

RIT American Museums Survey on Digital Imaging for Direct Capture of Artwork

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Abstract

More than 50 cultural heritage institutions from 21 states participated in the American Museums Digital Imaging Benchmark Survey. The survey was part of a research program at the Rochester Institute of Technology. It investigated the use of digital photography for direct capture of artwork within the nation's museums, libraries and archives. The survey was available online for a year. Facts and opinions were sought from those responsible for photography departments to learn the history, current status and future of digital imaging within the institutions. Composed of 78 questions, many multi-part, the survey carefully built a comprehensive picture of staff, equipment, software and workflow of the organizations and captured the attitudes of the respondents. The Mellon Foundation sponsored the project as part of an effort to assist the cultural heritage community in implementing and updating its use of digital imaging and digital images.

U.S. institutions and multiple surveys from the same institution were filtered out, leaving a total of 52 surveys from 21 states. The distribution from throughout the United States is shown in Table I.

The 78 questions of the survey took about one hour to complete. Participants included many of the major American museums, along with libraries, archives, imaging studios and consultants. That so many took the time to respond to the questions is testimony to a strong need and interest by photographic service providers for a better understanding of digital imaging. The community is looking for answers to the challenges of making initial image captures that are suitable for a wide variety of purposes and long-term documentation.^{5,6}

The survey questions were aimed at learning about digital imaging for direct capture of artwork. This included the digital photography of paintings and sculpture, but did not include scanning of photographic prints, negatives or chromes. Questions were divided into 10 categories as follows:

- I. *About You:* General contact information
- II. *More About You:* Respondent background
- III. *About Your Staff:* Staff backgrounds
- IV. *Use of Digital Photography:* Attitudes on the new technologies
- V. *Imaging Workflow:* Workflow details
- VI. *Digital Imaging Studio Setup and Equipment:* Descriptions of up to 5 studios
- VII. *Image Editing:* Workflow image modifications
- VIII. *Color Management:* Color control in workflow
- IX. *Digital Master Files:* Maintenance of archives
- X. *Final Questions:* Info. sources and comments

Table I: Breakdown of Responses by State

State	Respondents	State	Respondents
CA	6	MN	2
CO	2	MO	3
CT	3	NC	2
DC	3	NM	1
GA	2	NY	6
FL	1	OH	2
IL	1	PA	4
IN	1	TX	2
MA	6	VA	1
MD	2	WI	1
MI	1		
Total		52	

Introduction

The American Museums Digital Imaging Benchmark Survey went live on the RIT web site on October 20, 2003 and terminated a little less than 12 months later. The survey was designed to complement other worldwide efforts^{1,4} in deriving a comprehensive picture of how the cultural heritage community is using digital photography. Over the survey period, close to 60 responses were received. Non-

Responses

Survey Question 20 asked for the year that digital imaging was first used at the institution. Figure 1 is a histogram of the responses. Considering the slope of the cumulative frequency plot in Figure 1, 1995 appears to be the year that digital imaging began to see a considerable increase in cultural heritage users. Since that time there has been consistent growth. The timeline illustrated in Figure 1 is consistent with the growth of digital photography that

20. Year Institution Started Using Digital Photography

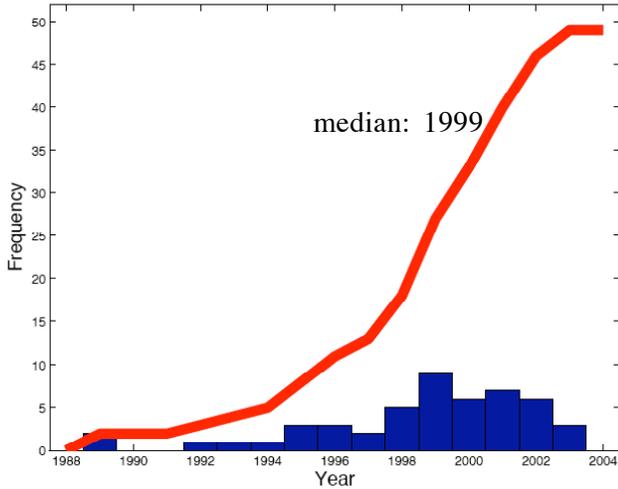


Figure 1. Histogram of the year institutions began use of digital imaging. Solid curve is cumulative frequency.

21. Percentage of Photog. Done Digitally Last Year

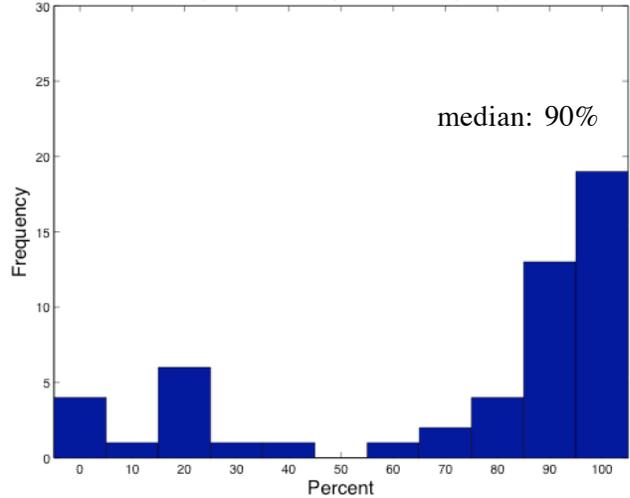


Figure 2. Histogram of the percentage of photography performed digitally last year.

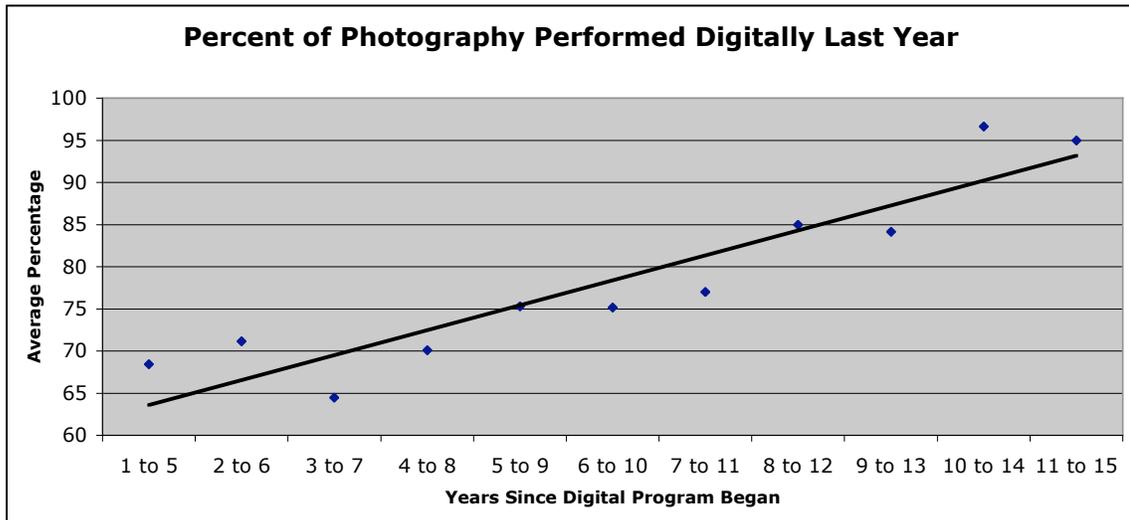


Figure 3. Comparing year of introduction of digital to the percentage of photography performed digitally last year. Trend line shows an average 3% growth per year.

occurred within commercial studios. In this respect, the museum community has been representative of the greater professional photographic market.

The Figure 1 histogram shows the median year of digital introduction to have been 1999. When asked for the percentage of imaging performed digitally in the previous year, a median of 90% was reported as illustrated in Figure 2. Over half of the 52 respondents performed at least 90% of their photography digitally last year demonstrating an extraordinary shift in an average of only five years.

Figure 3 shows average percentage of photography performed digitally last year compared with when digital program was initiated. The data show that within the first five years a majority of photographs was digitally generated. A 3% growth trend of digital usage per year is seen once digital photography is adopted.

Further documentation for fast growth of digital photography within these institutions: 49 of the respondents, 94% of the total, reported that they are increasing their use of digital photography; a count of 32 surveys, 62%, said their departments were investing in new equipment; 14 responses at 27% of the survey population describe recent new staff hires to support the digital photography programs; and 41% of the organizations, 21 in total, have applied for grants to support their transition to a digital workflow. Other indicators are that many reported that they were buying new software, that they were receiving requests for digital images from new users within the institution and that often these new customers came from departments not previously served by the photographic studios. Investment in staff retraining was commonly mentioned on the surveys.

Figure 4 looks at the relationship between length of photography experience and digital photography experience for individuals in the survey population. In that graph, respondents are grouped in five-year blocks according to how long they have been practicing photography. For each group, the average years of digital photography experience was calculated and displayed (dark curve). Separately, the average percentage of years spent in the digital medium was also calculated and displayed (light curve). The latter data shows that those who entered the photography field in the last 15 years have spent, on average, at least half that time using digital technology. There is a steep increase for those entering recently. Those who have five years or less experience have spent almost all of that time in digital photography.

Survey Question 13 asked whether the respondents felt they knew enough about digital imaging on a scale from 1

to 5 where 1 was assigned to "I do not know enough" and 5 to "I definitely know enough." 56% responded with a 3 or less. See Figure 5. This indicates that many have a perceived lack of knowledge about the new technologies. This may not be surprising since the population reported a median of only five years experience with digital photography whereas it had a median of just less than twenty years of overall photographic experience. On top of this, Figure 3 demonstrated a fast pace of digital adoption at the institutions.

It is encouraging that in spite of uncertainty, lack of experience and fast changes, respondents strongly indicated that they are at peace with the emergence of digital photography. This can be seen in Figure 6 where 75% chose one of the top two positive answers when asked for their comfort level with the digital direction.

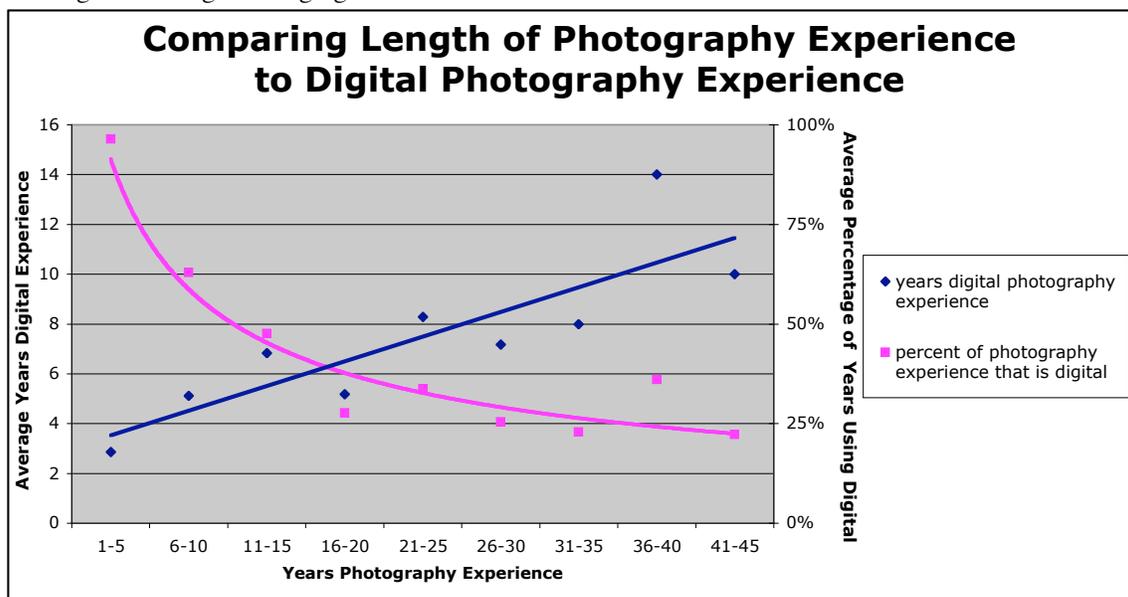


Figure 4. Comparing length of respondent's total photography experience with experience in digital photography. Average years of digital experience: dark diamonds, average percentage of photographic years spent with digital photography: light squares.

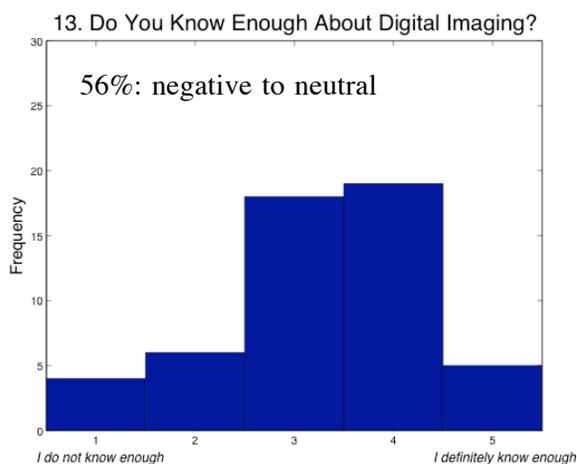


Figure 5. Histogram of respondent self-described knowledge of digital imaging.

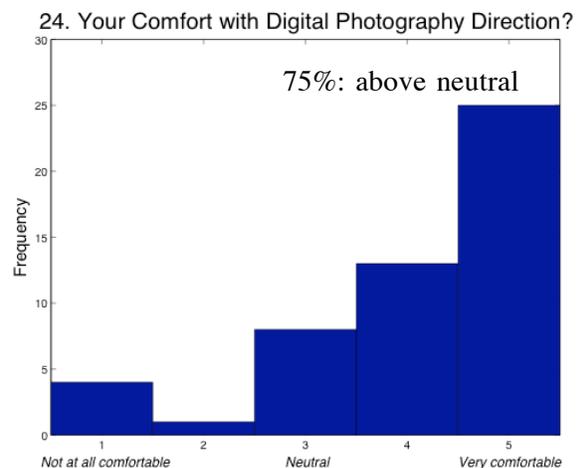


Figure 6. Histogram of respondent comfort with the institution's digital photography direction.

Table II summarizes the demands being met by digital photography within the museums, libraries and archives represented in the survey population. This is from Survey Question 30 at the beginning of the Section V workflow questions. While much of the purposes fall within traditional documentation and publication workflows, it is interesting to note that the largest responses were in areas not possible without digital images: making collections accessible over the Internet and placing images into a collections management system. Both categories were selected by close to 90% of the institutions as reasons for their use of direct digital photography of their artwork.

Table II: Reasons for taking digital images of the collection (Question 30)

Reason	Percent
To protect vulnerable originals from use	67%
To produce printed reproductions	78%
To make collection accessible over the Internet	88%
To include in a collection management system	87%
To document conservation treatment	60%
Other	29%

The survey left space for 5 complete studio descriptions from each institution. A total of 92 digital studio configurations were described. On examining the studio descriptions, the researchers divided them into the 3 categories of high-end, medium-level and low-end. Point-and-shoot systems fell into the bottom category. Systems that delivered the same or better quality than a traditional 4x5 studio camera were classified as high-end. All others fell into the medium category. Several systems were not sufficiently described. Studio system summary is found in Table III.

Table III Digital studio system categories (Section VI)

System	Number
High-end camera	53
Medium-level camera	27
Low-end camera	8
Camera not sufficiently described	4

Table IV lists the manufacturers of the cameras found in the high-end systems. At this time for American museum imaging departments, it appears that four manufacturers dominate the field: Better Light, Sinar, Phase One and Leaf. Only one of these companies, Sinar, comes out of traditional photography. The other three companies have been solely digitally based since their inception.

**Table IV: Dominant camera systems in high-end studios (Section VI)
scan=linear CCD, area=2-dimensional CCD**

Manufacturer	Number
Better Light (scan)	14
Sinar (area)	10
Phase One (scan)	9
Leaf (area)	7
Phase One (area)	6
Other/ambiguous	7

Although there is a small number of camera manufacturers represented on the list, there has been steady growth of museum digital studios. As the museum community continues to come together and understand its requirements for camera systems, those camera systems that most closely respond to such demands will likely find the marketplace open to them.

The calibration behavior of participants was also captured within the Section VI questions on the survey. More than 50% of the studios were described as following a regular calibration practice. Most indicated the use of a Gretag Macbeth Color Checker, either the traditional 24-patch target or the Color Checker DC. Other targets popularly mentioned in survey responses included the Kodak gray scale and the Kodak Color Separation target. Calibration frequencies ranged from "several times a session" to every 3 to 6 months. Although, as already mentioned, only approximately half of the studios perform calibration, 91% of the studios capture and save targets along with their artwork.

Sections VII and VIII included questions on processing applied to photographs once the cameras have delivered data to the system. Respondents were asked to describe manipulations made within their workflow. For Survey Question 49 with results illustrated in Figure 7, the following categories were used: *visual editing* defined as global changes such as contrast and color balance; *retouching* defined as local changes and *sharpening*. Most images produced by the survey community undergo some form of digital processing.

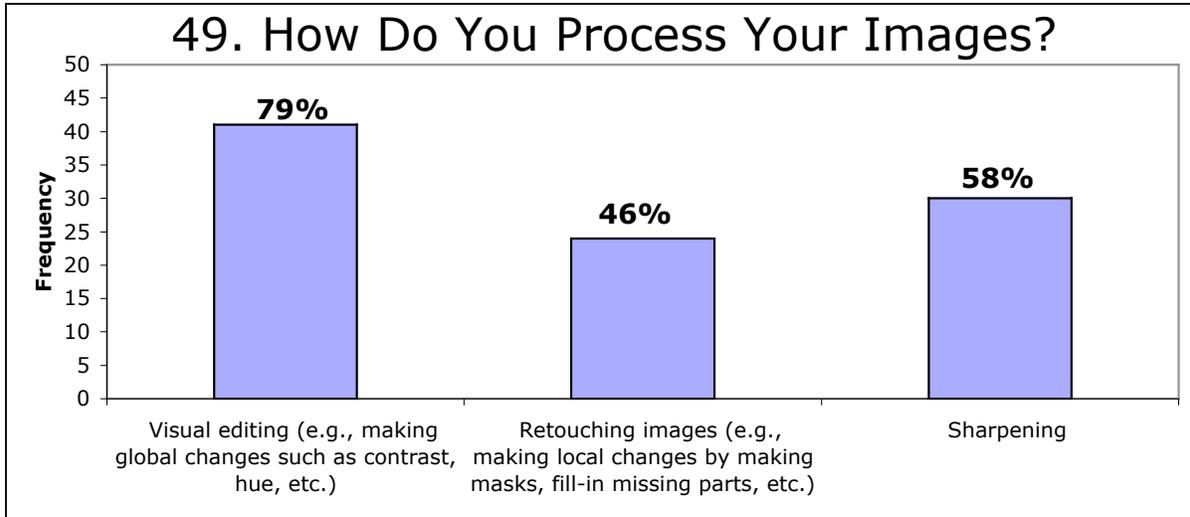


Figure 7. Histogram of ways in which images are processed.

Of great interest to the researchers of this study was gaining understanding of the manner in which these processes are applied. Most of the tasks are performed manually. Only 20% of the institutions reported any form of automated processing. Of these, seven of the institutions have developed these time savers by themselves. Without exception, all those using automated processing are still spending some time manually processing images as well, some for as long as 40 minutes on average per image.

Figure 8 shows a histogram of the amount of time spent in post-processing images by all institutions. The spread is wide. More than half spend an average of over 12 minutes per image with one out of five of the population investing an average of a half an hour or more to each image for post-capture processing.

54% of the respondents reported using color management. Of these, 80% said they built their own profiles. Only 14 of the 28 institutions that use color management reported using color measurement instrumentation to check the validity of their profiles.

Questions were answered concerning the choice of rendering intents, working spaces and storage color spaces. The most telling answers, though, were in response to the question of whether the respondents know enough about color management. A histogram of responses to Survey Question 14, “Do you know enough about Color Management?” is found in Figure 9. 52% categorized themselves as neutral to “I do not know enough.” It is worth noting that only 2 of the respondents gave themselves highest marks. This negative bias of respondents’ comfort with color management deserves attention within the community.

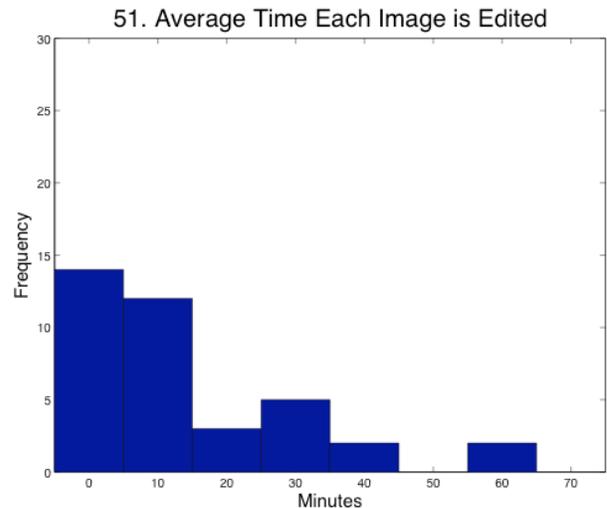


Figure 8. Histogram of average time spent editing images.

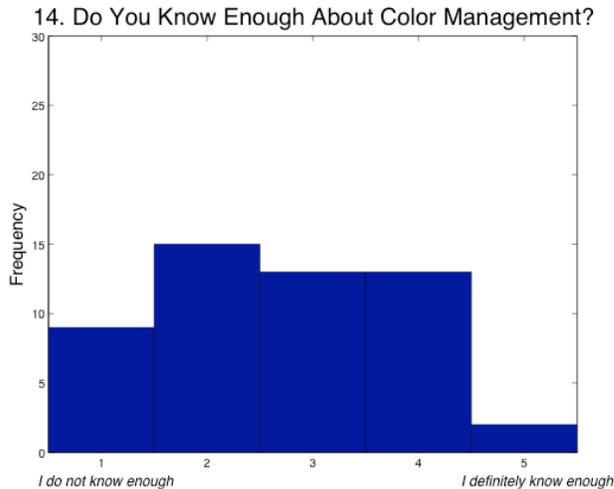


Figure 9. Histogram of respondent self-described knowledge of color management.

Conclusion

The American Museums Digital Imaging Benchmark Survey has proven to be a useful exercise for uncovering information about how the photography studios in U.S. museums, libraries and archives are using digital photography for direct capture of artwork. Most of those running these departments have five years or less experience with digital photography and yet over 90% of all photographs taken last year within these institutions were digital. Respondents showed they were still lacking knowledge about the new systems and about critical aspects such as color management, but that they are comfortable with the direction the technology is taking them.

A small number of camera manufacturers dominate the high-end of the field. One of the open questions on the capture side is the capture and saving of technical metadata. The results of this survey might help push forward solutions in this area since camera manufacturers need to know what the users are doing and need to implement automatic metadata capture in their systems.⁷⁻⁹ Many of the digital images taken are destined for traditional workflows but new purposes for these digital images are dominating their uses. In most cases images are being taken to be available for long-term use, making the correct capture and storage an even stricter requirement¹⁰.

Photographers are spending a tremendous amount of time editing and manipulating their images. A majority of respondents reported spending 12 minutes or more on each captured image with some institutions spending up to an average of one hour. It seems clear that there will be much to gain in improving the imaging process so that required quality is delivered directly, removing the need for such extensive post-processing time and effort.

In this short paper, only a small overview of the survey has been possible. A complete report on the survey and related research is available. Information on how to obtain the report can be found on the research website of the cultural heritage imaging group of the Munsell Color Science Laboratory at RIT, www.art-si.com.

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Biography

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