capture, identifying specific equipment used in each era, and analyzing historical workflow documentation. This step was crucial for understanding the technological context of each image in the collection.


d. Use the mouse to position the four colored circles in the image at the centers of the four corner patches of the chart. The colors of the circles should correspond to the colors of the patches.

e. Leave the popup menu set at Both color tables.

f. Click the *Create Color Table...* button. The DNG Profile Editor automatically builds a set of 18 color adjustments (one for each color patch in the first three rows of the chart).

g. Choose *File → Save Recipe*. This saves your work so that you can refine your color adjustments later if needed. Note that this step does not create a camera profile. It just saves your list of color adjustments to a document (i.e., recipe). Creating the actual profile itself will be done in the next step.

NGA DIVS Rapid Capture_Workflow_v12.doc 1/9/14 Page 10 of 21

Figure 1. *Camera Profiling Workflow, Rapid Capture, 2014*

Key workflow details evaluated included:

- Color Calibration
- Studio Lighting
- Approval Process
- File Formats
- Post-Processing
- Conformance to *ISO 3664:2009 Graphic technology and photography — Viewing conditions*

Technical Assessment

Each capture device's capabilities were quantitatively evaluated using measurable parameters. Pixel dimensions were compared to determine resolution capabilities. Sensor specs helped identify potential image quality variations, including consideration of single-shot and multi-shot systems. When available, SFR measurements provided objective data about each system's ability to capture fine detail and edge definition.

For example, this timeline illustration (**Figure 2**) lists every camera used since 2004 (left column) and details:

- Which year(s) the camera was in use
- How many images captured on each camera
- Sensor dimensions (pixels)
- Single-Shot or Multi-Shot sensor
- Photo studios where it was used

Figure 2. *Camera Usage Timeline and Stats*

Photography Workflow Analysis

We examined photographer procedures and methodologies throughout different periods and for different types of art objects, identifying how varying workflows impacted image quality. This included evaluating capture techniques, color management practices, post-processing procedures, and any other relevant workflow steps.

For example, in the past our workflow included visual color corrections in post-processing, but it wasn't until approximately 2012 when we initiated a visual validation step by a second photographer. This extra validation made the image color more reliable and therefore, on average, higher quality.

Also considered were the monitors in use when an image was captured, the calibration process, and the calibration settings selected (**Figure 3**). Each of these factors affected how accurately we were able to perceive the image colors and details.

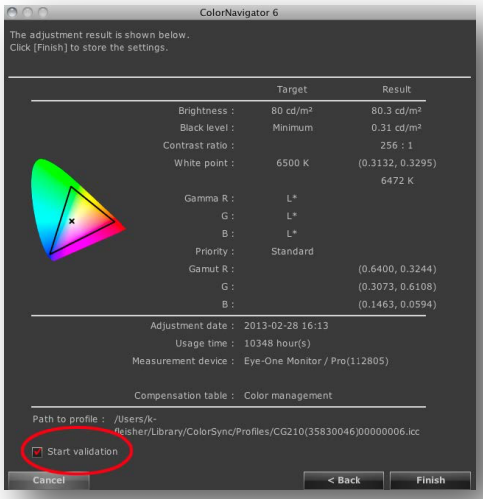


Figure 3. *ColorNavigator Monitor Calibration Settings, 2013*

Rating System Development

Based on the data gathered, we created a four-tier classification system. Each tier was defined by specific technical parameters and matched to appropriate use cases. The system was designed to be easily understood by non-technical users while maintaining sufficient technical detail for imaging specialists.

★★★★

File Specification

- 120 MB or larger (uncompressed RGB file size)
- 5000 x 7200 px or larger

Use Cases

- Web
- PowerPoint
- Printed Publications (12"x17" or larger at 300 ppi)
- Poster
- Murals
- Can be used for details

★★★☆

File Specification

- 50 MB – 120 MB (uncompressed RGB file size)
- 4000 x 5000 px – 5000 x 7200 px

Use Cases

- Web
- PowerPoint
- Printed Publications (max 11"x17" at 300 ppi)
- Poster
- Can be used for details (image dependent)

★★☆☆

File Specification

- Less than 50 MB (uncompressed RGB file size)
- Under 4000 x 5000 px

Use Cases

- Web
- PowerPoint
- Printed Publications (max 8"x10" at 300 ppi)
- Cannot be used for details
- Requires new photography for additional uses

★☆☆☆

File Specification

- Less than 30 MB (uncompressed RGB file size)
- Under 4000 px in any dimension

Use Cases

- Reference only
- Web
- PowerPoint
- Not suitable for publication
- Requires new photography for additional uses

Implementation

The final step involved integrating the rating system into the existing digital asset management infrastructure. This required developing clear user interfaces for communicating image ratings, filtering collection images based on image quality, creating simple documentation, and establishing protocols for rating new and existing images.

As part of our DAM, we have The Portal which is a subset of images in the DAM available to all NGA staff without need for a user account. The Portal provides a self-service image repository where staff can search, browse, and download high resolution images. For the initial implementation phase of our new image ratings, we focused primarily on images available in The Portal because these would provide the greatest direct benefit to NGA staff.

Based on the evaluation criteria, images were first segmented into groups that could be searched for and isolated within the DAM. Values for the new star rating were assigned in bulk to these image groups.

Once star ratings were assigned to images in the DAM, the next step was to expose that information in The Portal.

Figure 4 shows how a 3-star rating is included on the object page of The Portal immediately after the filename.

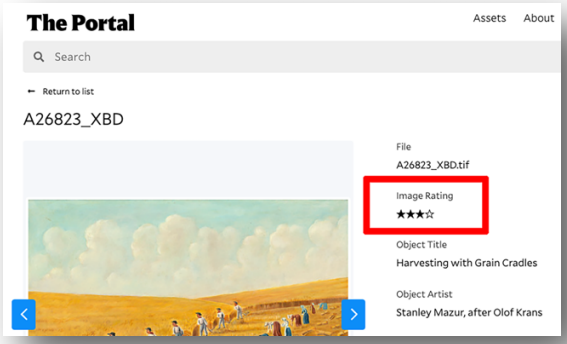


Figure 4. *Star Rating Display in The Portal*

As a final step, a new filter was added to The Portal so that users can restrict their search results based on their end use case. This prevents them from selecting images that cannot be used for their purposes. In **Figure 5**, the search results are limited to a 3-star rating.

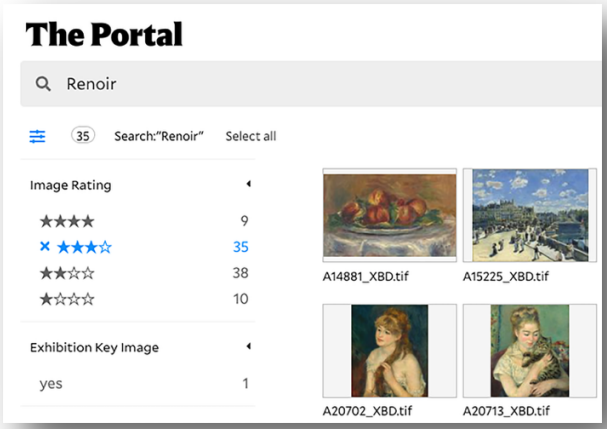


Figure 5. *Image Rating Filters in The Portal Search Results*

Results

Assignment of ratings was not 100% accurate. By grouping large sets of images based on criteria that was searchable in the DAM, it was inevitable that some images received an incorrect rating. We estimate that about 90% - 95% of the ratings are accurate.

For images that are not rated correctly, we evaluate those on a case-by-case basis as they become known. For example, images from a Sinar 54M were marked as 2-star images due partly to the sensor size (4080 x 5440 px) combined with other factors resulting from an early digital imaging workflow. This rating is correct for all single-shot images, but we neglected to account for artwork that was photographed in tiles and then stitched together to increase the effective resolution.

When we first encountered some of these images in production, we did a manual evaluation to determine that they should be rated as 3-star images and could be used for most use cases. Eventually, we decided to do a new search for all images captured with the Sinar 54M in tiles that were stitched for increased resolution and re-assigned them a 3-star rating.

Ultimately, the project resulted in the successful development and implementation of a four-star image quality rating system. Each rating category includes basic technical specifications and use case scenarios.

The image quality star rating system was successfully integrated into the institution's image portal, providing immediate quality assessment information to users. This has led to a reduction of inquiries about whether an image can be used for a particular project.

The implementation has streamlined decision-making processes for image selection and helped identify priorities for re-digitization efforts. By providing a quick assessment of existing files, it has become faster and easier to think about scheduling new photography for exhibitions. While individual file review is still necessary, it has also made scheduling new photography for outgoing loans easier.

Conclusions

This research provides a practical framework for evaluating and managing legacy digital collections that can be adapted by other institutions facing similar challenges. The rating system has improved efficiency in image selection and resource allocation for re-digitization projects. Key lessons learned include:

- The importance of comprehensive documentation of historical imaging practices
- The value of quantifiable technical specifications in quality assessment
- The need for clear communication of image limitations and capabilities to end users
- The benefits of systematic evaluation in preventing redundant digitization efforts

The methodology developed through this project offers a scalable approach that can evolve with changing technology while maintaining consistent evaluation standards. Future applications could include automation of quality assessment processes and direct integration with the digital asset management system.

The successful development and deployment of the image rating system was achieved through collaborative effort. Kate Mayo, Metadata Specialist, played an instrumental role by providing critical image statistics essential for the creation of image groupings. Furthermore, she developed the integration framework with our Digital Asset Management (DAM) system and executed the comprehensive update of all records with their corresponding ratings. The project was completed in approximately five months.

Author Biography

Kenneth N. Fleisher is a Color Scientist in Digital Experience — Imaging at the National Gallery of Art, Washington, D.C. He ensures color accuracy and file integrity in digital imaging workflows through equipment validation, staff training, and workflow documentation. He holds an MS in Color Science and a BFA in Photography from Rochester Institute of Technology.