

CHAPTER 7

The MESL Experience versus Slide Libraries: Comparison and Analysis

Howard Besser and Robert Yamashita (eds.). *The Cost of Digital Image Distribution: The Social and Economic Implications of the Production, Distribution, and Usage of Image Data* (A report to the Andrew W. Mellon Foundation), Berkeley: UCB School of Information Management & Systems, 1998.

Caveats for Cost Comparison

Any attempt to compare the cost of existing analog systems to those of emerging digital environments must be qualified by caveats and disclaimers, and our study is no exception. We can be much more definitive in statements about a process that has reached maturity (analog slide libraries) than we can about processes that are still experimental (digital image distribution).

Here are some of the background reasons for caution when using the MESL data:

- Our digital data comes from a prototype project, while our analog data comes from a set of ongoing operations.
- MESL was an experimental project. It began at a time when many of the underlying software and architectures that it needed were immature. MESL implementers had to spend an inordinate amount of time developing or fixing software or processes, many of which are now either available as off-the-shelf software or as well-known best approaches to solving a problem.
- Much of the first year of MESL was spent solving problems, so first-year costs are undoubtedly higher than ongoing costs would be for continuing to follow the same procedures. Second-year costs are probably also higher than third-year costs would be if everything continued to be done the same way. But we can expect that technological changes will cause a periodic revamping of the way things are done, and costs would probably increase each time this happens. Therefore, we view MESL second-year costs as reflective of ongoing annual costs, and use those figures in our calculations.
- The MESL project chose a distribution scheme in which a central site sitting between the museums and universities had only rudimentary responsibility for error checking and forwarding the data to the universities. Follow-up projects currently underway model a much more significant role for a central site, including direct delivery to end users. We have tried to examine the costs in a way that is as amenable as possible to different models, but we are hampered by the fact that we only have data from the MESL model.
- The MESL project was composed of voluntary participants, and there were no financial incentives or penalties to encourage activities or the meeting of deadlines. Though there was clearly a strong commitment from some administrators and staff, few staff were formally assigned to work on MESL for a fixed percentage of time. So a number of tasks that might have benefited the project as a whole were either not undertaken or not completed.
- Analog slide libraries provide a valuable set of services that digital projects such as MESL are not likely to duplicate. For example, their content and services are responsive to local needs and they react quickly to changing needs. They also require a far less complex technological infrastructure than digital distribution schemes.
- One way to compare these two distribution models is to examine costs per image. However, we realize that this method can be problematic, because it is impossible to accurately compare per-image costs between the analog and digital distribution systems. Much of the cost of each of these systems is in the type of overhead that remains constant across a large number of images, but then can suddenly jump dramatically. For example, a site can add tens of thousands of images to the collection before suddenly having to add a new staff member, an extra room, a new fileserver, or higher bandwidth. Spreading this overhead cost across the collection to yield a

per-image cost does not reflect the sporadic and sudden changes in these overhead costs. And spreading overhead costs into per-image costs is particularly misleading when the two distribution systems we are comparing have such a wide disparity in collection size. The average analog slide library we studied had 285,000 images in its collection, while MESL had only 9,110 images (see Table 1). Fixed overhead costs spread among a collection as small as MESL can unfairly impact the per-image cost.

Image Collection Type	Average Collection Size
Analog slide library	285,000
MESL	9,110

Table 1—Image Collection Size

In addition to the general warnings about comparing MESL costs to analog costs (stated above), we must also warn about the specific slide library data gathered for this study. Technical procedures at each institution differed markedly, and accurately assessing the cost of any particular task was problematic for some of the following reasons:

- For many tasks, there was a wide variation in effort involved just within a single institution. For example, one slide might be cataloged quickly while another might first require extensive research. (We saw similar phenomena in museum collection management records, whose creation times varied from 30 to more than 180 minutes each.) Calculating an “average” amount of time could be misleading, because such figures can be easily skewed by higher proportions of “difficult” or “easy” slides.
- The amount of time spent on certain tasks differed markedly between institutions. In the area of cataloging, for example, some slide libraries reported spending an average of as much as 16 minutes gathering data for a purchased image, while others spent as little as 3 minutes. In the same cataloging process, one institution spent 7 minutes entering the data into a database and 1 minute on filing. In contrast, another institution reported 1 minute for entering data into their database and 10 minutes for filing.
- A single person often performed multiple tasks simultaneously (such as handling security while labeling slides, or researching text data for several groups of slides at once). This makes it difficult to parse out the exact cost of performing each task.¹
- Recognized techniques for dealing with any one of the three issues listed above can lead to problems with the others. For example, asking an individual to keep careful records of the time spent on each individual sub-task can help parse costs between tasks. However, unless this is done over a prolonged period of time (not possible in this study due to time constraints and cooperation of participants), this assessment would be heavily weighted by groups of similar images (both “easy-to-catalog” and “difficult-to-catalog” images tend to come in large batches). In most cases our methodology has involved calculating the total time spent on a particular task and dividing this by the total number of images. This technique naturally skews any summary

¹ The different ways of parsing out costs between these tasks could be misleading. (Using the security/labeling example: Tracking the actual time spent labeling would lead to a high figure because full attention would not have gone into that task. Any figure less than the full time spent sitting at a security desk would not reflect that someone needed to be present to protect the collection, yet assessing full cost of security plus the full cost of labeling would lead to a false impression of how slide libraries spend their scarce resources).

number toward the mean and gives greater significance to a particular class of images. For example, architecture images of building details (e.g. windows from a particular angle) often require more time to catalog. This problem also exists for many art and art history collections as they are forced by their users to gather images that provide context for a particular art work. The methodology also ignores distinctions in practices between institutions. For example, collections specializing in architecture report significantly higher times to accomplish the same tasks than do art and art history facilities. However, because there are statistically fewer numbers of these kinds of collections, their requirements get diluted. The same is true in mixed art and architecture collections, where more of the images are used in art and art history courses.

- Analog slides come from three basic sources: purchasing, copy photography, and gifts. Though the cost of preparing each of these kinds of acquisitions for users varies tremendously in the areas of acquisition, cataloging, and handling, some slide libraries were not able to divide the costs between types (such as the difference between cataloging gifts and cataloging purchased slides). For practical purposes our summary tables have included a *weighted* average (34% purchase, 54% copy photography, 12% gifts). However, many slide libraries purchase few slides, while others do only minimal copy photography, and the collections we studied showed significant variance in the percentage distribution among these categories. (For example, one collection acquired 75% of their images from purchased sources, and only 15% came from copy photography. In contrast another site acquired 80% of their collection via copy photography, and only acquired 15% through purchase. Still another site acquired 27% of their images through gifts). Therefore, the *weighted* averages might be misleading for managers of collections whose acquisitions are heavily skewed towards one source (purchase or copy photography).

There were also serious limitations to data gathering of cost information in both the MESL Project and in the slide libraries. The institutions involved in this study often used different units of measurement, and sometimes only had access to portions of cost information.

- In most cases, we did not have access to information about salary levels. Salaries for similar job titles vary widely from institution to institution. A given functional responsibility may be assigned to very different job titles at different institutions, each having significantly different pay scales. (The latter poses an even more acute problem for measuring the cost of an experimental project like MESL, where existing staff temporarily assigned to the project carry job descriptions and salary levels based upon their previous work.) For this cost comparison we have measured cost in terms of staff hours spent, without regards to salaries.
- Cost reporting during the MESL Project focused on hours spent by staff in both museums and universities, and on actual purchases and materials (for software, scanners, notebooks, etc.) within the universities. Figures for museum purchases were unavailable.
- In general, reporting of auxiliary costs (for supplies, materials, and anything else beyond salaries) was inconsistent between institutions. We do not feel that these costs are very reliable, and for the most part will concentrate our study on the number of hours worked within the various cost centers.

The data we show here is really just a rough approximation of costs. We know it will be useful to many institutions, but anyone using it for planning purposes must recognize its limitations.

Comparing Analog Distribution Costs to MESL

To compare the MESL experience to the analog environment, we have both aggregated and subdivided some of the cost centers discussed in the museum and university studies (Chapters 2 and 3), and developed a new orientation of the data as shown in Table 2. In each category we have totaled both dollar expenditures and time (in minutes), as reported in the MESL Technical Reports and the slide library survey, and have divided each of these by the number of images handled. Dollar figures refer to miscellaneous monetary outlay, and do not incorporate the wages involved in the time expenditure. As we have pointed out before, production-level slide libraries are quite different from the experimental MESL project, so categories in either environment do not precisely map into the other environment.

The *ongoing* category refers to activities that a museum was likely to engage in irrespective of the MESL project (such as creating collection management records). The category *getting images to a university* reflects the per-image dollar and time expenditures for a MESL museum to prepare and reformat existing image and text data and send it off.² For analog slide libraries this category reflects the dollar and time expenditures to acquire a slide.³ *Processing* involves work done to prepare the works or metadata for distribution. In MESL this consisted of aggregation and rudimentary error-checking at the Michigan central site, and for slide libraries this involved putting slides into new mounts.⁴ *Cataloging* involves the slide library researching the images and developing descriptive and access metadata. The *database* category reflects the work done to prepare the metadata for user access. For MESL universities this involved processing the images and converting and indexing the metadata into a form needed by their deployment system, while in the slide libraries this involved getting the slides ready to file (including data entry of cataloging information and creating slide labeling). For the MESL universities, *deployment* revolves around the creation of functionality for users, while for slide libraries this consisted of the initial filing of the slide and any accompanying text records. *Security* consists of the various efforts aimed at preventing unauthorized use of the materials, theft, etc.⁵ The *usage* category reflects costs related to dealing with public use; for MESL universities this involved training and outreach, while for slide libraries this involved re-filing of slides.⁶

² **Please Note:** This category only reflects reformatting and processing costs. It does *not* reflect the significant cost of descriptive text development, nor the cost of scanning.

³ These figures reflect a combination of expenditures for both purchased slides and copy photography, as well as for gifts.

⁴ Note: This figure reflects the cost and time to remount, but not all slides acquired are remounted.

⁵ No MESL universities implemented security beyond simple IP address controls during the first year, and less than half of them implemented significant security during the second year. Some slide libraries station staff at entrances for security purposes, but did not report those costs.

⁶ Slide library data did not include information about user training and orientation costs.

		MESL		Analog	
MUSEUM ONGOING (irrespective of participation in an experimental image distribution project)		Time per Image (in minutes)	Cost per Image	Time per Image (in minutes)	Cost per Image
Creating Collection Management Records		30-180+	Not available	Not applicable	Not applicable
Rights Clearance		30-480			
GETTING IMAGES TO A UNIVERSITY					
Museum Selection	Acquisition	0.83	Not available	4.9	\$3.25
Museum Image Preparation		11.84			
Reformatting and Sending		3.51	Not available		
PROCESSING					
Organizing the Data or Works for Distribution [Michigan Central Facility]	Remounting and Labeling Slides, etc.	3.24	Not available	12.0	\$1.16
CATALOGING					
	Slide Cataloging			13.12	\$2.91
DATABASE					
Image and Data Preparation	Data Entry for Slide Cataloging	3.27	\$0.64	7.0	\$1.83
DEPLOYMENT					
Creating Functionality for Users	Initial Filing of Slide and Associated Records	5.45	\$1.12	5.0	\$0.37
SECURITY					
collection		1.66	\$0.48	infinitesimal	\$0.01
circulation				0.63	\$1.72
USAGE					
Training & Outreach		5.15	\$0.75	Not available	Not available
	Re-filing slides	Not applicable	Not applicable	0.97	\$0.12
Approximate Summary Cost (ignores other required time, e.g. administrative time, meetings, etc)		94.95-694.95	\$2.99* *missing data	43.62	\$11.37
Comparable Cost Data (adjusted for categories where data is incomplete)			2.99		\$2.33

Table — analog digital Image Distribution Comparison e age Co t Time S ent e Image

The categories in Table 2 reflect the chronological order of the activities and locations within the MESL project. The *ongoing* category reflects activities that took place in the museum before MESL began. The *getting images to a university* category took place at each MESL museum. The *processing* category took place at MESL’s Michigan central facility. The *cataloging* category did not exist within the MESL Project, and was really subsumed within the collection management records which the

MESL museums had created prior to MESL. The *database*, *deployment*, *security*, and *usage* categories took place within the MESL universities.

Analog slide libraries usually perform their tasks in a different order than the MESL participating institutions did. An analog slide library usually handles *acquisition* and *cataloging* closely together. They then remount the slide and enter the cataloging data (*process* and *database* categories) to prepare for the slide to enter the collection. They then *deploy* it by filing the image and metadata into the appropriate places. And, for slide libraries, *security* and *usage* are ongoing activities.

The figures in Table 2 are useful for mapping the MESL and analog processes to one another. But the figures in this table can lead to some confusion, as some of the costs that have been mapped into per-image costs are really more like overhead costs. And spreading overhead costs among the 9,110 MESL images is very different than spreading costs among 285,000 images in a slide collection. To make more sense, the figures in Table 2 have been split into two other tables: Table 3 shows ongoing costs that really are best measured on a per-image basis; Table 4 shows costs that are better measured as overhead costs (because the total costs in each of these cost centers remain the same even if more images are added). But one should keep in mind that though the costs shown in Table 4 are not particularly elastic with collection size (i.e. number of images), some of these costs tend to be very elastic in relation to the number of users. (For example, the cost for training and outreach varies according to the number of users, not according to the number of images in the collection.)

		MESL		ANALOG	
		Time (in minutes)	Cost	Time (in minutes)	Cost
MUSEUM Ongoing (irrespective of participation in an external image distribution project)					
Creating Collection Management Records		30-180+			
Rights Clearance		30-480			
GETTING IMAGES TO A UNIVERSITY					
Museum Selection	Acquisition	0.83	Not available	4.90	\$3.25
Museum Image Preparation		11.84			
Reformatting and Sending		3.51	Not available	0	
PROCESSING					
Organizing the Data or Works for Distribution [Michigan central facility]	Remounting and Labeling Slides, etc.	3.24	Not available	12.00	\$1.16
CATALOGING					
	Slide Cataloging			13.12	\$2.91
DATABASE					
Image and Data Preparation	Data Entry for Slide Cataloging	3.27	\$0.64	7.00	\$1.83
DEPLOYMENT					
	Initial Filing of Slide and Associated Records			5.00	\$0.37
USAGE					
	Re-Filing Slides			0.97	\$0.12
Total Cost per Image		83-683	\$0.64* *missing data	42.99	\$9.64
Total Cost per Image Less Museum Ongoing Costs		22.69	\$0.64* *missing data	42.99	\$9.64
Total Cost per Image for Acquiring an Image and Putting It Into Distribution		22.69	\$0.64* *missing data	42.02	\$9.52
Comparable Cost Data (adjusted for categories where data is incomplete)			\$0.64		\$2.32

Table — analog digital Image distribution Comparison cost time entire image total
o e ea

As Table 3 shows, when one removes overhead costs, the per-image time cost of MESL distribution was approximately double the per-image time cost of a slide library (83+ minutes versus 43 minutes), and miscellaneous per-image expenditures were only slightly lower (\$0.64 versus \$2.32) when adjusted for incomplete data. Slide library costs appear to be mainly in the areas of cataloging,

acquisition, data entry, and filing. Although most of these costs disappear in the MESL model, new costs arise, mainly in the conversion and error-checking processes, as well as the very substantial (and expensive) ongoing process of maintaining collection management records and clearing rights.

Key cost differences between analog and digital center around acquiring the image and putting it into service. Analog images are acquired individually or in small batches, and each must be individually cataloged. The MESL images were acquired in two very large groups, and came complete with cataloging information. The MESL images cost nothing to acquire, while, as Table 3 shows, the analog slides cost an average of \$3.25 each (and the analog acquisition process took almost five minutes per slide). In a production-level digital distribution system, the cost for universities to license digital images will certainly cost something more than \$0.

It initially appears that MESL per-image costs are more than double that of an analog slide library. However, when one removes the museum’s cost for rights clearance and collection management records creation (processes museums may need to do anyway), the per-image time devoted to MESL drops to about half the time of acquiring an analog slide and putting it into distribution. (See Table 3, “Total Cost per Image Less Museum Ongoing Costs”.) This would suggest that, if all the other problems cited above were overcome, a digital distribution model might support a modest cashflow back to the museum to help defray the cost of rights clearance and developing collection management records. But if this cashflow comes in the form of a licensing fee, one must be cautious in figuring an annual fee that is essentially replacing a one-time cost.

But while per-image digital distribution⁷ costs may be lower, fixed overhead costs for MESL were substantially higher than for analog slide libraries (see Table 4). (And the figures listed here do not take into consideration essential infrastructure elements such as network installation and classroom projectors.) Though some of the costs for security and creating functionality are start-up costs, changing technology and evolving user needs will likely result in substantial ongoing costs in these areas. Running a digital project requires a much more complex installation than running a slide library. Digital delivery systems need ongoing technical support and much more sophisticated user training than do analog slide libraries.⁸

Tasks	MESL		Analog	
	TIME (in hours)	Cost	TIME (in hours)	Cost
DEPLOYMENT				
Creating Functionality for Users	2054	\$10,247		
SECURITY	258	\$4,410	405	5,633
USAGE				
Training & Outreach	381	\$6,835	None reported	
TOTAL	2693	\$21,492	405	5,633

Table — analog digital Image Distribution Comparison: Total Cost Time Sent at
an e age n i e it

⁷ MESL University deployment is an overhead cost, not a per-image distribution cost. This type of deployment involves creating a set of tools that are needed, and that total costs within that cost center do not change if more images are added to the system.

⁸ Even though no costs for slide library training and outreach were reported, costs in this area would be extremely small when compared to the cost of training and outreach for a digital distribution system.

The area of greatest savings in the digital distribution domain arises from the fact that individual MESL images were not locally cataloged. Slide libraries spend about 20 acquiring and cataloging text data for each image. One of the key benefits from MESL distribution was not specific to a digital system (and could even become part of an analog distribution model)—the acquisition of cataloging information directly from the museum. Copy cataloging in libraries has shown that acquiring cataloging information from a central source can save cost and effort locally. But the lack of local cataloging information may be a barrier to user adoption of a digital system.

A key element that this monetary comparison ignores is the issue of user functionality. Today an analog system offers greater functionality, but someday this functionality may be greater in a digital system. Another element that must be considered in any comparison is that slide libraries make initial investments in acquiring and cataloging a slide, but thereafter that slide remains in their collection, only incurring filing and storage costs. Most digital distribution schemes, on the other hand, involve annual ongoing costs for licensing, as well as the potential cost of loss of access to some material that might be withdrawn by the licensor.

Future Digital Image Distribution

Although MESL was only an experimental project, it is clear that production-level image distribution schemes will follow. Currently, two such schemes that grew directly out of MESL are underway: the Art Museum Image Consortium (AMICO), sponsored by the Association of Art Museum Directors, and the Museum Digital Library Collection (MDLC), sponsored by the American Association of Museums. In addition to these emerging digital distribution consortia, commercial entities such as Corbis, Inc. are attempting to provide a smaller set of services to a much broader market.

We have cautioned against viewing digital distribution schemes as replacements for analog slide libraries. We believe that, for a variety of reasons, universities will begin to employ digital distribution schemes. We think that, for at least the next decade, these distribution schemes will exist alongside analog slide libraries. Administrators want to know what kind of costs to expect from distribution. Below, we will first examine conceptually how the costs incurred in analog slide libraries map into the expenses for a digital distribution scheme. We will then look at likely models for digital distribution schemes and which institutions might be responsible for the various necessary technical functions within these models. Finally, we will explain the hybrid analog/digital distribution models we are likely to see at universities over the next decade.

Slide Library	Digital Distribution Scheme
Acquisition, capture	Licensing
Cataloging	Supplied metadata, local cataloging
filing	Disappears for records coming from a single remote source. New unknown costs will arise if records from multiple sources (including local) are merged.
Re-filing	Disappears
Replacement	Subsumed in licensing cost
Storage cabinets, physical space	Disk drives, networks, maintenance
Security personnel	Purchase/development of protection software, maintenance of user authentication

Table — e e t e n i e i t a n a l o g C o t o i n a d i g i t a l i t i b t i o n o e l

In examining the slide library cost centers discussed in Chapter 4: **The Cost of Digitizing Analog Image Bibliographic Slides**, it is clear that a number of these university costs would be transformed in a digital distribution model (see Table 5). Acquisition and capture costs would be replaced by licensing costs. Re-filing costs would disappear. Cataloging costs would diminish if the metadata supplied by the digital distributor were similar enough to local cataloging standards (which was not the case during the MESL project). The cost of physical storage cabinets and floorspace would be replaced by the cost of disk drives, networks, and maintenance. The personnel cost for security would be replaced by capital outlays for protection software and ongoing maintenance costs for user authentication. Replacement costs for worn or damaged slides would disappear (and likely be absorbed into the licensing cost).

Cost Centers/Functions	MESL	Proposed Digital Distribution Schemes
Content selection	Museum	Museum/Consortium
Image preparation	Museum	Museum
Image transmission	Museum	Museum
Data preparation	Museum	Museum
Data transmission	Museum	Museum
Aggregation	Central Site	Consortium
Integration of museum data	not really done	Consortium
Image delivery preparation	University	Consortium
Structured data delivery preparation	University	Consortium
Unstructured data delivery preparation	University	Consortium
Delivery functionality	University	Consortium/University?
Delivery security	University	Consortium/University?
Delivery log files	University	Consortium
Delivery outreach	University	University?
Delivery usage training	University	University?
Delivery technical development	University	Consortium

Table 5 — Location of Cost Centers in Digital Distribution Model

It is clear that MESL’s organizational division of labor will not be repeated. Both of the emerging digital distribution consortia that grew out of MESL anticipate delivery systems that are different from MESL but similar to one another. A key feature in both plans is the elimination of duplication of effort. In MESL, each university had to build an individual delivery system, and then process and mount images and text. Both consortia plan to engage in these activities only once, either at a central site (AMICO has chosen the Research Libraries Group for this) or through a limited number of distributed repositories (MDLC).

Table 6 shows where the various cost centers were located in MESL, and where they will likely be located within these emerging digital distribution consortia. Most cost centers that previously resided in the museums will continue to reside there, but most university cost centers will migrate to the consortium, and the universities will pay the consortium a fee for this service. At this point it is unclear where the responsibility for certain types of costs (such as outreach, user training, security, and development of additional functionality) will lie.

	Average Collection Size	Average Annual Acquisition Rate
Analog Slide Library	285,000	2.42%

Table —Collection Size and Annual Acquisition Rate

It is clear that analog and digital distribution models will have to exist alongside each other for many years to come. As shown in Table 7, the average size of the analog slide collections we studied is 285,000, and these collections grow at a rate of about 2.5% per year. Even if the emerging digital distribution consortia grow by an ambitious figure of 50,000 images per year, it will still take them six to seven years to reach the size of an average analog slide library (which by then will be more than 15% larger).

An even more critical issue than the number of images available from a consortium is which images are available. The corpus of images in analog slide libraries has developed in response to faculty teaching and research needs. But the number of sources for those images is orders of magnitude larger than the membership of the emerging digital consortia. It is likely to be a very long time before the domain coverage offered by these consortia approach the coverage of existing analog slide libraries. And, considering changing tastes and local needs, it is doubtful that any consortium will ever be able to deliver all the images that most instructors need in order to teach. This raises a compelling argument for local mounting of supplementary material in digital form, but we don't yet know how to transparently integrate local content with images remotely accessed from a consortium. Until that research problem is solved, analog images will have to be used to fill in the gaps.

As we have seen in Chapter 6: **Academic Reaction to Teaching with Digital Images**, faculty will resist teaching with digital images unless they have adequate infrastructure and support. It will be many years before enough digital labs and classrooms are conveniently and commonly available to all academic departments and units. More importantly, there will be a significant time lag before tools are developed which will let faculty members prepare lessons with digital images as easily as they can with slides. And it is unclear whether a consortia delivery scheme will inhibit development of special tools (for organizing, analyzing, and presenting digital images) that individual faculty members may need. As seen in MESL, the cost of developing an "adequate" user interface was a significant percentage of the cost of deployment. The MESL interfaces were little more than access points to the images (the digital equivalent of going to a drawer and taking out a slide). Developing integrated tools that permit selecting, manipulation, and presentation of a useful set of images requires entirely different work. Finally, if using digital technologies in the classroom is really a goal, specific interactive tools (for example, those developed at Maryland under their ISIS system) would be required. More importantly, there would be a need to develop simple ways to customize consortia images for online syllabi, readers, study guides, etc.

Though it is clear that digital distribution schemes will not replace analog slide libraries anytime soon, maintaining parallel analog and digital distribution schemes will be a costly endeavor. We have serious concerns over the sustainability of parallel systems for any significant transition period without doing serious damage to services. However, it is clear that more image repositories are beginning to explore participation in such schemes.

Future Research

A number of issues around digital image distribution schemes will require further research. This study has identified a number of areas for exploration, and as activity increases in this domain, even more research areas will emerge.

- While this study examined the MESL experimental system, future studies need to examine real operational systems like those being developed by AMICO and MDLC.
- While the likely future digital distribution models (employing a limited number of distribution sites) are likely to be far more cost effective than the MESL model (an independent distribution system at each university), universities will still need to supplement images and text coming from a centralized source. A major research question is how to integrate information from a remote database with locally supplied information in a way that is invisible to the user. This research should investigate how to implement transparent searching across multiple collections, transparent integration of search results, and the ability for locally generated descriptive information to augment and modify descriptive information coming from a remote database.
- What do faculty really need in order to begin widespread teaching with digital images? This study has pointed to some preliminary answers from faculty stating what they thought they and their colleagues needed (without budgetary responsibility for the university resources that would need to be deployed to satisfy those needs). Future research needs to examine what faculty might really want (or be willing to settle for) if they have to face hard economic choices.
- How is teaching like to change as digital image resources become more available? There is a good chance that that availability of digital images will offer opportunities for improving education, and for making more coursework accessible to a greater number of people. The examination of changes to the instructional process would be an area worthy of further inquiry.
- Can tools be developed locally that will augment the delivery and presentation capabilities of the emerging digital distribution consortia? Faculty are likely to need powerful yet easy to use tools to sort through and reorganize images, prepare them for presentation to the students, build thematic web pages, etc. How will locally produced tools be integrated with these digital delivery systems?
- With each museum providing its own cataloging information, how will we solve the vocabulary control problem? Though the MESL data dictionary tried to ensure that museums mapped their collection management records into common fields, there was a great deal of irregularity in how these records were retrieved as part of user searches.⁹ MESL did not even begin to tackle the enormous problem of differing approaches to controlled vocabulary within a field. Research needs to explore solutions ranging from term expansion to conceptual mapping.
- At many different levels (from vocabulary control, to file formats, to the integration of user interfaces with databases and tools for manipulation) standards and common practices need to develop. How will these relate to standards in other fields? Who will build initial prototypes and testbeds and evaluate their utility? Who will take the lead in bringing the right parties to the table?

⁹ Besser, 1997b: 317-325; republished in Bearman and Trant, 1997:50-58.

Conclusions

In examining university use of digital images, it is important not to ignore the great value of museum descriptive information. We believe that perhaps the most important thing that the emerging digital image consortia can provide to universities is the rich set of information about their objects.

Digital image distribution does not currently appear to be cost effective for universities when compared with existing analog distribution schemes. While the per-image cost to universities appears viable, the overhead and infrastructure needed to support digital image distribution is significantly higher than that needed to support an analog system. But as costs diminish and as other university activities begin to share the infrastructure costs, these types of schemes are likely to become more viable.

Key per-image savings to universities from digital image distribution consortia are likely to come from the receipt of museum collection management information. Though there are still some serious questions whether this information can be an adequate substitute for what faculty currently use in analog slide collections, this particular cost center holds the potential of offering a great deal of cost savings. We offer an analogy of effect of computerization on library cataloging. With the advent of automation (and copy cataloging), most of the cost of cataloging was not entirely eliminated, but shifted from the local site to an external centralized spot. Because an individual book was not repeatedly cataloged at different sites as before, this greatly reduced the overall total costs among all members of the system. But the actual cost of cataloging a book was not reduced; the cost savings came because the same book was not repeatedly cataloged by each site. It's also interesting to note that most sites continued to have a cataloging cost for each book—the cost of finding the centralized copy cataloging and, if necessary, adopting it to local needs. So with the advent of copy cataloging, the cost of original cataloging shifted to a central site, leaving a greatly reduced cost of copy cataloging at each individual site. Of course this process only worked for items that were held by multiple sites (and the total savings to the system was greatest for items held by a wide number of sites).

We do not believe that the emerging digital image distribution consortia can financially sustain themselves from the university market alone. Possible scenarios for subsidizing this activity include museum contributions because museums view this activity as part of their mission; leveraging the cost of a university distribution system by using the same system to deliver individual images to the museum's traditional high-paying analog image customers (advertising agencies and pre-press operations); encouraging the production of added-value products which incorporate the images and metadata; and managing the sales of these to K-12 schools and individual consumers.

Even though there may be similarities between digital images and previous forms of image surrogates, it is important to note this fundamental difference: digital images are available remotely. Previous transitions to new media have not altered the need for physical space to house a collection and a set of personnel to staff that space. Yet if there were a complete conversion to a fully digital world, there would be no need for physical staffing of a circulation facility since there would be no items to "check out", nor would there be a need for a large physical space to house this type of surrogate. However, in a digital environment, physical space does not completely disappear; its use simply gets "reassigned" (in the form of online storage costs, server space, and workstation labs for accessing the material). A digital environment would still require staff for both user training and technical support (critically important in a digital environment, but may be handled centrally for an entire university campus). Staff might also be needed for image selection and collection

management, or these functions may be ceded to a consortium that provides digital images to most universities in North America.¹⁰

The allure of high technology and the desire to appear “technologically savvy” can drive administrators to pressure departments to move more quickly into the digital realm. Such mandates are justifiable given that space and labor are expensive commodities on college campuses. However, rapid moves to fully automate thus eliminating older technologies will probably *not* result in any cost savings—only a relatively expensive short-term “conversion” charge. Our observations suggest that the base cost of maintaining the functionality of the system will remain, and probably increase (although the increase will be masked by larger campus-wide technology initiatives). What is needed is a rational transition to the new technologies. Such a transition will require the support of the central campus administration. The acquisition of new digital image collections will severely impact local department (and college) budgets. The cost to convert legacy data and custom and campus-specific images into new formats will be enormous. Local development efforts will require technological sophistication so these data can be used in conjunction with purchased digital formats. Most importantly, these moves will need to be done over time and in conjunction with existing facilities.

There is some evidence to suggest potential university reluctance to enter into licensing agreements for image collections, at least as they have been initially proposed. Thus far, many universities have complained about proposed costs for these licensing schemes. Recently, in other domains, we have begun to see a new militancy among libraries resisting the licensing schemes initially proposed by content holders. Increasingly libraries have begun to resist the single-library license and have pressed content holders to instead write licenses to an entire consortium of libraries. And, for a variety of reasons including the perishability of digital information (Lyman and Besser, 1998:11-20), few libraries that have licensed content in digital form have yet abandoned their analog equivalents. But maintaining equivalent analog and digital collections is a costly proposition.

University administrators considering digital image distribution schemes need to be aware of a number of critical issues. Below we focus on three key questions: What might be lost if digital distribution schemes replace analog slide libraries? Will target groups use digitally distributed images? And what entity within the university will contract for digital distribution rights?

Examining Digital Distribution as a Replacement for Slide Libraries

Analog slide libraries provide a valuable set of services, some of which would be lost in currently emerging models for digital distribution. Here are some cautions about any attempt to completely replace analog slide libraries with digital image distribution schemes:

- Slide libraries are customized to their local environments. The slide library is usually close to departmental offices for the target departments served. The visual resources curator, who is intimately familiar with the collection, is usually readily available for inquiries from faculty. And the physical arrangement of the collection is usually well-understood by faculty from target departments.

¹⁰ Currently planned consortia are not yet targeting an international market due to differing intellectual property laws between countries.

- Slide library metadata are customized to local needs. The fields used are those most needed by local faculty. And the controlled vocabulary for those fields is usually well understood by local faculty.
- Analog slide libraries provide the right content for their users. In their many years of existence, these libraries have gathered a critical mass of images, many of which come from environments other than museums. But, more importantly, acquisition is end-user driven, and responds quickly to local needs; when a faculty member needs a set of images not currently in the collection, the slide library can respond quickly to add these to their collection.
- Existing slide libraries require very little technical infrastructure to use. Slides can be held up to the light for quick identification. They can be quickly sorted on an inexpensive back-lit piece of glass or plastic. And these can be shown in almost any classroom; an instructor only needs a slide projector and screen (or blank wall).

Will Target Groups Use Digitally Distributed Images?

Will faculty and students be willing to use digital image repositories in place of analog slide libraries? Interviews suggest a great deal of enthusiasm for digital images, particularly for their potential to free users from the time-and-place constraints of the analog slide library. Many faculty see digital images as offering the potential to surpass the functionality of slides and provide a truly new way of presenting the history and meaning of art (through animation, interactive learning, and reconstructions). But faculty and students still have serious concerns that may limit their use of online digital images:

- **Will digital image repositories provide the right content?** It will be a long time before digital image distribution schemes can provide comprehensive content. Distribution schemes that rely upon the content of member museums may never reach the comprehensiveness of today's analog slide libraries (which carry content not only from a plethora of museums, but also carry contextual images from the built environment, popular culture, and minor artists). Analog slide library content has always been user driven, quickly responding to faculty needs. Proposed schemes for digital image distribution are collection driven, based upon the content that member museums have.
- **Will future schemes permit seamless mixing of local content with content from a central source?** It is clear that central sources will not be able to provide all the images needed to teach most classes any time in the foreseeable future. Few instructors will be willing to teach without using supplementary images. But user access to supplementary material must be seamlessly integrated with access to the content from the central source, or instructors are likely to balk at using digital images at all.
- **Will users be willing to put up with a hybrid system,** using some images and metadata in analog form and some in digital form? Will university administrators be willing to support two parallel systems at least until some critical mass is reached with digital images?
- **Electronic classrooms need to be accessible for group viewing.** Universities need to invest in constructing these classrooms, and need to provide ongoing support to faculty

in using them. Electronic classrooms, which heretofore have been situated primarily in science and engineering buildings, need to also be conveniently located for humanities departments.

- **Barriers to faculty research and course preparation need to be removed, or some other incentive needs to be offered to faculty.** At this point in time, faculty feel that using digital images requires far too great a workload for the commensurate credit. The process of courseware design and integration needs to be much easier for faculty, and significant efforts need to be compensated. Administrators should consider offering faculty incentives to make this commitment of time and/or investing in ongoing support personnel and software to ease the logistics and use of digital images for instruction. Faculty need to feel that their administration values this work.
- **Faculty need to have the tools available to overlay their own perspectives onto the content that their students see.** They want the ability to regroup images and add explanatory information to reflect their own perspective.

Who in the University Will Contract for Digital Image Distribution Rights?

Most of today's analog slide libraries reside within individual campus departments, and primarily serve those departments. Our analog circulation study points to significant interest in cultural heritage slides from other disciplines, and most promotional talks for digital images insist that digital distribution schemes will appeal to wide interdisciplinary audiences.

Art history slide libraries have neither the technological savvy nor the financial resources to negotiate large-scale digital distribution licenses and/or locally mount and deliver large image databases. It seems obvious that these kinds of responsibilities will rest with a campus-wide department, such as the library or the information technology services department.

From our study of MESL, it is clear that the location of MESL operations within the university hierarchy had an effect on both the cost and the adoption process. In projects prior to MESL, both Michigan and Columbia had established staff that reported jointly to both their library and information technology units. This kind of joint responsibility positioned them to offer good service to their campuses and to become early adopters of emerging technological advances (such as more sophisticated user authentication systems).

Universities and the emerging digital distribution consortia both need to look closely at which university units will be responsible for contracting for and/or providing digital image distribution services. This will make a difference both in terms of service and funds available for such an endeavor. And university administrators need to earmark funding sources for this, which may be politically difficult considering that faculty will demand functioning analog slide libraries for many years to come.

As we have emphasized, data gathered from the MESL project can provide important insights into the cost of future digital distribution efforts, but one must interpret the MESL data with caution. The MESL project was composed of volunteers, each primarily seeking to answer their own needs, while at the same time seeking to participate in a project that would benefit the group as a whole. Having no precise concrete incentive to meet deadlines, and having few staff assigned to MESL for enough time to allow new development, meant that some initiatives were unable to go very far. In order to be successful, any follow-up venture will need to offer incentives to the museums and universities to commit the time and resources to the project. Incentives will also need to be offered

to get these institutions to accept standards and promote interoperability. As it is unlikely that external financial incentives will be available, the institutions must see that a cooperative venture like this will enhance their mission by allowing them to serve more users (and existing users better) for a cost increase that the institutions can bear. The MESL Project provided an initial foray for these institutions to begin to work together. Whether something like this can become a self-sustaining venture remains an open question.

A full-scale market analysis for digital image distribution schemes is beyond the scope of this chapter. But we would speculate that the university community by itself would have a great difficulty sustaining the cost of even one of these distribution schemes. We believe that such schemes will only be sustainable if they are subsidized by the content providers (e.g. by the museums as part of their mission) and/or if distribution costs are leveraged by broadening the market (to K-12, advertising agencies, consumers, etc.). But broadening the market raises other costs that we have not even begun to examine (e.g. a K-12 market will likely require added-value products that sit over the currently planned corpus of individual items).

We hope that the detailed findings of this study will be useful for a wide variety of planning purposes, from university administrators deciding how to allocate resources between analog and digital environments to museums considering imaging projects, to instructors hoping to teach with digital images, to any group considering digital distribution of images and accompanying descriptive information.