An Art Information System:
From Integration to Interpretation

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INTRODUCTION

BEFORE ADDRESSING THE COMPONENTS of an integrated art information system in a model setting—i.e., an art museum—one must draw a comparison between bibliographic systems and those systems being planned for art objects, and explore the qualities of the bibliographic and object entities themselves that contribute to the similarities and differences of the data describing them. More data, for example, may be required to describe adequately an object for purposes of research than may be necessary for bibliographic research. And the uniqueness of data on objects as compared to bibliographic data may be merely a quantitative difference. Whatever the differences are, the sharing of information and the methodology implicit in that sharing will become more and more important if research is to be expanded rather than impeded.

This article focuses on how those responsible for documenting art objects—art historians, curators, and registrars—might work cooperatively with those responsible for art bibliographic documentation. Those engaged in object documentation could not only tap applicable documentation principles already extant for bibliographic systems but also share in the expansion of these standards and the building of art information systems. The role of authority control may be seen as the linking component between bibliographic/research information and object/interpretive information toward the ultimate goal of an integrated art information system.

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COMPARISON OF BIBLIOGRAPHIC AND ART OBJECT SYSTEMS

Development of National Bibliographic Systems

　　Independent art research libraries, in particular the museum libraries, adopted automation much later than the art research libraries which are part of large university library systems. Both chose the same route: first, beginning with cataloging, automating technical processes through a shared, nationally centralized bibliographic system; and only much later turning to the systems that would serve within each of their institutions to integrate a variety of functions for the ultimate purpose of information retrieval. The actual passage from the historic bibliographic systems to the decentralized information retrieval systems was accompanied by decades of development and refinement of standards for cataloging, information transfer as contained in the MARC format, and vocabulary control as practiced by the Library of Congress and other national enterprises such as the Name Authority Cooperative Project (NACO).

　　The national bibliographic systems and networks, over two decades old, are unquestionably the de facto systems for the library community. Products of an era that had as its goal one nationally centralized database, these systems now enter a technological age that is shifting the emphases to separate, local systems linked to these larger databases via "arteries" and "switching stations" for the purpose of exchanging and sharing information on local, national, and even international levels. Rather than being viewed as replacement systems, the local systems serve as extensions—cooperative networks of library systems where most of the advancements in user interfaces, controlled vocabularies, and integrated authority control will be realized.

　　Evolving technology was *not* the cause for this shift in emphasis, but it served as a tool to save the monolithic databases from collapsing under their own weight. Intended to address prohibitive telecommunication costs and limited system capacity, linked systems represent a different approach with a different set of opportunities to serve the needs of specialized subject areas—for the purpose of this article, art and architectural history and research. With the development of personal computer systems and optical storage capabilities, technology supports local systems in a way that it could not have done ten years ago.

　　No matter what technological means are at hand to enhance systems—whether centralized or distributed systems—the goal of bibliographic documentation has always been to exchange and share information—to make information acccessible in an organized manner. Libraries early on developed cooperative relationships to improve standards. Networks are only a means to this objective. It is through

standards for cataloging and indexing, information transfer, and con-
trolled vocabularies, that special subject areas can be identified, iso-
lated, and, in the current information science jargon, "massaged" from
mere data into information and ultimately into knowledge-bases
equipped with artificial intelligence to relate, infer, and interpret.

Bibliographic standards evolved over the same period as the build-
ing of systems—i.e, toward uniformity with an emphasis on hierarchi-
cal formats designed with the printed word in mind: cataloging with
hierarchical main entries and controlled vocabularies with hierarchical
main terms. In the last few years there has been a reassessment of
ethnocentricities (Allen 1987, pp. 21-23) and a reassessment of the neces-
sity for predetermined patterns and structures (Molholt 1987, p. 8),
resulting in a more open-ended approach to standards that could only
have occurred, along with recent developments in technology, to sup-
port concepts such as faceted indexing, transparent or invisible term
switching, hierarchical thesauri, and multilingual and multithesauri
systems.

The principle of medium merging with its message and reshaping
information is nowhere more evident than in the field of information
science. It is important to note that this is an additive process that
enriches information by continually expanding access to it. Lenore
Sarasan (1984) described this process for visual access systems, but it
could as easily apply to bibliographic systems:

> Technology has brought us to the brink of a major redefinition of how art
> history will be pursued in the future....Much of the potential of automation,
> though, depends on how data are defined and structured in a computer. If we
> simply transfer manual systems to computers without substantive changes, we
> will do nothing more than speed up the answering of the same questions we
> can now answer using manual systems. If instead, we expand the accessibility
> of both visual and non-visual data by exploring and experimenting with new
> methodologies and by rethinking how we approach fine art information, we
> can take art history studies far beyond the reaches of conventional research.
> (p. 406)

Retrieval, no matter how sophisticated, is dependent on how an
item was indexed or, in Sarasan's words, "how data are defined." The
dramatic research of the last ten years in information science impinges
on two areas: indexing methodology and retrieval capabilities, and the
symbiotic relationship between them. Whereas new technology may
dramatically shape the ability to retrieve—even without substantial
changes in indexing practices—it will have less effect on how indexing
is performed. Although much is being written about artificial intelli-
gence and reasoning, it has yet to go beyond the research and develop-
ment phase in its attempt to mimic and surpass human intelligence. In
other words, technology will not dramatically change how an item is
indexed without the cataloger or indexer first changing how he/she
goes about the process of documentation.

Cataloging and indexing methodology, within the historic biblio-
graphic systems and thus within the cataloging departments of large
research libraries throughout this country, is unlikely to change sub-
stantially; or if change comes, it will come slowly in the form of
acceptance of subject specific vocabularies and thesauri and reformat-
ting of the MARC subject indexing fields. It is more likely that new
applications will occur initially in the area of special collections and
special media—e.g., periodical indexes, architectural drawings, and
visual resources—which have not evolved as part of the historic biblio-
graphic systems and their accompanying standards.

Development of Systems for Art Objects

Much has been, and will continue to be, written about the early
attempts to computerize information on object collections in museums.
These early attempts occurred in the same era as the groundwork was
breaking for the large bibliographic systems. The pioneers in museum
computerization of the 1960s foresaw a "universal museum index
(Vance 1985, pp. 36-37)." Unencumbered by mammoth historic card
catalogs, their dream of universality went far beyond the national
boundaries of the developing bibliographic systems.

Libraries had their opportunity to develop international standards
in 1961 with the *Paris Principles*, a statement of cataloging code princi-
ples developed by the International Federation of Library Associations
and Institutions (IFLA) meant to serve as a foundation for national
codes that would facilitate universal bibliographic control. The result-
ing Anglo-American cataloging code was a compromise between accep-
tance of international standards and the inertia of the large
long-established American research libraries to change their card cata-
logs (Clack 1980, p. 6). Not until the second edition of those codes in
1978 was the impact of internationalism felt on the library card catalog.
But by then most of the research libraries were beginning to plan for
their online catalogs.

On the other hand, museums having only local or grassroots stan-
dards had much to gain from the development and acceptance of inter-
national standards for museum documentation. Out of these very early
attempts at museum computerization came not just a system unable to
carry the weight of undeveloped and inconsistent documentation, but
the beginnings of international work—i.e., committees and forums
such as the International Council of Museums (ICOM) and its Interna-
tional Committee for Documentation (CIDOC)—that would slowly,
over the next two decades, work to develop museum standards for
defining data and controlled vocabularies. At the same time, national
organizations, particularly in Great Britain and Europe, worked coop-
eratively with ICOM and CIDOC toward mutual ends. The United

States, lacking a unified museum system and national directives, participated with somewhat less enthusiasm than their European counterparts, much like the library world of two decades earlier.

While this international work on museum documentation was slowly developing, a new generation of computers came into being—personal computers—bringing with them flexibility and the means (or the *illusion*) of creating databases quickly. Inventories, collection management, and cataloging projects could take place on the local level. Often, data managers and computer scientists served as advisors. With no experience in library science, little in information science, and less experience with standards beyond the machine level (e.g., ASCII), they reinforced idiosyncratic systems building and personalized vocabularies. So, while one area of the museum and art history world attempted to develop international standards, another area forged ahead to develop databases in the absence of these slowly evolving standards.

Since the pioneer days of museum computerization, many of the automation projects delayed or abandoned attempts to computerize cataloging for more practical in-house collection management activities. This was not the approach taken historically by libraries, to automate cataloging first before turning to collection management areas. The incentive to share cataloging data does not have the same relevance to unique objects that it does to bibliographic items. Unique objects, cataloged uniquely, cannot be seen to benefit easily from shared records in a database. The expediency of cloning records is simply not applicable. Unless items are treated in some collective, generic way, as in the case of archives, the cataloging of each object is labor intensive and requires original cataloging procedures. Furthermore, the practical need to develop systems that would benefit museums immediately, shifted work away from the building of large data files and their in-house negotiated documentation standards to functions such as acquisitions, loans, inventory, access, and care of the collections—functions similar to the divisions of library collection management, and, ultimately, to the modular approaches of automated library systems.

COMPARISON OF BIBLIOGRAPHIC AND ART OBJECT INFORMATION

The very basic elements of documentation evolved out of library science. The bibliographic documentation systems—data structures, cataloging codes, classification schemes, nomenclature and their syndetic and thesauri structures, and the online systems built to house them—were designed to evolve and expand. For nonbibliographic disciplines and fields to accept these principles and standards as they presently exist would be foolish without first undertaking a thorough investigation.

A few years ago the Society of American Archivists set up task forces to work with the Library of Congress on defining data relevant to

archivists. The MARC format for Archives and Manuscripts was the result (Floyd 1984). The visual resource world is currently setting up its own committees to begin a similar investigation which may result in the adoption and/or expansion of the MARC format for visual materials and other bibliographic standards. The art history and object world has yet to take this step. In the last decade, a number of conferences, workshops, and papers have appeared dealing with art history and museum computerization. Many of these papers recommend tapping the computer and information sciences, but few make mention of library science, and where restrained mention has been made, the assumptions and conclusions seem questionable. What follows is an attempt to pinpoint the issues that contribute to this misunderstanding of methodology and hamper cooperation toward the mutual goal of an integrated art information system. .

Modular Systems Versus Total System Approach

Reading about bibliographic databases from the art historian and museum perspectives, one encounters again and again the assumption that there is a very limited number of fields in bibliographic databases— "at the most, thirty different fields." In museums, there may be "well over a thousand of what could be construed by different people to be very useful information" (American Society for Information Science [ASIS] 1983, p. 11). This useful information includes loans, insurance value, exhibition restrictions, artist biographical information, and other data, some of which can be categorized as collection management information rather than cataloging information. Library science makes a clear distinction between cataloging information and acquisitions, circulation, interlibrary loan, and authority control information. In an integrated online catalog system, all information on a bibliographic item or object would be brought together from these different files and subsystems into one unified catalog.

Viewed from the librarian's perspective, information on an item breaks down into modular processes, and these processes are described by distinct sets of data elements. These elements are then slotted into fields that may then be "subfielded." A bibliographic item is monitored as it crosses through separate and administratively distinct territories from acquisitions, cataloging, circulation, and interlibrary loan through the user or researcher's own interaction with the system for the purpose of information retrieval. These divisions of labor have been translated into the modules or subsystems of library systems.

In the same way, the categories of nomenclature—names, subjects, and uniform titles—are, in turn, capable of being faceted into types. This methodology of categorizing information from data to knowledge is fundamental to library science. But for the nonlibrarian—e.g., the art historian and curator—to apply these same principles to objects, may,

on the surface, seem an oversimplification. Historically, museum infor-
mation has not been so easily slotted. The integrated online catalog is
not viewed as the final stage but rather as the process itself. Thus the
catalog takes on mammoth proportions as the attempt is made early on
to gather all data into one file. For the library world, the cataloging
system remains the core system around which in-house collection man-
agement subsystems and authority control rotate. For the art historian
and curator, information extraneous to the object itself—its prove-
nance, exhibition history, or artist's bibliographical information—
takes on historical relevance for the cataloging record. For both the
bibliographic and art object systems, answers to queries such as what
paintings were "exhibited by one artist during the years that another
lived in proximity" or what paintings were "bought by patrons of a
certain nationality during a particular period (Arms 1984, pp. 30-31)"
are dependent on how the data were structured, how the nomenclature
was applied, and how the files are designed to interact.

Intrinsic/Extrinsic Issue or Pointer Versus Surrogate

Most of the literature documenting the differences between a bibli-
ographic item and an art object goes to great length in dealing with the
intrinsic/extrinsic issue. The information used to document a biblio-
graphic item is generally *intrinsic* to the book itself—i.e., its author,
title, or publication date—whereas the information used to document
an art object is mostly *extrinsic* to the object—i.e., the scholarly opin-
ions, interpretations, and attributions of an art historian. These are real
and basic differences that ultimately make one set of documentation acts
as a pointer to the literature contained in the book, and the other set of
documentation acts as a complete description of an otherwise mute
object. Whatever there is to say about that object may be totally con-
tained in the surrogate record, including a surrogate image of that
object. Do the differences between a pointer and a surrogate record have
grave ramifications for the ability of the museum and art history world
to tap bibliographic documentation principles and systems?

While half the purpose of a bibliographic catalog is to function as a
pointer to a known entity—the desired book—the other half is to locate
unanticipated documents through its system of subject descriptors. In
this latter case, the catalog could be said to be pointing at the contents of
a book—contents that might also contain an art historian's opinions,
interpretations, and attributions. The usual method of making compar-
isons, item-for-item, needs to be suspended in order that the record
information about the art object may be compared with the information
contained within the pages of the book—not the usual one-to-one,
record-to-record, comparison.

A massive task has taken place in the bibliographic catalog through
subject analysis: the construction of a scheme of knowledge that seem-
ingly unbinds the book. If it could be said that the art object is much

enriched by the art historian's documentation, then that same informa-
tion, elaborated on and published as unique documentation in articles
and books, needs to be linked to that object. The real difference between
object and bibliographic item information is that the object description
enumerates and the bibliographic content description ("descriptors")
abstracts. But whether enumerative or abstracted, the basic elements of
subject description—the descriptors—remain the same. Those same
questions posed to an object catalog can be posed to a bibliographic
catalog. The former answers them for specific art work, the genre of
object databases; the latter, for the whole realm of art historical research
beyond the physical object. Elements of conservation, technique, and
iconography are being linked into a broader conceptual scheme of
knowledge including *conservation, techniques,* and *iconography* with
each aspect maintained within a distinct syndetic structure of faceted
subject knowledge.

Inference Issue
    A major misconception about library systems and documentation
is to assume that the large network systems now in place for biblio-
graphic control are the model systems desired by the library community
for both management and retrieval of information. This is to ignore the
large body of library and information science literature of the last two
decades directed toward the need for interactive online public access
catalogs and integrated authority control, enriched vocabularies to
augment Library of Congress headings, changes in the syndetic struc-
ture of authority files, the mounting of subject-specific thesauri, the
expansion of the MARC formats for nonbibliographic materials, and
the restructuring of this format for indexing purposes (to list but a few
major research issues).
    William Y. Arms (1984), then director of the Museum Prototype
Project, in his paper given at the 1984 Pisa Conference on Automatic
Processing of Art History Data and Documents, remarked that "library
systems are poor at searching for ranges or combinations of informa-
tion, much less for drawing scholarly inference from complex data"
(pp. 33-34). Later in his paper he acknowledges that inference relates to
artificial intelligence which is still in the early stages of research. The
obvious conclusion might have been that library systems, like object
systems, are intended to incorporate inference capabilities. But that is
not the conclusion drawn in his paper; rather, he states that "the
fundamental differences of design philosophy makes real difficulties in
attempting to use library systems for scholarly inference." In assessing
the Research Libraries Information Network (RLIN), he states that: "It
makes no attempt at the scholarly inference required by Museums. It
does not know that Florence is in Italy or that painters are artists...it
makes no inference." But just as the Art and Architecture Thesaurus
with its hierarchy *Agents* (i.e., People and Organizations) treats the term

painter as a narrower term under *artist,* a hierarchical gazetteer could position Florence as a narrower term under Italy. With state-of-the-art computer technology and integrated authority control, so-called inferences can be incorporated into our systems. But such links have to be constructed as separate, ongoing, properly funded projects (Barnett 1985, pp. 10-11).

Perhaps the art library community as a whole has not been adamant enough in demanding changes from their bibliographic utilities nor enthusiastic enough in supporting subject-specific research support projects such as the Art and Architecture Thesaurus (AAT). Or perhaps librarians are waiting out these applications for their linked local online retrieval systems. After decades of computerizing the cataloging and related work of library systems and over a decade of adapting to changes in the bibliographic cataloging code, the library world appears to lack enthusiasm and motivation to bring its formation together to the satisfaction of its users and researchers. Librarians need to be making demands on the vendors of local systems to produce these very sophisticated information retrieval and authority control capabilities so that when local systems are in place the queries posed by their researchers can be answered. In the same way, the library world and the art library world in particular, resist the tasks involved in refining the subject-specific indexing fields that will complement the mounting of thesauri and contribute to more refined information retrieval.

Scholarly inference is needed for bibliographic systems as well as object systems. Research not only needs to focus on specific aspects of an object's provenance, exhibition history, conservation, or iconography, but it also needs to broaden its scope of the more general categories, concepts, or facets of knowledge. Object catalogs are focused on the objects themselves; bibliographic catalogs mirror research, whether object specific or encompassing more conceptual and expansive areas of subject knowledge.

While the museum world lacks motivation to work together to exchange and share information so as to define, adapt, and build its data structures and standards, the library world lacks motivation to refine and bring all of its data together into knowledge bases for the purpose of research.

Document Description Versus Knowledge Description

Jim Anderson, at Rutgers University and designer of the bilingual art history database for the merging of the U.S. based *International Repertory of the Literature of Art* (RILA) and the French based *Répertoire d'Art et d'Archéologie* (RAA), noted that bibliographic database design provides extensive structure and definition to elements of document description while "knowledge description is frequently relegated to a few relatively unstructured fields....The MARC format exemplifies this practice, devoting the major portion of its structure to bibliogra-

phic details of documents" (Anderson 1986). Document description in this context stands for the intrinsic elements such as title, imprint, and physical description; and knowledge description stands for the subject content represented. As with the earlier Arms description of the limitations of library systems, the critic could stop here or pursue a remedy. For those outside of libraries, it may appear easier to abandon MARC and start over; but for those with catalogs and databases already tied to MARC, the work required to expand these formats lies ahead. It should also be pointed out that to design a system that is not MARC formatted probably means that a MARC conversion table will eventually be required if the database is ever to be transportable.

If today's library systems are being redirected away from the monolithic system concept and extended to a distributed local system and if the structured subject vocabularies may be moving in a similar path—i.e., away from the single predetermined preferred term to a switching term with its emphasis on local preferences—then too MARC can be made capable of expansion beyond its bibliographic roots into more generic labeling useful for objects as well as printed materials. The item in hand can no longer be assumed to be a book.

The "few relatively unstructured fields" for knowledge description in the MARC format, referred to by Anderson, are being closely scrutinized by subject specialists in the art and architecture fields (Research Libraries Group [RLG] 1987). If a field such as the topical subject (650) field includes a code to identify which subject-specific thesauri are to be used, then the "subfielding" within that field could be coded specifically for the thesaurus identified. For example, if the thesaurus to be applied is the Art and Architecture Thesaurus rather than Library of Congress Subject Headings, the subject indexing within the 650 field could then be subfielded to correspond to the AAT's unique scheme or facets of knowledge. In this way, those "few relatively unstructured fields" can be expanded to provide a structure and definition to knowledge, in this case, art and architecture. By assigning a term to a facet, that term is given a relationship. These relationships allow for an interpretive process in which inferences can be based on structured context rather than data content alone. Until the work to expand the MARC format is done, these MARC subject fields remain few and unstructured, speaking to and for an earlier age.

Unique Item Versus Multiple Copies

If the unique aspects of objects impose labor-intensive work on catalogers, the sharing of data has little relevance for cataloging unique objects. The advantages of shared systems for building bibliographic databases are simply not present for object cataloging. And yet, without the cataloging standards for description and form of names, and the painstaking application of common, or at least, compatible controlled vocabularies that are implied in the use of a shared system, object

databases would be quite as idiosyncratic online as they are in their present manual states. What, then, prompts data sharing? Perhaps it is that refined stage of information retrieval in which the researcher poses questions that demand more of the data than is presently provided. There are no real research advantages to labor-intensive time spent searching separate unrelated files. When the knowledge bases begin to act as collaborators (Molholt 1987, p. 3) in exploring and aiding in making correlations and relationships, research will expand and the benefits of shared knowledge will be realized.

Components of an Integrated Art Information System

Most of the needs of art object system builders are shared by art bibliographic system builders—i.e., the need for integrated information systems, the need for expanded MARC formats to support more specific knowledge structure for both indexing and retrieval, and the need for an enriched subject controlled vocabulary. As integration is seen more and more as the goal of information systems, the symbiotic relationship of parts is evident between cataloging system and authority control, between authority control module and mounted thesauri structures, and between mounted thesauri structures and linked bibliographic or object records.

The field of art and architecture is ultimately concerned with objects and therefore primarily visual. But along with image access, objects are enriched by their accompanying research, both descriptive and interpretive. Different document formats should not hamper access. The information should still flow in spite of the physical properties that house it—whether book, periodical, or object catalog. To make this integration possible, complementary data fields are needed to allow access to both image and text. Beyond this, complementary applications of standards are required—i.e., standards for cataloging and indexing, standards for the formats that house this data and transport it, and the standards that apply to the nomenclature that describes concepts and names names.

Authority control can be seen as the linking mechanism that supports integration between object information and research/bibliographic information and ultimately collaborates in making relationships, inferences, and interpretation possible. By mutually supporting the expansion of already established standards, both art object system builders and research support system builders will find their paths converging toward the ultimate goal of an integrated art information system.

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