

COLLECTIONS MANAGEMENT

CHAPTER III. INFORMATION SYSTEMS IN CULTURAL REPOSITORIES

A. THE APPLICATIONS

Cultural repositories depend on a number of interrelated information systems of which collections management information systems are only one. Some differences in functional requirements for collections management systems are derived from differences in the way these institutions have implemented other information systems.

All organizations must manage their resources - people, space, money and time. All organizations must manage information about their products and its market. All organizations must manage information about the methods by which they do their work and the agents through whom it is conducted. Cultural repositories, in addition, need information systems which assist in managing collections.

It is not enough to maintain files on resources, products and methods; organizations want information systems which help them do their work. When an employee is hired, the budget projection should reflect the additional salary. When a shipment is received, the shippers history of timely deliveries is updated. When an acquisition decision is made, space is reserved for storage of the materials and applicable laws and procedures are checked to assure the acquisition is handled properly. Organized action sequences, or procedures, are supported by organized information sequences, or applications⁹.

There are seven principal information systems in a cultural repository: Personnel management, Financial management, Space management,

⁹ This concept that procedures are sequences of actions and can be defined by a general language of actions was first articulated by the author as "checklists" in "A Plan for the Acquisition of an Integrated, Generalized Collections Management Information System: a request for comment on the Smithsonian Institution Collections Information System" Washington, DC, Smithsonian Institution, April 1984 and was developed further, as an object oriented virtual system, in "CMASS (Collections Management Actions Support System): A Statement of Problem", Washington, DC, Smithsonian Institution, August 1985. The planning processes leading up to these formulations of the issues are discussed in articles by Stephen B. Weiner and Michel Vulpe, cited in the bibliography.

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Contracts management, Publication management, Exhibits management, and Collections management. For the purposes of this discussion, I will briefly introduce each of these applications, especially as they may take on distinctive characteristics within cultural repositories, and note in what way they relate to the collections management information system.

1. Personnel Management

Any organization must keep track of its employees, but cultural repositories have a number of unique requirements because they are frequently heavily dependent upon volunteers as well. One effect of operating a volunteer program, which requires that tasks which need to be performed be matched with individuals capable of performing them, is that management becomes aware of the great benefit to be obtained by defining personnel skills, and scheduling and monitoring tasks as part of the overall personnel management function for all employees, instead of limiting the scope of personnel management information system to hiring, firing and benefits. In addition to scheduling and monitoring actions, the personnel information system when linked to collections management enables management of the cultural repository to identify and maintain records of accountability and to monitor the effect of collections variables on individual productivity.

2. Financial Management

Unlike organizations which derive the largest part of their income from sales or regular appropriations, cultural repositories are often in the business of raising money with which to conduct their activity. Development (and often the membership functions which are part of it), thus plays a part in the financial system. One of the consequences of raising funds in these ways is that a part of the income of the organization is restricted in the ways it can be spent. The number of different funds, and restrictions on these funds, in cultural repositories not only forces them to adopt accounting systems which can support a large number of separate funds but also encourages them to engage in programmatic reporting and programmatic budgeting. The benefits of this are that the costs of program elements are discernable through the financial management system and the implications of commitments can be better planned. By going one step further, and linking costs to actions performed on objects, it is possible to identify collection

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related variables affecting costs in the collections management system and to better budget for future actions.

3. Space Management

Unlike most organizations, cultural repositories do not dedicate most of their space to staff or equipment, whose demands are relatively fixed and need not be continuously monitored, but to collections storage and display, the demand for which is fluid and configuration of which is important to the success of two major missions of the institution: conservation and interpretation. To support the needs of cultural institutions therefore, space management systems cannot be simply spatial inventories, but must permit modelling and computer-aided design, support space budgetting, space utilization projection, and scheduling, and have links into environmental reporting facilities which permit space characterization by temperature, humidity and other factors. This is particularly true if none of these views of spaces is supported by collections management systems functions, and the system considers space as simply a location, either occupied by objects or free, as is so often the case.

4. Contracts Management

Traditional contracts management information systems often end at the point that the contract has been signed, but cultural repositories need an information system which monitors contractor performances and permits them to select the best agent for a particular task. Cultural repositories use outside services to perform many tasks from running cafeterias to managing facilities. Numerous collections management related functions from acquiring objects for the collections, insuring them, and shipping them on loan to making educational presentations and constructing exhibits are conducted under contract. A number of vendors compete to serve as agents of the repository in each of these service areas, and management needs to keep track of their rates and abilities and their performance. Contractors are linked to the collections management system through the actions they perform, just as employees are. When the action-agents framework is adopted, there are very strong arguments for supporting the monitoring and linking of agents within a collections management system, but repositories must be aware that they have contractual agents which are not linked to object related or event related actions.

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5. Publication Management

Publication management supports the creation of print products and tracks their distribution and sale. Increasingly we can imagine publication information support systems which also maintain multi-media databases from which individualized products are "published" on demand, both in print and tape (audio, video, data) formats. Whatever their contents, publication management support capabilities should assist the cultural repository to maintain information in a format which can be brought out in a commercial package. Publications management is not library maintenance or a bibliographic reference file. Bibliographic objects, including catalogs as publications, are recorded in the documentation management facility of a collections management application, as objects.

6. Exhibits Management

Exhibits, like publications, must be designed and scripted, objects need to be identified and brought together, the whole must be produced and promoted, and finally it all must be dismantled and evaluated, but few information systems have been designed to achieve these objectives. We could envision exhibits support systems as graphically oriented outliner functions with support for building the sections of the outline in texts and images and arranging the product graphically. When linked to the collection management information system, exhibits are simply an event involving an object cohort. Because each object in the cohort points to a common event, the event can be reconstructed as consisting of the objects, but in no particular relation to one another and stripped of the script which gave them meaning.

7. Collections Management

Collections management on a day-to-day level involves the application of procedures to diverse materials at discrete stages in their life-cycle as cultural objects. A procedure, such as that for acquiring a collection, loaning an object, or inventorying a storage facility, consists of taking a number of discrete steps designed to carry out a previously developed institutional policy. Staff of the cultural repository, who are applying these procedures, need only be aware in a general sense that they were designed to carry out policies. Specific actions which comprise the procedures are dictated for particular situations so that they can be routinized. But the number of

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different conditions requiring slightly different actions and approval steps are substantial

Collections management is among the responsibilities of a large number of professionals within a cultural repository. Because the concerted action of numerous offices and individuals must serve the interests of collections management, records of collection management actions must be maintained at a large number of locations within a repository which employs manual systems. These records are laden with redundant information reported from one office to the next to enable the latter office to make a determination, take an action or grant an approval.

Carrying out procedures in a cultural repository is complicated by a number of factors:

- The objects are, typically, unique in some way. To carry out a procedure they must be seen as sharing another characteristic which allows a minimal number of variants.

- The objects do not pass through the same sequences of actions. Once accessioned, objects are constantly subjected to actions related to the four core purposes of the institution (Storage, Conservation, Interpretation, and Access)

- The procedures are not standard from one institution (or even one department in an institution) to the next. Different action steps comprise similarly named procedures in different institutions. However, the actions taken are also not random, for they are steps in processes defined by the organization.

- Procedures depend heavily on knowledge of the action history of the object. At each of these steps, additive information from previous actions plays an important role. Therefore, for the organizations own procedures to be properly carried out, the institution must support an information system which provides necessary information about prior actions to those responsible for today's work.

- Procedures are carried out on objects in all senses of that term: collections, accessions, constructions, items, components and pieces. Because any action or procedure may apply to any object, in all these senses of object, the results of procedures are inherited by all those objects which comprise the target of the procedure. Thus all the items in an accession are accessioned when it is and all the components of an object are exhibited

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when it is. The capability to exclude objects otherwise covered by the inheritance network of an action, would be a time-saving function, since it is often the case that all of an accession, except for a few objects, is treated in a similar fashion, or all of a loan is returned except for one item.

In sum then, collections management procedures are quite complex, though they consist of relatively simple component actions. They can be initiated from almost any point in the system, and they require information and authorization for numerous other points in the system. Large numbers of individuals may need to coordinate their actions in order to get a single object, requested for a loan, to and back from, the borrower. Procedures also depend heavily on knowledge and judgment of the staff. While the system can check that appropriate actions are taken and valid statuses are recorded as a consequence of actions, it depends on information from professionals, especially in the initial documentation of the object, to determine what procedures must be carried out. A major design issue in collections management systems is the need to reflect what overall procedure is taking place at the same time as providing facilities for management of the discrete actions that comprise the procedure.

One way to accommodate this requirement is to create procedures records within the arena of actions, which link individual actions together in networks, the shape of which is determined by characteristics of the objects participating in the procedure. Thus, a procedure for loan might always begin with the step of a loan request and its linkage to an object record, but all subsequent steps in the procedure would be determined by the values recorded on the loan request and in the object record. Requests for objects from one department might be managed differently from those from another. Requests for objects by facilities with reports on file would be handled differently from those without. Requests for objects for which previous conservation action histories revealed particular shipping problems would take a different path from those with clean condition reports. This concept of procedures as a "checklist" and the database as an object oriented data processing was developed as a logical model at the Smithsonian in 1985/6, but it is not necessary to implement the logical model in this physical way in order to achieve the flexibility in system design needed to administer collections. What is necessary is to use a building block approach

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to defining procedures, so that they can be modified by system users as the institution evolves.

B. COLLECTIONS MANAGEMENT MODULES

The collections management application may be thought of as having six modules, each of which is critically dependent on a different technique of data manipulation.

1. Documentation management

The most basic application within collections management (indeed so basic that it is often thought to be the sum of collection management) is documentation management. The primary technical challenges of a documentation system are structuring information appropriately for the uses to which it will subsequently be put, providing methods for data entry and storage at a reasonable cost, and sorting information for reporting. The primary administrative challenge is reducing the intellectual effort which must be invested in making object documentation and generating more products from the information which is created for documentation. A secondary administrative challenge is distributing access to documentation.

The documentation application supports maintenance of administrative and descriptive information pertaining to objects. The application must allow for convenient addition, editing and deletion of records consisting of both structured fields and free text, and the easy sorting of records on the basis of structured field data into reports which can be printed, viewed or output to convenient storage media (such as microform or disk). These reports typically cover either the entire collection (such as catalogs, guides, inventories, indexes) or all holdings with shared intrinsic characteristics, which are defined here as characteristics possessed by the object independent of its status as a "collected" object (created in a given place or time, made of a given material, associated with a specific individual or historical event).

The documentation application supports the recording of:

- the provenance of objects
- the physical description of objects

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- the intellectual description of objects
- references to object surrogates, including bibliographic references, abstracts, reviews, images, models etc.
- the history of creation, use, and manufacture of objects, including (but not limited to) the names of associated persons, organizations, places, and events and dates
- relationships to other objects in the holdings and elsewhere, and
- representations of the objects themselves.

As presently implemented in automated systems, most documentation management facilities support only descriptive cataloging surrogates of the objects to be stored, but future systems will increasingly incorporate the full-text of documents, images of graphic objects, and three dimensional data representations of 3-D objects, as well as digital sound for objects which are, or make, sounds.

Issues which must be addressed in defining a documentation application include:

- the amount and nature of data validation
- the types of restricted data and conditions for viewing them
- the degree of distribution in the process of documenting an object and how various administrative units will collectively construct documentation over time
- the way in which action history is summarized or reported to documentation
- the means by which collection development, collection management and collection documentation policies and guidelines are enforced within the application
- what common data elements will be recorded for all objects, particularly the relationship between documentation data definitions for artifacts and specimens and those for audio-visual, library and archival materials, and
- what documentation will be included for objects not accessioned, such as objects borrowed, objects desired for acquisition, and objects considered for acquisition but rejected.

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2. Actions Management

Actions management logs all the actions which take place on collected objects, not only tracking what has been done (by whom, under what authority and with what result) but also allowing us to schedule what should be done. The primary technical challenges of actions management are automatic reporting, especially time-based reporting (e.g., tickling future actions), space-based reporting (e.g., mapping storage locations) and statistical reporting (e.g., summarizing past actions) all of which benefit from graphical interfaces, and procedures management.

Typically actions management has been implemented action by action rather than as a generalized capability. For instance, loan management, maintains control over objects temporarily in, and out of, the physical custody of the repository. Like other actions management sub-systems, it enforces procedures established to control the process of loaning/borrowing objects. It issues contract forms and condition reports when materials are lent, sends notices when they are due, and keeps track of movements from shelf to reference room or shipping dock and back. Generally it structures interaction of staff with the system so as to ensure that appropriate procedures are followed and necessary information is obtained before authorizing the action to take place. Sophisticated applications may keep records of "holds" placed on objects for future use and generate statistics of use, wear, and loan experiences of objects.

Usually the reason actions management is implemented in separate sub-systems for each action is that the underlying commonalities are not perceived by designers. But there are also some actions which have specialized requirements beyond those of the basic actions management capability. Conservation information management, for example, is like other actions in that it involves recording the state of an object following a specific intervention the characteristics of which are recorded. However, conservation management also would, ideally, involve a real-time interface to environmental monitoring systems which could be appropriately adjusting storage conditions and preservation actions to the physical requirements of holdings. It might also involve an interface with the conservation supplies inventory to assure that needed equipment and materiel is on hand. The record of changes in storage locations and of intervention to preserve materials is properly maintained by the Actions Management application;

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data regarding physical condition and composition is maintained by the Documentation Management application. Conservation management maintains information about appropriate methods of conservation for particular materials, about preservation techniques and supplies on hand, and about results of past preservation activity and supplies tools to support making appropriate conservation decisions and establishing conservation priorities.

An even more problematic special requirement is encountered with the management of living species in zoos, aquaria, botanical gardens and some natural history museums. Although such specimens are objects, live-specimen management is an action management sub-system. Continuous actions must be scheduled if live-specimens are to eat, exercise, and reproduce, as well as be observed and studied. Cultural repositories with live specimens must maintain systems which resemble personnel management, restaurant management and medical records systems. These are not discussed any further in this document, but interested repositories should contact ISIS for information about the further development of such facilities.¹⁰

Other than in these special areas, the issues involved in defining an action management application are:

- which actions will be managed (values which can be recorded);
- what kinds of agent records they will be linked to;
- how to manage the authorization requirements associated with procedures for taking actions;
- whether and how to incorporate action restrictions;
- how action status is reported to documentation management;
- the degree of generalization in defining the host of messages, notices, bills and labels which accompany, precede or follow objects in actions;
- whether to continue printing periodic list-like reports, such as temporary deposit lists, outgoing loan expiration reports, receiving reports, etc. or to define summary statistical reports and employ the system on-line;
- and how to construct action restricting data segments, such as agent

¹⁰ International Species Inventory System, 12101 Johnny Cake Rd., Apple Valley, MN, 55124 is a membership organization representing over 125 zoological gardens.

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capabilities segments and object shipping requirements segments so that actions cannot link with objects and agents in violation of procedures or guidelines.

3. Events Management

While some events occur at only one time, are open to all, and are not evaluated, most events planned by staff of cultural repositories occur over a period of time or through multiple "performances" and their audiences are either known or controlled, therefore it is possible and desirable to assess the impact of the event and to target audiences for similar events in the future. Events management is not simply a view of the database from the perspective of the event entity. It must assist in the construction of calendars of events which recognize the multiple components and occurrences of event elements; support the identification of audiences by staff attribution, recording of survey data and/or managing the sale of tickets for event components and performances; and provide statistical tools for assessing events and sorting facilities to support attracting targeted audiences for similarly classified events in the future. These facilities could be linked to support for the project management/planning of events and exhibits. The participation of objects in events is recorded through the holdings management application.

The issues in designing an events management application include:

- whether events management must support project management of events, including exhibition and publication production phasing;
- the degree to which events management should support design, especially typography and graphics for exhibits, but also complex features such as CAD/CAM (computer-aided-design/computer-aided manufacture);
- the amount and nature of audience information that will be collected and the way in which such information will be summarized within event histories;
- the level of events managed (individual showings of films and exhibit-hour records are necessary for ticket sales and audience analysis but not for history); and
- the way in which events data will be used for notifications (invitations and advertisements), certification (tickets and confirmations), and follow-up (receipts and letters of thanks), for participants in events and for audiences.

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4. Agent Management

Agent management consists primarily of matching a profile for an agent, be it a donor or a shipper, against a service which is required (acquisitions of Pre-Columbian artifacts or shipments of them), to identify those agents which might serve in a particular capacity. The profiles can be quite complex (as they are for conservators and appraisers) or very simple (as they are for purveyors of standardized products, such as paper or building materials). A defining characteristic of agent management systems is that agents are external to the organization, and are therefore communicated with in writing, usually by mail. The requirement to create mailing lists and merge database records with texts for solicitation of donors, bids of vendors, thank you's to patrons, and notifications to borrowers, is central to the agent management capability.

Among the issues which must be addressed in agent management applications, are:

- the degree to which the underlying facility will be customized for agents which have such different relationships to the repository as shippers and donors; (This issue is largely one of user psychology because the concept of agents will otherwise face resistance, whatever its functional merits);
- the way in which action history will summarize or report into agent records;
- whether the same individuals and firms will appear as agents (which are actually roles, not actors) sufficiently often to warrant introducing redundancy reducing strategies (a higher level of record);
- whether agents will be able to report directly into the system (borrowers recording their facility reports or shippers updating price schedules); and
- whether to use agent performance data in weighting possible agents for specific actions.

5. Information Retrieval

One specialized application that is increasingly being incorporated within collections management systems is information retrieval. At the heart of this application is a capability to search a database by multiple variables (using Boolean logic, Query by Example, Vector representation techniques, or full-text). Because of the limitations of such retrieval in uncontrolled databases, these applications also require methods of developing and

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maintaining controlled vocabularies, hierarchical thesauri, ancillary "reference" files and value tables. The technical challenges of such applications are developing user interfaces that are accessible to potential users, optimizing retrieval efficiency while permitting access by any value in the database, and supporting syndetic structures and cross-referencing and/or thesaurus augmented full-text searching.

Cultural repositories should not assume that they need on-line public access catalogs, a specialized implementation of information retrieval facilities which has recently become popular in libraries, or that if needed, such an application should be fully integrated with their documentation and holdings management applications. The need for such systems arises from having general users doing direct research on the holdings, and with the exception of libraries, few cultural repositories provide such a service, and therefore require such an application.

The issues in designing an information retrieval application include:

- the degree to which the user interface is intended to support users without any prior knowledge of the system;
- the degree, other than view-only limitations, of security imposed by the application;
- the number of "indexes" which will be constructed to support information retrieval and their browsability;
- the linkage with authority files and validation tables designed to support documentation management; and
- whether facilities for searching unindexed fields and free text will be supported, and if so, their performance implications.

6. Information Analysis & Display

If management is to evaluate performance of an organization against its projections, it needs to analyze the information contained in the collections management system. A system must at least be able to calculate totals, arithmetic means and averages and simple percentage displays in bar-graphs and pie charts. More complex multi-variate analysis and statistical significance tests are needed if trends are to be analyzed or factors inhibiting and encouraging specific tendencies are to be identified. Since these advanced capabilities are not likely to be incorporated into collections

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management systems, potential buyers of such systems should incorporate functional requirements to export data and evaluate operating systems selected for collections management in part on the basis of whether software to perform the kinds of statistical analysis they require will be able to run in them.

The issues involved in designing an information analysis and display application, or interfacing to one, include:

- whether to record "counts" of field occurrences and value occurrences as data in the system or to conduct searches of the system to count occurrences on an ad hoc basis;
- how to store statistically analyzable data in a sufficiently disaggregated form; and
- whether data on use of the information system itself is to be analyzed, and if so what variables of use are to be recorded and what kinds of analysis of them supported.