Local Practice and the Growth of Knowledge:
Decisions in Subject Access to Digitized Images

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Abstract

This paper reports a pilot study of image digitization projects and the subject access they provide. It examines the factors which lead to undertaking a project, decisions about what images will be digitized, and the use of standard vocabularies and locally created vocabularies. The study considers these developments as examples of the growth of professional knowledge.

Introduction

This paper explores the growth of a professional knowledge base in terms of the interaction between formal, published standards and the ways that professional tasks are carried out "on the ground," in specific institutions. It defines a "professional knowledge base" as consisting of both the facts and theory codified in texts, journal articles, and published standards of practice and the day-to-day situated actions of professionals in the field. It takes the opportunity represented by the current period of rapid professional knowledge growth in the area of image digitization to explore the relationship between the two.

Improvements in technologies of compression and storage, network bandwidth, and display resolution, coupled with falling costs and the availability of grant money, have resulted in a burst of image digitization projects. Many libraries, museums, and other organizations have responded by making portions of their collections available to their users in this way; it is estimated that there may currently be literally thousands of such projects underway in the United States. The technologies and labor costs are inexpensive enough to bring such projects within the range of many organizations with modest financial resources, but are also still costly enough that converting entire collections wholesale is not an option. Therefore, decisions have to be made about what portions of the collection are appropriate for digitization, what funding sources will be sought, and how collections will be maintained and enlarged over time. The research described is a pilot project for a larger study of small-scale image digitization projects and the decisions about subject access as examples of growth in a professional knowledge base. The pilot project used questionnaires

completed by 15 respondents and follow-up interviews with eight individuals. The central concern is to understand decisions made in these projects about what to make physically accessible digitally and how to make it intellectually accessible through subject representation in terms of the relationship between standards and local practice.

The collections represented here primarily contain surrogates (slides) of works of art or architecture. This is in part the result of the fact that the study is concerned with images, and a large number of image collections naturally represent the visual arts. It is also a reflection of the fact that most of the sample was drawn from attendees at the 1999 annual conference of the Visual Resources Association, and VRA members tend to come from museums and university art and architecture departments. There are two exceptions, however: an archives of historical photographs in the Southwest and an archives of slides documenting a feminist art organization.

Because this is a pilot study, the research questions are primarily exploratory and descriptive:

1) What factors drive the decision to undertake a digitization project?
2) What factors drive decisions about what to digitize?
3) What subject access decisions are being made?
4) How are users brought into the process?
5) What are the formal and informal communication channels which provide for the growth of knowledge?

Literature review: background and context

Growth of knowledge

The concept of a professional knowledge base goes back to early sociological definitions of professions as unique occupations (Parsons, 1939; Greenwood, 1962; Goode, 1969) and has been carried into contemporary information science in such research as that by White and McCain (1998), which identifies clusters within disciplinary knowledge and Sydney Pierce's (1987) exploration of the knowledge structures of professional literatures.

Such knowledge is inherently provisional. The summations of professional knowledge presented in books and journals are subject to argument (as in Ellsworth Mason's famous challenge to library automation, "Great Gas Bubble Prick'd; or, Computers Revealed -- by a Gentleman of Quality (1971)) and to evolution (as with AACR and AACR2). The knowledge embodied in the minds and practices of the profession's members is also fluid. It is built over time in webs of ideas and experiences from professional education, the literature, conferences, vendors' sales representatives, colleagues, and just trying things out – and grows sometimes in

advance of and sometimes behind the knowledge captured in publications. Often this knowledge growth consists of casual "let's try it this way" changes, taking place in on-the-fly insights and experiments; they may or may not ever be communicated to colleagues, and may or may not be channeled back into the public arena. Professional association conferences function midway between the public standard and local practice, sometimes bringing authorities in as session presenters and sometimes giving local experts the opportunity to tell "how we done it good" in a specific setting. The growth in a profession's knowledge base also occurs as new entrants to the field are educated, increasing the number of individuals in whom knowledge is instantiated and thus its variety (Weedman, 1999). As Suchman (1987) argues, all knowledge is situated. The knowledge base of a profession is never a monolith, and never fully reified; it takes various forms in various locales, and grows at different rates and in different, not necessarily consistent, directions.

Diffusion of an innovation is one form of knowledge growth. Rogers's (1995) classic work on this subject identifies five characteristics of innovations which influence their adoption: (1) relative advantage, the degree to which the innovation is perceived as better than the idea it supercedes, in terms of economics, prestige, convenience, or other qualities, (2) compatibility, the extent to which the innovation is perceived as consistent with existing values, experiences, knowledge, and needs, (3) complexity, the perception of how difficult it is to understand or implement, (4) trialability, the extent to which it is easy to experiment with the innovation in small steps, and (5) observability, the extent to which individuals can see the implementation of others and the results.

Related to the observability of an innovation is the structure of formal and informal relationships in which an individual or organization is located. This social network structure (Wellman and Berkowitz, 1988; Wasserman and Faust, 1993; Rogers and Kincaid, 1981) determines the knowledge which can be brought into an organization; communication channels must exist along which the new idea or practice can gravel. Boundary-spanning communication is a central feature of innovation, as it allows new ideas to enter a system. Boundary-spanning includes a librarian working with technicians from an information technology department within the parent organization, which involves crossing both organizational and professional knowledge boundaries, or a librarian in one institution discussing his imaging project with another librarian during a break between meetings. Although the boundary spanning and diffusion literature has concentrated on informal communication, formal communication channels such as professional conferences and journals are also critical in bringing innovations into an individual's awareness (Weedman, 1992).

External funding sources are another formal communication channel; sometimes a grant announcement is the first encounter with the possibility of a particular type of project. Granting institutions often have priorities which can influence the direction a funded project takes. Two representative initiatives have been undertaken by the Library of Congress and the Getty Center. The Library of Congress's National

Digital Libraries Project offers competitive funding for academic and public libraries, museums, and archives to create digital collections of primary resources which are significant for understanding United States history and culture. The Getty Center's concern for preservation of cultural heritage information has led to such initiatives as L.A. Culture Net, a 3-year (1996-1999) pilot project to "organize online cultural resources in Los Angeles for people of all ages and walks of life. These grant-making institutions may provide training, may disseminate information, and may bring together participants to exchange insights and experiences.

Professional standards
As Bowker and Star (1997) state, decisions about subject access determine "what will be visible within a system (and of course what will thus be invisible)." Shatford (1986) wrote thirteen years ago that there was a need for determining "which … subjects are most important, which ones we should index first, which ones we should index secondarily, and which ones should not be indexed at all" (p. 54). These are issues with which designers of digitized collections must struggle.

What constitutes "subject" is the first set of issues which must be addressed. Discussions frequently refer to the work of Sara Shatford (1986) and Karen Markey (1986), both of whom use Erwin Panofksy's three levels of meaning in art as a foundation. At the first level, the pre-iconographic level, subject is considered in terms of the generic description of the objects and items represented -- a woman and children, for instance. The subject focuses on what is represented, what it is a representation *of*. It is also possible to consider what the representation is *about*: Dorothea Lange's Migrant Mother is a picture of a woman and children, which might be *about* strength or determination. Shatford uses the term "mood" for the pre-iconographic analysis of *about*. The second, iconographic, level is a cultural analysis of subject, recognition that a man in a painting is Moses (*of*) and that it is *about* escape from slavery; Shatford refers to symbolic meanings and abstract concepts that are communicated by images in the picture. The third level is "iconology," which involves interpretation; iconology is a synthesis of the other two levels with the artistic, social, and cultural context. The three levels can also be labeled description, analysis, and interpretation. (These are slippery distinctions which this paper will not attempt to resolve.) Shatford suggests that the first two levels can be indexed, but perhaps or probably not the third, at least with any consistency. O'Connor and O'Connor's recent work (1999) on users' descriptions of images supports Shatford's position; they found that users' interpretations of emotion were often directly opposed one person describing an image as "lovely" while another used the term "depressing."

The Visual Resources Association Core Categories for Visual Resources (Visual Resources Association, 1997) uses three of these five levels -- (1) the objective description of what is depicted (e.g., a man in uniform), (2) the identification of the subject (e.g., George Washington), and (3) the deeper meaning or interpretation ("Washington stands in classical pose and leans upon a bundle of rods that signify the

Roman Magistrate -- thus associating Washington with great and powerful Roman magistrates of antiquity").

It is also necessary to distinguish clearly between the original work of art and a visual document which reproduces the work or some part of the work. Thus the subject of the painting Mona Lisa is a woman, but the subject of the slide of the Mona Lisa might be said to be the work of art itself. The VRA's core categories clearly separate the categories pertaining to the work from the categories pertaining to the visual document. The distinction is not, however, as clear-cut as it sounds; even participants in the VRA's Vision Project had difficulty addressing the separate categories with consistency (discussion, Lanzi, 1999).

The existing standards for subject or content access are not stable. As the definition of what the core elements for description should be is still being refined, there is also no single vocabulary providing data values for those elements which would compare to the Library of Congress Subject Headings or Sears in its ability to provide uniform subject access to visual resources. There are several vocabularies in existence.

The Art and Architecture Thesaurus (Petersen, 1990) is an indexing vocabulary initially developed for textual materials about physical objects and images, but it is increasingly used to manage collections of the objects and images themselves (Rasmussen, 1997). It covers antiquity to the present, containing 120,000 terms. The AAT is structured and covers facets such as Physical Attributes, Styles, Materials, and Objects. It provides vocabulary "for all the characteristics of art works ... except for subjects" (Layne, 1994, p. 32).

There are two primary vocabularies which do address subject. One is the Library of Congress's Thesaurus for Graphic Materials 1 (Library of Congress, 1995), which contains 6,204 postable terms with an additional 4,324 entry vocabulary terms. Although it does not include art historical and iconographic concepts, TGM1 "does supply terms for abstract ideas represented in certain types of images." The introductory matter describes the difference between what an art work is *of* (what it depicts) and what it is *about* (the underlying intent or theme) and states that "subject cataloging must take into account both of these aspects if it is to satisfy as many search queries as possible."

ICONCLASS was developed specifically for iconography as an area within art history (Rasmussen, 1997); it contains 24,000 "definitions of objects, persons, events, situations, and abstract ideas" which reflect "themes and subjects in works of art" (ICONCLASS Research and Development Group, 1999).

Because people and places can be subjects of works of art, the Getty's Union List of Artists' Names (Getty Research Institute, 1999a) and Thesaurus of Geographic Names (Getty Research Institute, 1999b) are also important subject vocabularies, along with the Library of Congress's Name Authorities.

The Visual Resource Association's standards recommend all of these vocabularies: AAT and LCSH for subject, ICONCLASS and TGM1 for iconographic themes; LC Name Authorities and ULAN for persons or groups, and TGN and LCSH for geographic places.

It's clear from the sheer number of vocabularies that none have truly become the professional standard. Markey (1988) described the proliferation of separate local databases ten years ago, and noted then that the work of LC in developing cataloging rules, the adaptation of the MARC record for graphic materials, and the availability of the Art and Architecture Thesaurus might foster consistency among collections. No recent research has explored whether there has been any increase in consistency in the last decade, nor whether the architecture of the World Wide Web has resulted in more standardization, though clearly the growth of collections on the Web has given new impetus to those organizations developing the standards.

Rasmussen (1997) notes as well that many of the collections and vocabularies are being built by people outside the field of Library and Information Science. Professional values are reflected in approaches to subject access; Jain (1997, p. 32) notes that "in this interdisciplinary field, researchers have generally focused on issues related to their own disciplines." Librarians have a long tradition of organization of information. The museum community, by contrast, has traditionally operated on principles of rugged individualism, and has only recently begun work on standards; museums tend to prioritize local and collection management needs over standardization. People with backgrounds in technology management often approach solutions to problems of organization technologically (Chang, Smith, and Meng, 1997; Huang, Mehrota, and Ramchandran, 1997). There is a variety of knowledge bases and professional value systems informing contemporary image digitalization projects.

At the same time that grassroots digitization projects are springing up everywhere, and vocabularies and ontologies (as they are known in Computer Science) are proliferating, professional organizations are seeking to create metadata standards that will unify and provide for future usability and compatibility of digital visual resource collections. Four representative efforts are the Museum Educational Site Licensing Project (Trant, Jennifer, 1997; MESL, 1996), the CNI/OCLC Image Metadata Workshop (Weibel and Miller, 1997), and the Vision Project of the Visual Resources Association and the Research Libraries Group (The Vision Project, n.d.), and the MPEG (MPEG-2, 1996) standards for visual content description of moving images. It is not clear yet what impact these standards have had on practice in the field.

Method

The intent of this pilot project was to increase my knowledge of some of the environments in which digitization projects are being carried out and to explore research questions which seemed potentially useful. Fifteen individuals formed a convenience sample. One was known to me as having undertaken digitization projects, although I knew little about her work. Fourteen were attendees at the 1999 annual conference of the Visual Resources Association; I put out copies of a one-page questionnaire on the display table in the conference registration area, with a request that individuals engaged in or considering digitization projects complete it and return it to me. Semi-structured interviews lasting one to two hours were conducted by telephone with seven of the questionnaire respondents, and a two-hour interview was conducted on site with one individual.

The sample is entirely inappropriate for any inferential statistics; but the variation within the sample suggests that useful insights may be gained. Miles and Huberman (1994) note that to get to the conceptual construct in a qualitative research project, a sample needs to "provide different instances of it, in different places, with different people. The prime concern is with the conditions under which the construct or theory operates" (p.29). The respondents included seven university art collections, two university architecture collections, one university humanities collection, one learning/teaching support unit, three museums, and one archives. They came from 10 states and 2 countries.

The goals of the projects were varied. Some projects made the images available only for instructional use -- scanned at a high enough resolution that they could be projected during lectures or at a workstation in an individual tutorial. Other projects used the images solely for intellectual access to the original; thumbnails were linked to the database to provide additional information for the patron seeking a particular image or kind of image. Some projects did both in tandem. The respondents provided a rich introduction to the array of solutions which are evolving in local practice to the problems of subject access to images.

The respondents and their projects

Ten of the 15 respondents were slide librarians or curators in universities, seven in schools or departments of art, two in colleges of architecture, and one in a unit providing technological support for learning and teaching. One of the respondents was the librarian for a college of art and design. Three were in museums of art, and one was in a state records center and archives. Table 1 provides summary information for the interviewees. In this table, and throughout the rest of the text and tables, projects are identified by a number followed by a U or M (to indicate a

university or museum environment), and *art* or *arch* to indicate whether the collection subject matter was primarily art or architecture.

	Size of total collection Size of digitized collection	Project description	Images to be digitized
1-U-*art*	<data missing>	MARC records for images in university OPAC; links to images	entire collection, eventually.
2-M-*art*	430,000 3	database/online catalog with linked images	entire collection, eventually
3-U-*art*	150,000 2,500	images on CD-ROMs, eventual link to database/catalog	slides used in undergraduate and graduate courses
4-U-*arch*	95,000 <data missing>	1: instructional package of PowerPoint slides 2: imagebase to be used in resource sharing project	1: images for review for exams (undergraduate) 2: donated collection of landscape images
5-M-*art*	11,750 <data missing>	pilot project: digitize images and link to MARC records	images from Registrar's collection (not the main slide collection)
6-U-*art*	100,000 1: 800 (200 per syllabus) 2: 300	1: 4 syllabi put up on web, images for each unit linked from syllabus 2: imagebase	1: most important images for each period, medium covered in course 2: photography collection
7-U-*arch*	300,000 2,000	pilot project: imagebase	slides used in survey course
8-U-*art*	<data missing> 1500	web database, one of several regional databases available through the site	subset of a collection dealing with women's culture

Table 1. The Projects

The job titles of respondents included: archivist, photoarchivist, center manager, project manager, digital project coordinator, humanities curator, slide curator (two individuals), visual resources librarian (two), and visual resources curator (three). For convenience, the most common term, curator, will usually be used when referring to the respondents.

Years in this particular job ranged from one to thirty, with a mode of 7 and a mean of 7.5. All had degrees in art or architecture. Four of the eight had MLIS degrees, and each had a second masters in arts administration or art history; one had a masters degree in museum studies. One of the curators had a masters degree in art history, one a degree in architecture, and one a Ph.D. in art history.

The interviews were conducted with five of the individuals in universities, the librarian in the art college, and two of the museum slide librarians. Both of the museums had formal relationships with nearby colleges or universities and functioned as instructional collections in addition to their role serving the general public.

The vast majority of images in the collections were slides, but there were also 4x5" transparencies and photographs.

Art and architecture slides come from three sources. The first source is commercial packages, often produced to accompany courses. The second source is copy work from books -- slides created by photographing illustrations. The third source is original photography -- these may include slides of buildings shot by architects, photographs of events, collections of the work of artists whose medium is photography, photographs of faculty or student art (paintings, sculpture, performance art, etc.), and various other images. The proportions of slides from each source are different in each collection.

The projects ranged from comprehensive plans to digitize the entire collection to small, experimental beginnings. The size of the collection to be digitized for the first project undertaken (some of the librarians had two separate projects underway) ranged from 200 to 430,000. The largest number of images actually digitized and in use was 2,000. To provide a sense of scale, in a university art department, a collection of 50,000 slides is considered a small collection.

Decisions to digitize and decisions to provide subject access were loosely coupled. The decision to create an electronic database as a catalog to a collection could precede a decision to digitize by several years, could occur simultaneously, or could be planned as a future application for the digitized images. Physical access and intellectual access were not intrinsically related, although in fact they sometimes were undertaken together.

Thirteen of the fifteen questionnaire respondents were providing subject access in some form to their digital images; all eight of the individuals interviewed were doing so. Of the eight interviewees, two began with images specifically for lectures and study and later developed projects to link images to a database.

In the remainder of this paper, the discussion is based on the eight interviews completed, except where the fifteen questionnaire respondents are explicitly referred to.

What drives the decision to undertake a digitization project?

Underlying all the discussions I conducted with practitioners was the sense that digital storage of image collections will eventually become as widespread as digital storage of documents. It is a technology which will change their collections, and change the ways in which the collections are used. Some of the respondents had a

sense of urgency about the technology; one described talking with other slide library curators in the area and realizing that "a *lot* of them were doing digitization. I realized how far behind we were." The important issue was not the specific uses of the technology, but a more general sense that the profession is moving, changing, and that if one is part of the profession (or, at least, a respectable part of it), one grows with the profession. Another, more concrete, version of this feeling was expressed by the respondent who said "Eventually enough collections will be digitized, enough rooms will be wired, and enough people will expect digital images that we will reach critical mass and I would rather be a part of the mass than have it fall on me."

The interviews conducted with eight of the librarians examined the immediate impetus for undertaking a project, other enabling factors, and the goals of the project.

In two cases, the availability of grant money provided the immediate impetus for the project. In one of these situations, the grant-making agency knew the school had a collection of cultural and historical interest, and sought the librarian out. In the other, another member of the academic community had received funds for a digitization project and his initial plan fell through, so he went looking for something to digitize. The librarians in this case were less than enthusiastic about having their time and resources drawn into someone else's enthusiasms, but their administrator gave them little choice.

In two cases, faculty were digitizing images for use in their classes, with no planning for bibliographic control, accessibility, or future needs. The librarians saw this as an opportunity to begin a project and impose some rationality and consistency on choices about organization, resolution, etc.

Librarians went to the faculty to introduce the idea of using digitized images in two of the cases.

In two cases, one in a university and one in a museum, the digitization project began with a comprehensive plan to make the entire collection available through an image database. In the university, the proximate cause was the incorporation of the departmental slide collection into the university library, with the requirement that access be provided through the OPAC; the incorporation coincided with the retirement of the slide librarian, so the new librarian was hired with the administration of the project in mind. In the museum, the librarian began with the textual data, getting the records into a database, and was waiting for the right software to add images. When she found a program that seemed suitable, and discovered the company would work with her in designing the data structure, that provided the opportunity to begin scanning.

The compelling motivation for one of the curators was to create visibility for the library. "In a small college the faculty don't see librarians as colleagues, or as part of the educational process. So I've tried to change the perception the whole time I've

been there. I needed to have more visibility for the library, and I thought the only way to get the visibility I want is to grab their attention in some kind of digital way. Over time, that could lead to increases in the budget and I would be able to create more resources."

The sense of the inevitability of this particular technology surfaced in all the interviews. Accompanying it was a feeling that the respondent didn't know enough yet to start but that the time had come to jump in anyway. One said that her "biggest fear is that we will do something that we will wish we had done differently later."

What factors drive decisions about what to digitize?

Librarians and curators are in a situation where, although individual components of the technology are quite familiar, the use of it for providing access to an image collection and the implications are not. There is uncertainty about the best instructional uses, the best way to link images to the catalog, uses permitted by copyright law, how to plan now for future needs, what resolutions should be provided, and more.

All of the interviewees started small, even those who planned from the beginning to reproduce the entire collection. As one said, "I'd been wanting to do some kind of digital work. I wanted to do an image database for the whole collection -- but I don't have an assistant curator -- so I decided it was best just to pick something and jump in." One of the respondents said: "Nobody has said, 'Do this, and then this, and then this; this is how you do a project.' I feel like I'm in this position where I have to create it myself. So the only way I can even conceive to create these things is small little steps. Where you do a little bit and you take another step and you see what the interest is and then you take on a little bit bigger project and you just keep building on it. That's the only way I can think of to learn it, because I can't afford to take a semester and go to some school or whatever. And nobody that I know around here is really teaching it that much."

Often the logical place to start is with an instructional package for a course rather than with an image base. This has the advantages of defining a discrete part of the collection and of having an established structure, a clearly definable objective, and a single individual to work with. One librarian began with a course syllabus which she put up on the web, with images linked for each unit. Another began with review tutorials, using text and images in kiosks which already ran PowerPoint slides for departmental announcements. A third began with a lecture that one of the faculty members had given on the decorative element in contemporary artists' work which included the work of many of the faculty; she got permissions from the faculty members and digitized the slides of their work, to put on a CD along with the lecture and some introductory text.

Others, who had planned from the beginning to make the entire collection available, started with as few as three or ten images. They were able to experiment with the software, see the effect of various resolutions, get a feel for all the pieces before putting them together. How were these first three or ten selected? A typical answer was provided by a museum librarian, who said: "Simple. The next exhibition."

Another factor that weighed heavily in the decision is copyright law, or the librarian's understanding of copyright law. Who owned the rights to particular images and how easy or difficult it was to contact and obtain the permissions for reproduction affected the choice of images. One librarian started with a collection that was a donation to the university, because the library owned the rights. Another started with commercial images because the rights-holders were publishers and therefore easy to identify and locate (not always the case with original photography). A third was starting with copy work, because she felt it fell into a gray area in copyright law, whereas she knew she didn't have the rights to commercial slides and the faculty who produced the original works had in many cases retired or moved on. Copyright affected both what images to digitize, and what resolution to use.

What subject access decisions are being made?

This discussion will focus on the database and catalog projects, and omit those projects which were purely instructional in nature. See Table 2 for a summary of the data.

Visual resource collections have traditionally been arranged physically, with no subject access (Small, 1991). Many materials in collections -- for instance, crafts -- lack even titles. Slides are arranged geographically by nationality of creator or by location, or chronologically, and then by the creator. The slide label is often the full record for that slide; therefore, the information is brief. To enable information to be recorded, abbreviation authority lists have been created by the Visual Resources Association (Schuller, 1989) and coding systems have been developed. The Smith-Tansey system for architecture, for instance, uses a coded square of numbers and letters to represent attributes include time period, country, art form, style, artist's name, medium, title, subject, part of building, and view. It is used for physical arrangement, and is, according to one of the respondents, indecipherable to the users of the collection; it does not allow searching by actual subject. The introduction of commercial database software, and the refinement of its functionality to allow printing of selected fields on slide labels, made possible the addition of subjects to the searchable information about collections. Six of the eight curators had built databases containing textual records for at least a portion of their collections before beginning digitization of the images themselves; for the other two, the ability to link images to the data provided the impetus to create a database.

Three of the projects -- two in university art departments and one in a museum of art -- were comprehensive; the intent was to create a database for the entire collection, at least from that point forward. The other five projects were limited in scope, focused on a single discrete collection within the collection as a whole. Three of the five were experimental, intended to allow the curator to explore the potential, the best approaches, and the technologies themselves, without committing the library to a comprehensive plan for the future. The other two projects were the result of unexpected grant money, and the scope of the project was tailored to the life of the grant.

The three experimental projects were all preceded by robust instructional projects; there was a sense that these projects created an opportunity that was too important to pass up for linking those images to a database, though there were only limited resources available for doing so. One of the respondents said that discussions of digitizing additional images and connecting them to the database all began with the phrase "when we get the money...". Another respondent lamented, "It's a huge project -- there's a lot of data entry -- and we have no real help. The students are doing slide accessioning, labeling, etc. It's hard to find a big enough chunk of labor; hard to make any headway. I haven't actually worked on this in the last ten months or so."

It is most useful to consider each of the projects in turn. The aspects of subject access to be discussed are the vocabularies used, the number of terms assigned, cataloging of the entire image versus detail (individual objects within the image), and responsibility for term assignment

At the university which was integrating its visual resources collection into the library's OPAC (1-Uart), the data structure was of course the MARC record. The librarian was hired specifically to implement the changeover from a departmental, unautomated collection to representation in the university's online catalog. The expectation is that permissions will ultimately be sought for the entire collection, and all the images for which the permissions are obtained will be linked to their OPAC records. This collection uses AAT and LCSH, in different fields. The 6xx fields are the subject access fields; LCSH is used in these. The curator initially assigned up to ten terms per image, but the under-staffed technical services department imposed a six term limit. The average number of subject headings per item is four. In general, these terms address the image as a whole. AAT is used in the notes (5xx) fields. the terms from the thesaurus are incorporated into one or two, often very long, sentences. This field captures the specifics of the image, and the terms are selected on the basis of anticipated uses and queries. A typical sentence in the notes field might read "Mary is weaving on a tablet loom; view of Gothic interior arch, leaded glass windows; Joseph is sitting on stool with weaving tool." The curator was not able to estimate how many AAT terms might be incorporated into such a sentence, but said that the sentences "can get pretty long."

	Project	Fields	Vocabularies used	Example of in house terms (where available)	Indiv. objects or details	Number of terms typically assigned	Subject terms assigned by
1-U-art	Comprehensive database and digitization in tandem	MARC: 5xx 6xx	5xx: ATT 6xx: LCSH supplement w/ in-house		yes	5xx: 5-12 6xx: 4	respondent
2-M-art	Comprehensive database preceded digitization	1) subject 2) AAT 3)	1) in house 2) AAT 3) ICONCLASS	Prisons -- Chain gang Costume -- Prisoner Agriculture—Farming—U.S. Cartography -- Aerial Buddhism -- Symbols -- Wheel of Law Allegory	yes	"as many as necessary to get all the important things in"	respondent
3-U-art	Comprehensive database preceded digitization	hierarchical	AAT, ICONCLASS, LCSH, in-house to supplement		yes	<missing data>	cataloging cooperative
4-U-arch	Comprehensive database preceded digitization; discrete digitization project has own database	description	AAT in-house to supplement		yes	2-6 (estimate)	students
5-M-art	Discrete collection mgmt system preceded; new database in tandem with digitization	MARC: 6xx	1) work type (in-house) 2) AAT, LCSH	African architecture American fiber art American Furniture European metal work Classical decorative art European print Asian painting	yes	not decided	respondent
6-U-art	Discrete database and digitization in tandem	1) subject 2) keyword	1) in-house categories from physical arrangement 2) in-house	Landscape Nonobjective Animal Ballet Narrative with figure	yes	1) 1 2) multiple	respondent
7-U-arch	Comprehensive database preceded digitization	building type special feature	in-house drawn from architectural dictionaries & reference books	House, country Tree, oak	yes	15-20	students
8-U-art	database and digitization in tandem	keyword	in-house	Women's culture Events Performance Feminist studio Workshop Public art	no	2-4	respondent

Table 2. Subject access

The curator found AAT to be "very ample," and a good fit to the collection. Her expectation had been that both vocabularies would be unacceptably weak for non-Western art, and would not be specific enough for item-level cataloging; in practice, she found that she rarely needed to supplement the terms. When she does supplement them, it is for something "very obscure," and she uses terms from subject specialty dictionaries.

The curator doing the other large and comprehensive project, at an art museum, had been providing subject access to the collection for three decades, and implemented an electronic database several years ago. She had a very different opinion of LCSH and AAT. She finds LCSH to be unusably broad, AAT to contain descriptive terms rather than true subject, and both, along with ICONCLASS, to be ethnocentric and biased regarding non-Western art. For a collection which is one-third non-Western, this is a significant problem. However, the curator has provided fields for AAT and ICONCLASS in the data structure. The primary subject field contains subject headings which she developed for the collection, which are loosely patterned on LCSH but more specific. Where LC provides the term "architecture, domestic," the in-house vocabulary gives building type, building style, and location -- for instance, "Architecture - Residence - Georgian - Virginia." ICONCLASS does address aboutness, and the curator expects that it may eventually become much more widely used than it is currently. However, she feels that the coding structure makes it extremely difficult to use and for the moment is not adding ICONCLASS terms to the records. Since the in-house vocabulary provides the primary subject access, the AAT vocabulary is used without modification. Term assignment is done by the curator.

The other comprehensive project, 3-U-*art*, has its cataloging done by a collective, and the VRA core categories form the basis for the data structure. The subject field is hierarchical, and they select terms as needed from AAT, ICONCLASS, and LCSH; when the needed term is not in any of those three, they will add their own. The terms they find they need to add are the most specific terms -- for the first two levels in the hierarchy, appropriate terms are available.

4-U-*arch*, which is doing simultaneous database and imagebase projects on different computer platforms, is using AAT for the description field, embedded in one or two short phrases or sentences. The curator was unable to estimate the average number of terms used per record. She said that they do occasionally supplement the vocabulary, but wasn't aware that the terms they need to add formed a pattern or tended to be of any particular nature. Students do the cataloging, and it is checked by the curator. As noted earlier, the digitized slides are being handled separately from the others; a truncated version of the primary database is in use, which contains only the information that can be printed on the slide, not the description field or additional access points, plus links to the images on a separate CD-ROM.

5-M-*art*, the pilot project digitizing the discrete collection of the Registrar's transparencies and slides, is also using MARC as a data structure. They are still in the process of working out subject access. In the 6xx fields, they will use an in-house vocabulary based on the pre-existing physical slide arrangement system. There are 26 terms used to represent work type -- architecture, fiber arts, furniture, photography, sculpture, and painting are representative examples. The subject headings will combine work type with department (American, Asian, European, Classics), followed by the creator's name and date. The cataloging will be done by the respondent. An additional field will be created for LCSH subject headings They are also considering adding descriptions to the notes field -- perhaps 3 sentences or a short paragraph describing the literal content of the image (no interpretation), such as "young girl riding side saddle, hair in pony tail..." One issue in a museum is the divided nature of the responsibilities; the Registrar's office manages the collection, provides the database of holdings, keeps records of the use of each object in exhibitions and loans, and does the actual hanging, while the curatorial staff plans the exhibits and deals with intellectual content. Decisions about notes and descriptions may overlap with curatorial responsibilities, requiring negotiation and agreement. The museum is considering the use of AAT terms, which have the advantages of being intended for such collections and of being used in the pre-existing collection management database; but concerns about conflict between AAT and LCSH terminology may preclude use of AAT.

6-U-*art* has two fields for subject access, referred to as subject and key word fields. The subject terms are drawn from the physical arrangement, which is first by work type (architecture, sculpture, painting), followed by a facet for country, then century, artist, and subject. "Subject" refers to the nature of what is depicted; landscape, animal, ballet, narrative with figure, nonobjective, etc. There is an authority list kept of terms assigned in the key word field. The image is analyzed as a whole.

In 7-U-*arch*, there are two subject fields, one for building type and one for special features. The special features field can contain 15-20 words, drawn from various architectural dictionaries as needed. However, the terms are assigned by architecture students, who don't have a great deal of architectural knowledge yet, and often don't use the dictionaries and reference books. The records are checked by the curator, but this is time-consuming and often cannot be done as thoroughly as she would like. The curator would use AAT extensively if the library had a paper copy; they have found AAT cumbersome to use online, and Netscape crashes whenever they access the site.

For 8-U-*art*, subject access is provided through key words. These were composed on the fly by the curator. They are designed to address the fact that the web search engine allows users to search this database simultaneously with other databases from a wide range of subject areas. "Women's Culture," for instance, is a key word for every slide, so that they can be found among images of cowboys, aqueducts, historical landmarks, and neighborhoods. The user group is broad and unpredictable,

making a general vocabulary more useful than a highly specialized feminist, historical, or art vocabulary. A list of terms was not maintained by the curator.

How are users brought into the process?

Only one of the curators, 1-U-*art*, incorporated users directly into the planning process, and she did so because of the structure imposed by the university; a committee of 12 faculty members and the dean participated in setting policies for circulation, access, etc. The respondent found two advantages to working with the committee; it provided them with support in the Faculty Senate, and it gave them a strong base from which to publicize the collection. One of the other librarians planning a comprehensive catalog said that she would bring in users as soon as she had a web page design that she liked, and actively solicit opinions. In some cases, the faculty unknowingly played a role in the decision as to what to digitize, since it was the slides requested most frequently for course use -- the "monuments," as one librarian called them -- that would be digitized first.

Discussion of use of the collection focused on the teaching needs of faculty and students rather than on research needs. Several of the curators described professors coming in to pull the slides they always use for a particular course. Response to the innovation by users has been mixed. Students have been overwhelmingly enthusiastic, especially about tutorials which can be reviewed at individual workstations, rather than in lightboxes with groups of students huddled around trying to see. Faculty at the university which put their syllabi up and linked images to them were rapid converts to web technology; the librarian said that although at first they were very skeptical, "they've turned around so quickly I'm just shocked. They're old world scholar types. Very wary. Now they come to me and ask for web pages. They were hesitant; now they're very excited." The slide collection added to the university library OPAC found a clear increase in usage by faculty and students from outside the art department.

However, faculty are often reluctant to change their tried and true habits. There is also the physical appeal of the old way of doing things; "they love their slides and the photographs," they know exactly where to find what they want, they enjoy the physical process of working with drawers of slides. In these cases, an imagebase goes largely unused. Another librarian began her work with digitization by putting faculty art up on a web page, hoping to generate enthusiasm and a sense of the potential of the medium, to "grab their attention in some kind of digital way." She found, however, that "when it's not part of a culture, it's not the expectation ... And I've put out newsletters, and spoken at the faculty assembly about what we're doing, but I still don't think they've really quite gotten it. They're not beating down the door with their slides, and saying 'Please include me' yet. So we're just trying to kind of gradually spread the word."

What are the formal and informal communication channels which provide for the growth of knowledge?

The sample of librarians and curators for this pilot project is skewed toward the more active members of the profession. Attendance at an out-of-state conference is in itself an indication that an individual has a certain level of professional involvement. The element of self-selection present, because the questionnaire was distributed passively, also has an effect on the results. Still, the individuals interviewed give an interesting look at the movement of ideas among members of a profession. Table 3 lists the communication channels cited.

The individuals experimenting with digitization and linking images to textual representations found both formal and informal channels to be very useful. The Visual Resources Association was the association most frequently mentioned -- not surprisingly since all the respondents were originally contacted through the VRA. The formal presentations themselves were useful, and the ability to contact a presenter later and ask specific questions was equally, sometimes more, important. The Art Libraries Society of North America was also mentioned by 4 of the respondents. NINCH, the National Initiative for a Networked Cultural Heritage, and the Museum Computer Network were both mentioned -- though, interestingly, by one of the individuals in a university slide library, not a museum. Five of the respondents cited the VRA's listserv as an important source of technical information, and a good place to obtain answers to specific questions. One respondent commented that she "could not have done the project without this listserv ... it really is so important to a project like this when you're all alone."

Project (profl degree of curator)	1-U-art (MLIS)	2-M-art (art hist.)	3-U-art (MLIS)	4-U-arch (museum studies)	5-M-art (MLIS)	6-U-art (art hist.)	7-U-arch (architect.)	8-U-art (MLIS)
Journals, articles	Art Documentation on VRA Bulletin Art Library Journal	Art Documentation Visual Documentation VRA Bulletin	Shatford Layne articles in Cataloging & Classisification Quarterly, JASIS, The Reference Librarian.		Art Documentation	VRA Bulletin Spectra (Museum Computer Network)		New Media Communication Arts graphic design journals general news media
Books	McRae and White (1998). ArtMARC Sourcebook Kenney and Chapman, (1996). Digital Imaging for Libraries and Archives.		Petersen and Barnett (1994). Guide to Indexing and Cataloging with the AAT. Besser and Trant (1995). Introduction to Imaging.		Petersen and Mollholt (1990). Beyond the Book McRae and White (1998). ArtMARC.			
Electronic*		VRA listserv		VRA listserv	RLG's DigiNews	NINCH website	VRA listserv	VRA listerv ARLIS listserv
Conferences*	VRA ARLIS	ARLIS	VRA	VRA	VRA (natl) ARLIS (local)	SECAC	VRA	
Workshops		Getty's on AAT, ULAN						
Colleagues			librarians at her university	nearby collection	follow-up from VRA conference		colleagues at VRA technical support people on campus	imaging software developer artists who've done CD-ROMs grant participants

Acronyms: VRA = Visual Resources Association, ARLIS = Art Library Society of North America, NINCH = National Initiative for a Networked Cultural Heritage, SECAC = Southeast College Art Conference, RLG = Research Libraries Group.

Table 3. Communication channels important to digitization and subject access projects

The three individuals involved in more comprehensive projects found the associations and the listserv less useful; the majority of attention was focused on projects that were smaller in scope than their own. All three had contributed themselves to association programs or publications.

Five of the respondents did a lot of reading at the beginnings of their projects. Four books were mentioned: ArtMARC Sourcebook (McRae and White, 1998), Beyond MARC (Petersen and Molholt, 1990), Guide to Indexing and Cataloging with the Art and Architecture Thesaurus (Petersen, 1994), Introduction to Imaging (Besser and Trant, 1995), and Digital Imaging for Libraries and Archives (Kenney and Chapman, 1996), by a group at Cornell who developed an imagebase. The journals published by the Visual Resources Association and ÅRLIS were mentioned by five of the respondents.

As mentioned above, the three individuals involved in comprehensive projects were contributors to the national associations in various ways. They had made presentations at conferences, written journal articles and book chapters, and served on data standards or copyright committees. Two of the people doing smaller projects had presented at the national or local level as well. Two others were planning to do presentations when their projects were farther along.

All the respondents also participated in informal exchanges about digitization, data structures, and copyright. There were visits to see what others were doing, conversations at conferences, queries posted to listservs, and interactions with individuals encountered in various ways. One respondent described systematically seeking people out, and asking them to suggest other people she should talk to. Again, it was the people doing smaller projects who found useful information through various informal channels. One respondent noted that the most useful people to talk with are those who "are maybe just a little further ahead than me, and not in a big institution. I could maybe get, you know, the next level of what's happening. If they're too big, too far ahead, then they're doing things that we might never do."

Both those with small projects and those with comprehensive ones were sought out by others who wanted to see what they were doing, and perhaps ask advice. Those doing the largest projects seemed to be the ones most often contacted; probably because their formal contributions to the profession brought them to people's notice.

Only one of the respondents found very little of value through either formal or informal communication channels.

Conclusion

How, then, is the professional knowledge base growing, as represented in these eight projects?

Rogers's five factors clearly played a role. Observability appears to have had a strong impact on the decision to undertake a digitization project. At the most general level, professional journals, association conferences, conversations with colleagues, and the varied uses of images on the Web have created a sense of inevitability about image digitization and the incorporation of images into databases and online catalogs. Some of the respondents even had difficulty identifying a source for their decision to do a project; as one curator said, "It's everywhere." More specifically, the willingness of local innovators to speak at local and national conferences has brought small- to medium-scale projects into visibility. The VRA listserv in particular has played an important role in allowing for the exchange of technical information between people at various stages of trial and implementation. Where subject access is concerned, formal channels seem to be more important than informal. Respondents reported many conversations about scanning, but relatively few about subject access. All of the respondents were at least aware of the Art and Architecture Thesaurus and considered it to be an obvious alternative to consider, though not all found it the obvious choice. LCSH, because of its widespread use in libraries, is also a must-consider, though not a must-choose. ICONCLASS and TGM1 fall far behind the other two vocabularies in being established in the professional knowledge base.

One of the questions out of which this study arose concerned the boundary-spanning nature of professional knowledge growth. Half of the people I interviewed had professional degrees in Library and Information Studies. One had a degree in museum studies (anthropology), which included a course in collection management. The others had masters degrees or Ph.D.s in art history. Visual resource collections in art or architecture are not traditionally staffed by librarians, nor are they usually a part of a university library system; normally they fall administratively within a department or school. Museum curators and Registry Department staff members are a different profession yet (and in fact these two groups themselves have very different professional roles). The Visual Resource Association is bringing many of these individuals into the same conversation, although each professional group has its own associations as well. The Getty has also contributed to the observability of innovation across professional boundaries through its development of the AAT.

Trialability has worked in favor of rapid growth of knowledge in the area of technology for physical access, and somewhat against change in subject access. Because the equipment is relatively low cost, it's possible to invest in a scanner and software and try out the technology on a clearly demarcated part of the collection. Pilot projects make sense; the resource investment doesn't require a long-range commitment to total conversion for justification. Intellectual access, however, poses

different problems. Changing subject access is not something a curator is likely to do on a provisional basis. In fact, the prevalence of incremental approaches to digitizing which results from small grants, uncertainty about the best way to do things, and limited resources, may work against long-term, comprehensive planning for subject access. One way of resolving the tension between need for stability and need for change is provided by the flexibility of the field structure of an electronic database; the ability to create multiple subject fields allows the use of new and old vocabularies simultaneously, thus permitting trial of the new vocabulary without losing the known usefulness of the old. Four of the eight projects studied incorporated part or all of their old system into the database, and added fields for AAT, LCSH, or ICONCLASS. Of the four that did not, two made a wholesale change to standard vocabularies, one made a wholesale change to an in-house vocabulary created from specialized dictionaries and reference works, and one created hers as she added the images.

Complexity is an important factor; imagebase projects involve copyright law (about which there are a variety of conflicting opinions), image manipulation techniques, large amounts of storage, time (one curator found it took 30 minutes per slide when time to size it and make corrections was included), data structures, and vocabularies. Many of these aspects are not yet a well established part of the professional knowledge base. Respondents were particularly uncertain about copyright and appropriate resolutions. The intellectual complexity of subject access has clearly been a barrier to the emergence of a professional standard. AAT has the highest level of adoption, with use by five of the eight sites. However, only one uses it alone. LCSH is used by three collections, always in conjunction with other vocabularies. All but one of the collections uses local terms at least as occasional supplements to standard vocabularies, and five use them as the primary vocabulary.

Rogers's factor of relative advantage highlights additional aspects of current professional knowledge growth. Slide libraries have gotten along with rigid filing systems, small labels, limited-access lightboxes, and projectors for decades. Where visual information is sought for clearly defined and slow changing purposes, the ability to browse online has little urgency. Shatford's question about which subjects should be indexed, and which should not, is still far from being answered. When asked about uses of the collection, the curators described known-item, or known-category, searches, not the exploratory, iterative, refine-the-question-as-you-go searches described in research on textual information seeking behavior (Kuhlthau, 1993). One of the curators reflected on the fact that visual resource collections are based on "specific, deep, repeated courses." This makes them very different from collections supporting creative work such as advertising, where what is desired may be a concept or a mood; there, an imagebase may have more persuasive advantages. The apparent predictability of information needs in this small data set raises the question of the importance of indexing at the levels of aboutness and interpretation. Only one of the projects actually uses ICONCLASS, although another has a field for its eventual use. None use TGM1. The in-house vocabularies, with the exception of

2-M-*art*, do not reflect analytic or interpretive approaches. Would availability of a truly comprehensive imagebase with rich subject access to both image and objects within the image change the way faculty work? Perhaps; technologies often have unforeseen impacts. But possible and unforeseen impacts are not the motivators for change. Perhaps the reason students have welcomed digitization to a greater extent than faculty has less to do with their youth than with the fact that the advantage of sitting at a workstation over gathering around a lightbox is much more clear cut.

Compatibility, Rogers's fifth factor, is a problem for many faculty. The faculty members know which slide drawers contain "their" slides, and they appreciate the tactile routines of pulling slides. Slide projectors rarely malfunction, and they serve the need of lecturers quite well. Here, interestingly, changes in subject access are less problematic. As long as slides are physically arranged in the same ways, the database and vocabulary are a sort of superstructure which can be ignored. One librarian (not among the respondents for this study) who was a pioneer in image digitization has created an extremely rich imagebase -- but she told me that her faculty and students never use it. While she has clearly contributed to the knowledge of the profession through her publications, the innovation remains largely unused at the local level. By contrast, the integration of the slide collection into a university OPAC has greatly increased its use by individuals outside the primary departmental clientele.

Subject access may be a more revolutionary innovation in visual resource collections than the technological advance of image digitization. Users have always had images available to examine; the change from a slide drawer to a monitor seems one of convenience rather than of intellectual process. It is a much greater change to go from providing access by location, time period, and creator to providing access by subject. It allows one to search for the unknown rather than for the known.

The research questions for the larger study for which this was a pilot project will focus on subject access in greater detail. This project provided a sense of the landscape -- current practice, the vocabularies, the contexts of formal and informal knowledge growth within which subject decisions are made. The next step is to add depth to the exploration of subject: the nature and structure of home-grown vocabularies, differences between teaching and research uses of image collections, and an investigation of the thinking behind subject decisions.

The processes of growth in a profession's knowledge base are multivariately messy. Innovation often takes place without clear-cut goals and objectives; rather, there may be only a sense that this is something too important to ignore, or an opportunity may present itself to which the curator has to react. Advances are uneven. Each professional must solve the problems of innovation in the context of a specific organization with needs and expectations which have evolved over time. The new knowledge and practices codified in the published literature and standards of the field may or may not be instantiated in its individual members. Local practice may or may not be communicated much beyond the walls of the institution. Every respondent

expressed a feeling, at one time or another, of having insufficient information for what she was trying to do. Most also expressed a sense of working alone and needing to reach beyond her own institution for the necessary information and ideas. The data reported here reveal some of the ways in which advances radiate out along a ragged set of formal and informal channels, and accrete to the body of knowledge that forms the foundation of future growth.

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