In May 2001, Penn State University embarked on a twenty-six-month study to assess the requirements of a digital image delivery service for a large and complex university. The study grew out of discussions within the Libraries about the scope, nature and content of the digital library. The opportunity to examine still images as an aspect of digital library development immediately drew willing partners from outside the library including the museums and many academic units. Penn State’s Center for Quality and Planning and the Teaching and Learning with Technology group have been especially valuable partners in this work. Together we wanted to explore how images are currently used on campus, who uses them, what functions are served by image use, and the degree to which picture use has become digital.

During the first half of the Visual Image User Study (VIUS) a broad variety of measures have been employed including: surveying thousands of faculty and students in arts, humanities, and environmental studies disciplines; analyzing demographic data for the users of licensed image databases; conducting ten focus group discussions and 24 interviews with faculty; and studying some transaction logs for image databases. Using the knowledge gleaned from these studies we are creating prototype services for further evaluation. This paper can only provide an early glimpse of the work—it describes highlights of the preliminary findings as well as questions they raise for image delivery systems and services. Although our primary goal is to serve local needs, we hope that our rigorous approach will provide information useful to other institutions and to system developers as they move to create digital library services including visual materials. Although we have focused our study on still images we feel that our findings bear implications for many other aspects of digital library development.

User Expectations
The VIUS project has interested many in the Penn State community where picture use is widespread. Response rates to the largest surveys have been unusually good for our institution—41 percent of fac-
ulty and 20.2 percent of students completed our largest surveys. Most of these people (75.4% of faculty and 55% of students) reported that they use digital or analog (non-digital) pictures for educational purposes. Respondents supported the idea of a digital image delivery system at Penn State. More than 62% of faculty and more than 56% of students agreed or strongly agreed that such a system would be useful for their work. Among self-described image users that support was even stronger (76.8% of faculty and 79.2% of students.)

Content is the most important factor when students and faculty consider the value of a digital image delivery system. Although interest in the development of such a delivery system is high among both students and faculty, their greatest apprehension about the development of such a system is that it might not contain images of interest to them. More than 51 percent of faculty and 35 percent of students chose this from a list of 12 potential apprehensions about an image delivery system. It was by far the most frequently chosen for both groups. One of the clearest results in our large surveys might be reduced to the phrase: “Content is king.” Interviews and focus groups confirmed that the needs and interests of faculty and students are not static. Because of this, the content of an image delivery system must respond quickly to the needs of its users. But this requirement raises the first of a series of very difficult questions: Database systems can be very good at delivering what they have, but can they do anything to help obtain what they do not have? Can a centralized service be sufficiently responsive to changing needs for content?

Expectations are high for an image delivery service. When a hypothetical system was described, both students and faculty wanted most for it to give them access to more pictures and to reduce their labor in gathering or managing images. Next important to faculty was the ability of a service to sort out copyright considerations; they also hoped that it would encourage them to try digital images. For students, this second level of expectations was different. They hoped that using a system would be easier than checking lots of separate sources and that it would provide pictures from a variety of disciplines.

Disciplinary Scope
Our study targets arts, humanities, and environmental disciplines. This scope is interpreted broadly and our larger surveys have included people in nearly 70 academic departments and research centers scattered across Penn State’s 23 campuses. Although we have a large amount of very detailed information on Penn State’s users of pictures, breaking down the data by discipline has been difficult due to variations in department names, position titles, address lists, etc. Nonetheless, some of the numbers that are immediately available can be used to get a picture of the potential audience for an interdisciplinary image database service.

In most of the targeted disciplines, faculty use some pictures; in some of those disciplines, faculty use large numbers of pictures. An interdisciplinary image service may need to address two distinct audiences: a very large group of occasional or light users and a much smaller group of frequent and intense users. For example, when we grouped the relevant disciplines into five categories (which roughly correspond to colleges at the main, University Park campus) the arts and architecture faculty stand out as using a larger number of pictures than their colleagues—perhaps a predictable result. However, when the same groupings were considered as simple headcounts of picture users, there were many more picture users in earth and mineral sciences or agriculture than in the arts by a comparison 2 to 1. How can we best provide content and services for two kinds of users—intense and occasional image users?

Basic Demands of the Academic Setting
We have proposed that an image delivery system must support three functions in an academic setting: teaching, independent learning, and collection management and we organize some of our findings in these categories.

Teaching
Faculty expect that a digital image delivery system would be helpful—but much more helpful for teaching than for research or outreach activities. (When asked to indicate the function for which an image system would be most useful, teaching was chosen twice as often as research and outreach combined.) However, the faculty expectation that a digital image delivery system will be most useful for teaching is somewhat at odds with current use
patterns. Among faculty, analog images were most likely to be used for teaching and digital images were more likely to be used for research. We offer two explanations for this gap between expectations and current behavior.

The most likely explanation may be described as an "implementation gap." Our data indicates that teaching activities employ more than twice as many pictures as research activities; the larger quantity of images would require much time and resources to digitize. Similarly, classrooms are more expensive to equip than offices. Teaching with digital images may simply lag behind conducting research with digital images.

A secondary explanation for the gap may relate to the characteristics of the new media. The 35 mm slide, the dominant form of analog image used by faculty, is excellent for group viewing (typical of teaching) and less satisfactory for individual viewing (individual activities being more characteristic of research than teaching). The personal computer and the Internet have made digital images superior to slides as devices for individual viewing. If expectations for teaching center on classroom projection, the many other uses of digital images may be underestimated or undervalued. While current expectations do focus on teaching it may be a mistake to interpret this as a mandate to concentrate exclusively on classroom projection. Digital images have many other uses—especially individual uses related to the active forms of learning that are encouraged in higher education today.

Faculty who use images primarily for teaching have some concerns that differ from faculty who use images primarily for research. For example, those using pictures for research placed a higher value on a wider variety of search criteria (names, dates, places, themes, etc.) Teachers chose fewer and more specific search criteria. Perhaps teaching needs are more often met by a search for a "known item". A single access point is common in slide libraries that support teaching and it seems that a relatively simple retrieval system is all that teaching requires.

Many faculty use web pages or learning management software to extend what has traditionally taken place in the classroom or library (tutoring, supplemental readings, review of pictures, etc.) It will be important for an image delivery system to facilitate these uses. How can image delivery work closely with learning management systems and other software used for teaching?

**Teaching and Copyright**

Faculty want the University to clarify a teacher’s situation regarding copyright and the use of pictures. For example, the guidelines for placing texts on course reserves and in course-packs have been made fairly clear in recent years. Many faculty want some similar guidance for the use of images. This was clear both from the focus group discussions and the survey of faculty. (For example, 45.9 percent of faculty who are image users selected “Copyright & permissions sorted out for me” from a list of 11 potential assets of an image delivery system. 30.4 percent of student picture users made that selection.) **Can we clarify policies regarding copyright and images? If so, are there system tools that can sort out permissions and enforce such policies?**

**Teaching and the Classroom Setting**

Faculty remain uncomfortable with some aspects of using technology in the classroom and this discomfort conflicts with the features of some recent image delivery systems. Discomfort could arise from many factors, the simple presence of an audience being one. Only 6.2 percent of faculty reported discomfort with using technology outside the classroom, but 25.4 percent expressed discomfort at using technology in the classroom. Inadequate equipping of classrooms is seen as an obstacle to the use of digital images for teaching. While 58.1 percent of responding faculty agreed or agreed strongly with the statement, “Classrooms with hardware for projecting digital images are available,” focus group discussions revealed that there are many concerns about this equipment and its use. Faculty are especially distrustful of using live network connections for presentations during class. They are more comfortable with presentations from stand-alone media (hard drives, CDs, zip disks, etc.). The amount of time required for an image to load and the reliability of network connections were perceived as significant impediments. However several recent products for image delivery feature presentation tools that require a live database connection. **What should a system offer in the way of presentation tools for classroom presentations?**
Independent Learning
Independent learners seem to require a more flexible system than do teachers. Considering students as the main model for independent learners, we find that they are concerned, more than faculty are, about an adequate supply of sources and the quality of images. Students placed importance in a wider variety of uses than did faculty, prioritizing as most important: obtaining digital images on the web, scanning pictures, illustrating papers, and showing pictures for group viewing. (Most picture use by students was related to their class assignments.) Independent learners also need a variety of search features and well-described pictures. Students placed a much higher degree of importance on search features than did the majority of faculty. They were much more concerned that their ways of searching may not match the features offered by a system. Faculty conducting pictorial research (as opposed to teaching) seemed to share the students’ desire for an array of search features, and for that reason have been included in our model of independent learning. Of course, most database software facilitates creating a large number of database fields and search keys, but populating those fields with useful information is a more difficult and labor-intensive requirement. We have begun to wonder about obtaining descriptive information from the users or from their behavior in the system. Can software design, or the design of a service, encourage the more extensive descriptions apparently useful for independent learning?

Collection Management: Individual Collections
Penn State does not have a large number of institutionally managed picture collections. The Art History Department’s Slide Library is the largest and most actively used picture collection in the disciplines covered by our study. The Libraries, particularly in Special Collections and the Maps Library, have significant pictorial archives. The Palmer Museum of Art, and, to a lesser degree, the other museums at University Park have image collections. Each has employed some form of database but only the library catalog is widely distributed. Digital efforts among these collections have been modest. While use of Penn State’s public image collections has not been quantified, it does not equal the amount of picture use reported in the surveys of faculty and students. (Together, faculty and students who responded to the surveys report using more than 190,000 images per semester.)

Traffic on the two licensed image databases offered by the Libraries (at the time of data collection) can be described as moderate, but still does not account for all of the image use reported in the surveys. Use of the AP Multimedia Archive (a database of roughly 700,000 Associated Press photos and related graphics) was above the median for the roughly 250 databases offered by the University Libraries. Searching on the AMICO Library (approximately 65,000 images from art museums) was slightly below the median. Only 5 percent of faculty and 10 percent of students reported ever having used the AP Multimedia Archive. Only 2.6 percent of faculty and 3.1 percent of students reported any use of the AMICO Library.

Collection Management: Individual Collections
Many faculty and students, in a wide variety of disciplines, have individual collections of pictures. Overall, 44.1 percent of 639 faculty who use pictures reported that they “personally maintain or oversee the maintenance of a collection of analog or digital images for professional use.” The median size of those collections is 500 pictures. Much of what we know about these collections comes from our softer assessment methods: focus group discussion, interviews, and an informal survey of faculty known to maintain individual collections (which has obtained only 40 responses). Many faculty are making the transition from analog to digital pictures. At present, only a few are employing database or file management software. Most of those involved with scanning or data management would like to find more support for that work. A surprising number of students (44% of 309) also reported that they keep a collection of pictures “for educational uses.” (Although the median size was much smaller: 50 pictures.) Individual collections serve as a major pictorial resource at Penn State.

As these individual collections become digital, the technical means of sharing these resources presents itself as a challenge. Among the issues related to sharing these pictures are copyright and trust. Faculty expressed concern that the sources of their pictures (often completely unknown) are questionable as regards copyright. Many considered their pictures part

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of their teaching craft—a valued aspect of their work product that should not be given away indiscriminately. Many faculty said that they would be willing to share if… (and what followed varies…if only with my department…if I get something in return…etc.) Most of these collectors responded positively to the benefits of a centralized distribution system for digital images, but only a very small portion thought that a centralized system might alleviate their needs to maintain an individual collection. In spite of the difficulties, many people reacted positively to the idea of sharing individual collections. **Can anything be done to help individuals turn these resources into shared ones?**

Many also want to use an image delivery system in conjunction with their own pictures or images from other sources. A successful system will facilitate these mixed uses—perhaps by simply permitting downloads or perhaps by more sophisticated means. Some recent software systems impede this mix of system images with personal ones. **How can a system enable people to use their own pictures in conjunction with those provided by a centralized system?**

Prototyping Services

In our study we proposed a list of system features for a database service that would begin to address the many stated and perceived needs of a digital image delivery system. We also became interested in the potential of peer-to-peer software as a way of recognizing the value of individual collections and supporting their development and exchange. Unfortunately few of the features we sought were available in an appropriate software system. Our current strategy involves building a database service, using a conventional image management system and focused on a handful of course offerings, to test our ability to obtain content in a timely manner and describe it appropriately. Concurrently we are developing a prototype of a peer-to-peer service, from which we may be able to learn more about the environment for sharing individual collections.

Images and the Digital Library

Clearly, this research suggests that the user requirements for an image delivery system are demanding. How can a system:

- Be highly responsive to changing needs for content?
- Provide the right type of services for both intense and occasional users?
- Work closely with learning management systems and other software used for teaching?
- Clarify and help enforce policies and permissions?
- Facilitate classroom presentations?
- Encourage the more extensive descriptions useful for independent learning?
- Assist people in managing and sharing their own collections?
- Help people use their own materials in conjunction with those provided by a centralized system?

These questions resonate with other aspects of digital library development. Regardless of the media—text, images, video—users expectations are high for digital services. If we can address the defined needs for a digital image delivery system we will have gone a long way towards informing digital library development.

**Notes**

1. We are grateful to the Andrew W. Mellon Foundation for supporting our study. This report summarizes work conducted by the entire project team, which includes: John Attig, Monograph Cataloging Librarian, University Libraries; Joni Barnoff, Senior Research Programmer, Digital Library Technologies; Tun Chin, Associate Director, Digital Library Technologies; Ann Copeland, Special Collections Cataloging Librarian, University Libraries; Michael Dooris, Director for Planning Research & Assessment, Center for Quality and Planning; Nancy Eaton, Dean, University Libraries (Principal Investigator); Eric Ferrin, Senior Director, Digital Library Technologies; John Harwood, Senior Director, Teaching and Learning with Technology; James Frost, VIUS Project Associate, University Libraries; Michael Halm, Director for Special Projects, Center for Education Technology Services; Jack Orlandi, Group Manager, Digital Library Technologies; Michael Pelikan, Technology Initiatives Librarian, University Libraries; Henry Pisciotta, Arts & Architecture Librarian, University Libraries (Project Coordinator). The contributions of Dooris, who conducted and analyzed all focus group discussions, and Frost, who analyzed survey data, have been especially important to this preliminary report.

2. Additional background information on the purpose, research questions, and methods of the VIUS project are available at: http://www.libraries.psu.edu/crsweb/vius/.

3. The questionnaires for this survey may be found in the
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projects Interim Report (Section 2, 22–35) at: http://www.libraries.psu.edu/crsweb/vius/reports.html.


5. See especially the Faculty Focus Groups on LUNA’s Insight, MDID, and CONTENT dm in the Interim Report (Section 2, 9–20.)

6. We exercise some caution in comparing student assessments of importance to those of faculty. The faculty survey was a traditional paper one, while the student survey was delivered via the Web. Even though the web survey was rigorously sampled and conducted, one study has cautioned that web surveys might produce slightly more positive responses than paper ones: John Kennedy, George Kuh, and Robert Carini, “Web and Mail Surveys: Preliminary Results of Comparisons Based upon a Large-Scale Project,” presented at the Annual Meeting of the American Association of Public Opinion Research, May 19, 2000.

7. Thirty of the 40 respondents reported that some or all of the collection was digital. The median was 15 percent of a collection in digital form and the average was 38 percent.

8. Students with collections are slightly more likely to be graduates.

9. This was especially evident in the faculty focus groups on specific systems, but also in the survey of individual collections in the Interim Report (Section 2, 54–62.)

10. Interim Report (Appendix V: List of Ideal Database Features.)

11. Interim Report (Section 3, 5–10.)