Museum Collections Management Systems:

One Size Does *NOT* Fit All

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ABSTRACT

Collections management software companies claim their product can be used for any type of collection or museum. While this is true to some extent, in actuality, they are better suited for some types of collections and do not cover the others as well. Particular collections management databases have aspects that are better suited for certain types of collections and an individual museum's needs. Each system's particular combination of features and characteristics may make it a better fit for some museums' needs and not for others. Recommendations for collections databases are constantly sought after on the American Association of Museum's Registrar's Committee Listserv. The systems to be reviewed in this study are: PastPerfect, TMS, EmbARK, Argus, Re:discovery, Vernon CMS, and KE-EMu. With all of these choices available selecting the "right" system for a museum can be an overwhelming task. What the "right" system is, however, will be different for every institution. What may be a near perfect fit for one institution could result in disaster and frustration for another.

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I. INTRODUCTION

Finding the right collections management system for your museum is like trying to find your soul mate. To quote one director of a history museum on the Registrar's Committee Listserv of the American Association of Museums,

> "The CMS [collections management system] you choose must fit YOUR needs. You will be most pleased with your choice if you sit down and assess what data you collect and what procedures you need to automate. THEN find a CMS that does most of those things. So do your homework. If I had the opportunity to pick a CMS I personally would choose Vernon. Is that system right for you? How could I possibly answer that, I don't know what you need. No one else can answer that question either. Critically evaluate how you use and manage and assign data. Then find the system that does it best for you."

Conversely, an ill-fitted collections database could be ineffective for allowing museums' collections staff to easily and efficiently manage collections' records and organize exhibitions. For example, Museum X said of its collections management system, "We hate it. On good days we just dislike it" and that it is "counter intuitive." Another museum said about this same database, "Reports are impossible to figure out, customer help was ridiculously incompetent, running a search does not pull up the same fields as are listed on the records, and if you don't enter records in numerical order, forever after they will not sort correctly." The particular database these museums were referring to was not included in this study, but their cases illustrate what you do not want to let happen to your museum.

Collections management software companies claim their product can be used for any type of collection or museum. While this is true to some extent, in actuality, they are better suited for some types of collections and do not cover the others as well, or have unnecessary features for others making the system more difficult to learn. It is almost as if the vendors had a certain type of collection in mind when designing the system, but this is

not easily apparent. Particular collections management databases have aspects that are better suited for certain types of collections and an individual museum's needs. It is not that one CMS is just better than another, more that each system's particular combination of features and characteristics may make it a better fit for some museums' needs and not for others. The only way to know which database satisfies the needs of a particular institution is to compare them all to each other, feature by feature, and find out from the various museums that use them on a daily basis what they think the system does well and what it is lacking that may be significant. What may be a near-perfect fit for one institution could result in disaster and frustration for another and vice versa.

Many museums want to switch to a collections management-specific database and have difficulty deciding which one to choose. Currently, the only significant sources available on CMSs are the individual vendors' websites and extremely limited information on various other software review websites. Recommendations for collections databases are commonly sought after on the American Association of Museum's Registrar's Committee Listserv since a comprehensive and comparative review of numerous CMSs appears to be non-existent in the current literature. This paper attempts to remedy this situation by providing descriptions, comparisons, and in-depth analysis of several of the most popular CMSs available.

The author will not provide guidance on whether to use an in-house designed system or a commercial one because this decision is highly dependent on the museum's financial situation, among many other factors, and there are already multiple sources available on this topic.

An open-ended questionnaire (Appendix A) was e-mailed to the Registrar's Listserv twice during the course of my research to find out what museum registrars and collections managers thought about their CMSs and information about them that cannot be found on the vendors' websites. Subsequently, the questionnaire was e-mailed to a variety of specific museums, whose names were provided on the software companies' websites, to supplement the original responses. There were a total of 67 respondents for the systems researched here.

The first part of this research will explore the history of museums' uses of computer technology for registration and collections management purposes starting from the 1960s. This serves to show where the field and database technology has been over the past 50 years and how it got to where it is today to put the problem into an overall historical perspective. This is followed by a description of seven CMSs and their features meant for the average computer user. The systems to be reviewed in this study are: PastPerfect, TMS, EmbARK, Argus, Re:discovery, Vernon CMS, and KE-EMu. The descriptions are for the latest version of the software released at the time of writing. New versions of the software are usually released every few years. The basic organization and functions remain the same for much longer. The third section is an analysis and interpretation of these systems based on the information provided on the software companies' websites, the author's first-hand experience and, most importantly, the users' responses to the questionnaire.

II. MUSEUMS AND THEIR DATABASES: The 1960s to Today

It is essential to first review the history of how and why computers and databases have become so widely used in museums regarding collections records before proceeding with the descriptions and in-depth analysis of specific collections management systems. The practice of registration has not always been as regulated or automated as it is today, and museums were not as quick to adapt this new form of technology as other institutions such as libraries; nor have computers or databases been as sophisticated or powerful as they are in their current state. In many museums today, registration is often heavily aided by the computer and collections management systems (CMS) which have become integrated into the daily operations of museum registration, especially in the country's largest museums. They are used to track loans, store conservation reports, and keep track of an object's location among many other functions. However, this has not always been the case. The story of museums adapting computers for their needs starts in the 1960s.

The 1960s: From Paper to Punch Cards and Mainframes

Until the 1970s the individual registrar or curator in charge at the time primarily determined the methods employed to organize collections' records and cataloging; and, therefore, these methods were subject to change with each successor. Museums often did not have a prescribed or consistent records-keeping system through the years; so that, when a Registrar left the museum, knowledge of the records-keeping system was also lost. In addition, in many museums, collections information was maintained simply by the collective memories of curators and registrars instead of by accurate and complete files.

This problem only grew worse throughout the 1960s when many older museum professionals were beginning to retire in addition to the movement of staff among the different institutions. Information about cataloging procedures and records systems were virtually non-existent (Sarasan 1995).

Museums had begun to realize that their current methods of records-keeping were not adequate and were even described by one national collection as "amateurish" and "antiquated." Museum records often lacked important information, catalog cards were sometimes duplicated, records were written with inconsistent vocabulary throughout, cross-referencing was rare, and cards often went missing or there were cards for which the associated object was missing. It was also difficult to access collections across curatorial departments. During the initial phase of automation and standardization at the Smithsonian Institution, project investigators remarked on the amount of collections information that was not recorded because of "the inability of existing systems to capture data and because of the complete breakdown of existing retrieval systems (the curators)" (Parry 2007:28). Even before the technology was a reality, institutions like the Smithsonian realized that "machine-based data entry and information retrieval systems could improve data acquisition procedures by museum curators, which, it was thought, would lead to better and greater use of collections in both education and research" (Parry 2007:28). Museums needed a way to improve records-keeping standardization.

In addition to the growing problem of inconsistent records-keeping, was the increased public demand for accessibility. People no longer viewed museums as simply warehouses of objects but expected museums to play an important role in educating the public about their cultural heritage. In this cultural climate, museums began to pay more

attention to, and the public gave more attention to, museums' duties as a public trust. It has been proposed that, in light of this perspective, people began to request collections' information from museums more frequently; thereby putting additional pressure on them to develop consistent records-keeping practices so that registrars could find collections information easily and efficiently (Sully 2006). Museums turned to the new computing technology to help them meet this demand. In 1967 the Smithsonian recognized that automated collections would "… permit greater accessibility of fundamental resource materials of specimens and related data to students at all levels as well as senior scholars" (Parry 2007:26). Museums were recognizing that their current means of managing and retrieving information were very deficient and believed that automation and computing could help them meet the demand for access to information about their collections (Parry 2007).

During the 1960s and 1970s, the rate of new acquisitions accelerated due to paradigm shifts in multiple disciplines, the Civil Rights Movement, and the Women's Movement; and curators wanted artifacts that represented these previously underrepresented groups. History museums, in particular, experienced an "explosion" of collections growth that resulted in a further loss of museums' control over their collections (Parry 2007).

The field of archaeology also experienced changes that resulted in the growth of natural history museums' collections. This was partially due to the rescue movement and the National Historic Preservation Act in the U.S. to save archaeological sites before they were built over, and subsequently the site was essentially destroyed. In addition, curators of natural history collections reported that their collections were "growing at a rapid rate"

due to “the trusts of today’s larger science” and the “literature explosion” so that not only were natural history collections themselves growing but also the documentation associated with the accessioned specimens. The traditional cataloging methods used by museums made it “increasingly difficult to keep proper records of their own holdings” (Parry 2007:25). Manual methods of cross-referencing collections were also not efficient enough to keep up with the rate of growth and museums experienced cataloging backlogs. Museums needed new ways to manage their new accessions and regain control. “Many museum collections were in trouble, and computers provided the promise of part of the solution” (Parry 2007:25).

The development of machine-readable standards in libraries was another influence on museums and their adaptation of computers. In the mid- and late 1960s when museums were beginning to explore automation, libraries were working on the interchange of computer-based information as well as the “feasibility of standardization, central preparation and distribution… and bibliographic and machine features of the record” (Parry 2007:22).

In the library sector, a number of studies were conducted in an attempt to transfer catalog data to a machine-readable format, which led to the development of the pilot project MARC (machine-readable catalogue). The Library of Congress believed that it needed to create a machine-readable format to store catalog information on magnetic tape and that computer technology was essential to this development. MARC itself served as a standardized way to input catalog data. This showed museums how computer technology could be used and what standards were needed for cataloging. By 1967 MARC was well

accepted in the library sector and is actually still nationally used by libraries today, and within the next year, records on magnetic tape were made available (Parry 2007).

In the mid-1960s libraries and museums collaborated in their exploration of the new computer technology and its use for maintaining records. However, their paths diverged by the late 1960s because libraries already had registration data standards and unified methods for creating a card catalog system, which allowed them to advance more quickly. Museums, on the other hand, also had different needs than libraries because a museum's record had to constantly change to reflect new information about an object, while library records were more static and the individual objects in a museums collection were unique and required documentation about their history and meaning (Parry 2007).

Computers in the 1960s consisted of large mainframes that used punch cards for inputting and magnetic reels for storing it (Sully 2006). The process of inputting data involved a punch card operator encoding the information onto punch cards with a keypunch machine. The deck of punch cards produced would subsequently be loaded into the mainframe card reader whereby the mainframe program would merge the punch card data with the master file. Mainframes were very expensive, necessitated a staff with specialized knowledge to operate them, and required a lot of space for their size as well as sufficient ventilation. They were considered to be status symbols, and museums that could afford them were thought to have truly entered the 20th century (Sully 2006).

One of the earliest attempts to automate collections documentation was a research project conducted by the Smithsonian Institute that was begun in 1967 in order to understand the "potential of data processing for the museum community" (Parry 2007:15). The Smithsonian wanted to see if computer technology's potential benefits could be

applied to collections management. By 1969 it developed and implemented a data processing system called SIIR (Smithsonian Institution Information Retrieval) that could standardize input procedures with punch cards and created data entry and query software. The following year the National Museum of Natural History would create an Automatic Data Processing program. The Smithsonian's projects would capture the attention of another major automation project occurring at the same time in New York, the Museum Computer Network (Parry 2007).

Another early attempt at developing an automated collections management system was the GIPSY (Generalized Information Processing SYstem) project developed by the University of Oklahoma in 1968. The idea behind GIPSY was that it would be a "general database oriented information retrieval system" (Chenall 1975:150). It was designed so that museums could have flexibility for a collection database and retrieve information efficiently. GYPSY had the ability of batch processing and real-time interrogation (Chenhall 1975). GIPSY was intended as a pilot project for an inventory of ethnological objects in museums throughout the U.S. However, this goal was never achieved and was eventually abandoned (Sarasan 1995).

Meanwhile, in the late 1960s, a group of museums in New York, including the Metropolitan Museum of Art, organized by the Institute for Computer Research in Humanities, a part of New York University, formed the Museum Computer Network (MCN) (Parry 2007). It served as a forum for museums to discuss common information problems (Sarasan 1995). Its goals were to combine computer technology with the arts and humanities as well as to establish the Data Bank Computing Center, which would be a network of terminals for museums in New York City (Parry 2007). A tertiary goal of the

MCN was to establish information about museum computerization and a collections management database (CMD) that all museums could use and would come to be called GRIPHOS or General Retrieval and Information Processing for Humanities Oriented Studies (Sully 2006).

GRIPHOS was originally used by the United Nations for bibliographic data. It was written in programming language limited to IBM computers. The MCN adapted it so that museums could share information making it necessary for a standardized way of entering collections information. It was primarily used by art museums and then later by archaeology museums (Chenhall 1975). However, museums managed information in their own ways to fit their individual collections making GRIPHOS not always function as planned (Sully 2006). Later the MCN's focus began to change to "the creation of a nationwide information system for art museums" (Parry 2007:17).

In the late 1960s curators began to express concerns that their work would be "undermined" by the computer, which is still a theme of discussion even today. They feared that knowledge would not be incorporated into computer systems and that curatorship would be "reduced to code" (Sully 2006) (Parry 2007). However, museums professionals believed that computers could help them with their records-keeping responsibilities and there was increased pressure from multiple sources for more accountability (Solomon 1998).

The 1970s: Early Attempts at an Automated System with Hierarchical Databases

In 1970 the American Association of Museums started its accreditation program in order to "ensure standards of quality in collections care, administration, education and

exhibitions" (Sully 2006:27). The accreditation program along with numerous deaccessioning scandals further increased museums' growing recognition of accountability and the need to get their records in order. In the 1970s the microcomputer became available to more museums as its cost subsided. This development encouraged museums to automate and regain control of their records. However, sufficient software was still needed for cataloging (Sully 2006). One of the most popular software packages was the Smithsonian's SELGEM.

In the early 1970s the Smithsonian released its SELGEM (SELf-GEnerating Master) program, which was based on the earlier SIIR system. It was designed especially for museums and was written in a programming language that allowed it to be used on multiple types of computers and not just IBM machines (Sarasan 1995). It was described as "a collection of general purpose programs developed for information management" (Parry 2007:16). This included collections documentation and research projects through the use of master files for retrieval. Its flexibility allowed it to be adapted for individual museum needs (Chenhall 1975). The first museum to begin using it was the National Museum of Natural History, and by 1975 over sixty museums were using SELGEM, including the Field Museum of Natural History. The Smithsonian claimed that automated systems had the advantages of more efficiently "locating a specimen from a catalogue card or ledger entry; for the preservation of collections data; for making accurate statements about the collection's condition; for determining the economic feasibility of collections based research: and even for space planning" (Parry 2007:28). Like GIPSY, it was hoped that institutions nationwide would adopt SELGEM. However, many museums' staff were not satisfied with it, and it never became a standard national system. By the 1970s such

attempts at a standard automated system ended (Sarasan 1995). Other notable early software packages available at that time included ARTIS, TAXIR and ELMS (Solomon 1998).

The first generation of these database management systems used hierarchical logic. "It was a 'tree-like' cascading series of levels and nests that provided the underlying structure and conceptual framework…" (Parry 2007:54). They used a strict top-down taxonomy to categorize a museum's collections that can be characterized by "a strict taxonomy of differentiating expert terms…" (Parry 2007:55). First generation databases were determined by fixed standards, terminology control and disciplined automation. It is significant that most of these early database systems like SELGEM were developed and used primarily by natural history museums. While the structure based on hierarchical logic worked well for the scientific taxonomic organization of geological and biological specimens; it proved difficult to work with for the arts- and humanities-based collections (Parry 2007). Although databases now have a relational structure, to this day different types of collections have different cataloging needs and therefore the databases their records are stored in should be more tailored to their specific needs.

After the failure of several attempts for a national centralized museum cataloging system, museums had to face the reality of accounting for all of the financial resources and time they spent developing these systems. This discontent led many medium-sized museums to start developing their own individual home-grown systems (Sarasan 1995). Many of these projects, however, were unsuccessful because staff were not knowledgeable of data processing, did not know how to retrieve the data after it was entered, or only ended up with an automated version of their previous ineffective card catalog system (Sully 2006).

In the mid-1970s the computerization of collections increased at a dramatic pace; however, these efforts often occurred in an uncoordinated manner. Even different departments within an institution would have their own computerization project and there was not much communication between individual projects (Sarasan 1995). This situation coupled with a lack of faith in the new computer technology resulted in the formation of professional associations for museum databases. Their purpose was to give collections managers information about computers, databases, and advice about their collections systems (Sully 2006).

One such group was the Museum Data Bank Coordinating Committee (MDBCC), which provided museums with catalog standards for data entry that could be modified depending on the individual institution's type of collections (Sully 2006). The primary objective of the MDBCC was described by Chenall as "to coordinate the data categories and recording conventions used in computerized museum catalogs so that any museum, large or small, can catalog its collections for eventual computer entry and be confident that the work will not have to be redone at a later date" (Chenall 1975:47). It essentially established data standards, data category definitions, recording conventions and terms in order to help museums create catalogs for various types of collections as well as to become a basis for museums to share their catalog data in the future (Chenhall 1975).

Museum curators wanted their collections database to be understandable. In order to organize their exhibitions, it was necessary to have a database system that was quickly searchable. Education departments were under pressure to create more public programs and also needed collections-based information. Collections databases had to be more than a simple computerized version of the card catalog system (Sully 2006).

The 1980s: The Advent of Relational Databases and PCs

Due to past deaccessioning scandals compromising museums' reputations and pressures from the government, insurance companies and curators; museums wanted to make sure their collections management practices and policies were in peak condition (Solomon 1998). This environment led museums to adopt a more business-like approach to their functions. Part of this endeavor included improving their collections databases in order to maintain complete collections documentation records and better serve public requests for information (Sully 2006).

The availability, faster processor speed, and decreased cost of what we now know as the personal computer, or PC, in the 1980s also encouraged museums to further develop their collections databases. Unlike their mainframe counterparts, PCs did not require trained data processors to use them so that smaller museums could even afford to purchase and operate them (Sully 2006). According to a survey conducted by the Art Museum Association of America, by 1984 a little over one-third of museums in the U.S. had in-house computer systems; and according to the International Documentation Committee of the International Council of Museums (ICOM), by 1989, 86% of computers used by museums were PCs. The increasing dominance of PCs in museums, in turn, led to the development of less expensive and less complicated software programs (Solomon 1998).

By the late 1980s PCs even had the ability to display graphics which provided an important advantage for museums as they sought to share collections information with other museums, researchers, and students. Devices for PCs with the capacity for increased storage size also allowed for the computerization of images, which took up relatively large files. One common method for data storage was laserdiscs (ie CD-ROMs), which were more

easily navigable than previous data storage methods. However, they had the disadvantage of not being rewritable and came in a read-only form of data storage. As early as 1987, Howard Besser predicted that including pictures in databases would have an impact on data retrieval, collections management, conservation, exhibitions, and research. Although it was acknowledged that digitized images would increase access, there was already concern that museums would start to lose authority over the interpretation of their collections (Sully 2006). Ironically, now most museums are eager to have their complete collection digitized and available online. This is partially reflected by the fact that most commercial CMSs today have a web portal feature for publishing collections information and images on the Internet.

Another significant advent during the 1980s was the relational database. These databases allow individual flat files of data to be cross-referenced or related to each other in a less layered way so that each data table can be connected to another data table without redundancy. For example, donor or lender information can be linked to all of the individual object records associated with that particular donor. This class of databases is far more flexible and can be said to have a 'web-like' structure rather than a 'tree-like' structure (Parry 2007). T.W. Olle considers them to be a "natural outgrowth of the concept of a computer database" (Solomon 1998:50). They are the equivalent of physical cross-referenced files. The computer finds records directly instead of by cross-checking. This allows for content sorting on different levels which, according to J.E. Sammet, "introduces the idea of a program tailored to a specific purpose" (Solomon1998:51). The structure of the relational database was closer to the philosophy of modern curatorial practice. "It emphasized individual meaning-making, relativistic terms, layered readings, as well as

changing signifiers and descriptions…" (Parry 2007:55). Many second-generation databases that first became available in the 1980s are still used today and form the underlying database of commercial CMSs.

In the mid-1980s the MCN created a computer system for loans and insurance purposes. After the object documentation was entered, the program would generate loan forms. The system could be used to monitor all stages of an exhibition, check the status of loans and make sure they were all returned, and verify the accuracy of insurance coverage (Solomon 1998). Today the loans module is an integral part of nearly all commercial CMSs.

Commercial museum collections management software programs, as we know them today, started to become widely available for mini computers and PCs in the 1980s with the advent of the relational database including Vernon Systems (1985), Argus (1986), KE-EMu (1986), The Museum System (1987), and Re:discovery (1989) (Gallery Systems 2009e; KE Software 2009a; Questor Systems 2009a; Re:discovery Software 2009c; Vernon Systems 2009g). These commercial CMSs are based on generic relational databases, but the fields and functions are tailored specifically for museums by the software company. Some of these companies began with a commission to develop a CMS for a specific museum, such as Gallery Systems for the Metropolitan Museum of Art and Re:discovery for Monticello, and then made the program available on the market for other institutions (Gallery Systems 2009e; Re:discovery Software 2009c). The schema, or design, of some of these commercial CMSs, which were initially created in order to accommodate the needs of a particular type of collection, is still reflected in these systems today.

By the end of the 1980s museums never reached a consensus for a standard way of automating their collections data. Some museum professionals, however, recognized the need for museums to consider the public while developing their collections databases. Others emphasized the need for a common nomeclature and data standards knowing that museums would have to make their collections available digitally to the public in the near future (Sully 2006).

The 1990s: Collections Information Jumps onto the Information Superhighway

At first collections databases were for the most part only used by museum staff, primarily registrars and curators, and researchers. However, when use of the World Wide Web exploded in the 1990s, it put even more pressure on museums to make their collections records more easily accessible to the public. There was a growing perception that information should be more democratized and available on demand at all times. To meet this demand, museums needed a way to provide multiple kinds of information at once. Museums once again turned to their databases to try to find a way to make collections documentation more easily available and provide more information about individual objects (Sully 2006).

In the 1990s personal computers become more affordable and powerful, and museums were increasingly moving away from the more expensive 'minicomputers' and mainframes. Networking and inter-computer communication was also beginning in the early 1990s (Sully 2006). According to a study conducted by the Getty Art History Information Program (AHIP), by 1995, 81% of the art museums surveyed had computerized databases for their object records and about two-thirds of those museums

were using PCs. Forty-seven percent of art museums with PCs had them networked. Already by this time a little over a quarter of art museums with PCs had multi-user systems. While the majority of art museums had computerized databases by the mid-1990s, most of the time not all of the collection records are entered. Only 21% of museums with computerized collections records had their complete collection entered, and more than half of museums with digital records have less than half of their collections entered and without description standards. In large institutions the situation was even more dire (Solomon 1998).

In 1990 the MCN formed the Computer Interchange of Museum Information (CIMI) in order to come up with a standard way for museums to exchange information through computers. Its purpose would be to facilitate museum efforts to exchange data, develop similar databases, and transfer information between systems. The same year the Art Information Task Force was also formed. It had very similar goals as the CIMI except it was more concerned with art museums and how they described their pieces (Solomon 1998). To this day, however, digitization projects have remained largely independent.

The CMSs of the 1990s were becoming more sophisticated in that they could show pictures, sort information in more ways, record exhibition information, track locations, generate reports, and communicate with the museum's website expanding their utilization beyond only registration-related tasks (Sully 2006). They have become especially valuable for exhibition planning as traveling and temporary 'blockbuster' exhibitions have become more popular over the years. They also helped ease the burden for museums with off-site storage (Solomon 1998). The entry and query methods for databases also underwent advancements in that free text could be combined with structured searching using

probabilistic searching techniques. In this searching method, terms are "weighted according to formulae derived from probability theory" so that records can be sought with a natural language (Parry 2007:55). However, some museum professionals still felt their CMSs were not being used to their full potential due to many reasons within and outside the institutions themselves (Sully 2006). Taking advantage of the improvements and lowering costs of PCs and databases in general; commercial collections management software companies began to make programs for Windows-based machines by the mid-1990s.

With computers and databases becoming more advanced, museums began to make some collections information available on the web accompanied by images. Since at this time CMSs were still mainly used for inventory purposes, the information presented on the web was, and in many cases still is, very limited to basic information, such as: artist, title, date, size, and materials (Sully 2006). This could partially be the result of many museums simply entering basic information into the database that was contained in the existing catalog cards, which were often incomplete or incorrect (Solomon 1998). Many felt, however, that this bare minimal information was not enough and that museums should accompany their collections with interpretive elements. This is a topic that is still discussed to this day at conferences, and many suggestions have been made about how museums can do this (Sully 2006).

Today: Museum = CMS?

Museums have come a long way since the 1960s concerning their methods of collections documentation from the memories of curators and registrars and pure paper

records to the highly sophisticated relational database system (Parry 2007). They have evolved from a simple tracking tool to a sophisticated network of collections information with multiple modules for different collections-related tasks (Sully 2006). Now the database itself has become a symbol of the museum as staff has continued to grow more and more reliant on them (Parry 2007). Collections managers and registrars rely on them for inventory and to help with object identification, tracking loans and locations, recording shipping and packing information, keeping track of donors and lenders, generating reports and forms as well as recording object conditions among many other tasks. Directors use them as a way to meet public demands for transparency, access, and accountability (Sully 2006). Researchers, students, and the public at large can take advantage of how CMSs have helped museums to make their collections information more readily available online. It has become a "rationalizing system for the modern world" and a "system of thought" (Parry 2007:56). Museums' conceptions of its collections is even thought of and presented to the public in terms of their databases (Parry 2007). However, it is important to remember that databases cannot make important curatorial decisions regarding: which objects to accession or deaccession, determination of authenticity, loan approval, which objects to include in an exhibition, or how to display and interpret them. Nor can they create educational programs, condition report objects, decide when an object requires conservation, or how to store or pack a piece.

There are now more options than ever of commercial CMSs on the market for museums to choose from. This task can be very daunting and there are many aspects to consider.

III. SYSTEMS DESCRIPTION

It has become common for registrars to use collections management systems (CMS) to assist them with the many registration tasks. Therefore, it is very important for a museum to choose a CMS that fits the needs of the individual institution based on multiple factors. A significant part of the decision process is to have an understanding of the attributes of each CMS under consideration in order to make a fully informed decision. This section will first discuss some of the attributes of commercial systems in general, describe the common features of the CMSs that will be reviewed, and then describe the specifics for each of a few popular commercially available products. The specific commercial CMSs that will be described are: PastPerfect, The Museum System (TMS), EmbARK, Argus, Re:discovery, Vernon CMS, and KE-EMu. These systems were chosen because they are among the most well known in the museum field, are often included in other software reviews such as the Canadian Heritage Information Network (CHIN), and partly due to which museums responded to the survey and the availability of information about their features. The descriptions of each of these CMSs includes: the underlying database, how the CMS is organized, features, the percentage of the types of museums that use them, cost, and technical services provided by the vendors.

Commercial Collections Management Systems

Commercial CMS software are usually available as a complete package and the museum can start to use it right after it is installed and staff receive any necessary training. The museum's staff does not have to spend time creating the database and vendors supply

the updates and upgrades so there is room for growth and innovation. In this way museums do not require their own specialists on staff; besides a database administrator in some cases depending on the underlying generic database (Quigley, et al. 1998). If the underlying database comes with the software package then the software company usually provides the database support. There are also often company-sponsored help blogs available online for purchasers to communicate with each other and ask questions (Quigley, et al. 1998).

The major drawback is that the initial cost of the software package and implementation can be expensive. There are also yearly maintenance costs and additional user licenses that may need to be purchased depending on the size of the museum's staff. The stability of the company can also be a concern in terms of continual support. However, Quigely points out that the popularity of commercial systems continues to grow. "Commercial programs are becoming the collection management programs of choice in most museums" (Quigely et al 1998:22). Frequent requests for recommendations concerning which commercial CMS to choose on the Registrar's ListServ of the American Association of Museums shows that this continues to be the case.

Common CMS Features

Features and modules common to the CMSs to be reviewed will be briefly explained here to reduce redundancy. There may be slight variations, however significant differences and features that are unique or rare will be explained in the individual CMS sections.

- *Cataloging/Object:* Includes fields for basic pertinent object information such as: accession number, catalog number, title, components, object name, artist or creator,

date, culture, dimensions, materials and techniques, school, period, description, condition, current location, value, provenance, exhibition history, source, and picture.

- *Acquisitions:* Includes fields for donor name and contact information, type of acquisition, accession number, date of transferring document, promised gifts, date received and how object arrived at the museum, any donor restrictions, seller and purchase price. Typically a CMS allows the museum to use its own established accession numbering system.
- *Deaccessions:* File for catalog records for objects removed from the collection. Includes fields for method of disposal, date, and reason for deacessioning.
- *Thesaurus:* Controls the museum nomenclature for consistent cataloging terms.
- *Loans:* Tracking incoming and outgoing loans. Including catalog record for each object, lender name and contact information, special lender requirements, credit line, shipping information, insurance value, condition, picture, and loan history.
- *Exhibitions:* Information related to exhibits such as: exhibit name, location, duration, exhibition history, objects in exhibition, lenders, shipping information, insurance, installation notes, budget, and pictures of the exhibit.
- *Shipments/Transport*: Information about arrangements for transferring objects to different locations or venues. Includes fields for packing notes, crate dimensions, number of crates in shipment, objects in each crate, venue information, dates received and sent, courier, carrier, and customs information.
- *Condition/Conservation*: Fields to record an object's condition, date of inspection, inspector, and conservation reports.
- *Search:* Query methods, language or terms that can be used to search the database according to different entry points.
- *Reports:* Most CMSs allows for the generation of reports based on the information selected by the user pulled from information in the database either through a built-in report maker or a plug-in for other software such as Crystal Reports.

- *Security:* For systems with multiple users there are security settings so that only certain users can view or modify restricted data according to the settings put in place by the database administrator.
- *Multimedia:* Most databases support multimedia, which may or may not be included in the basic software package. The multimedia function allows digital images, video, audio and document files to be attached to records in a variety of formats and includes fields to record metadata.
- *Copyright/Reproductions*: Includes fields such as copyright restrictions, permissions and copyright owner
- *Importing/Exporting data*: Allows for data to be imported and exported in a variety of formats such as xml or doc.
- *Barcoding:* Allows the program to create and print barcode labels that include information such as: the accession number, title, and picture. It scans and reads barcodes, track objects and aids inventory control.

PastPerfect 4.0 (PastPerfect Software)

PastPerfect is organized according to cataloging modules, which appear on the home screen. There are four cataloging modules on PastPerfect: *Objects, Photos, Archives*, and *Library*. There are also functions or activities on the home screen for accessions, temporary custody, incoming loans, outgoing loans, deaccessions, exhibits, research, reports, contacts, lists and labels, campaigns, pledges/receipts, utilities, backup, setup, and reindex (Stallbaumer 2004). The generic underlying database PastPerfect is based on is Microsoft Visual FoxPro 8. This means that PastPerfect can only run on the Windows operating system (Spiro 2009).

The PastPerfect features are listed and explained below:

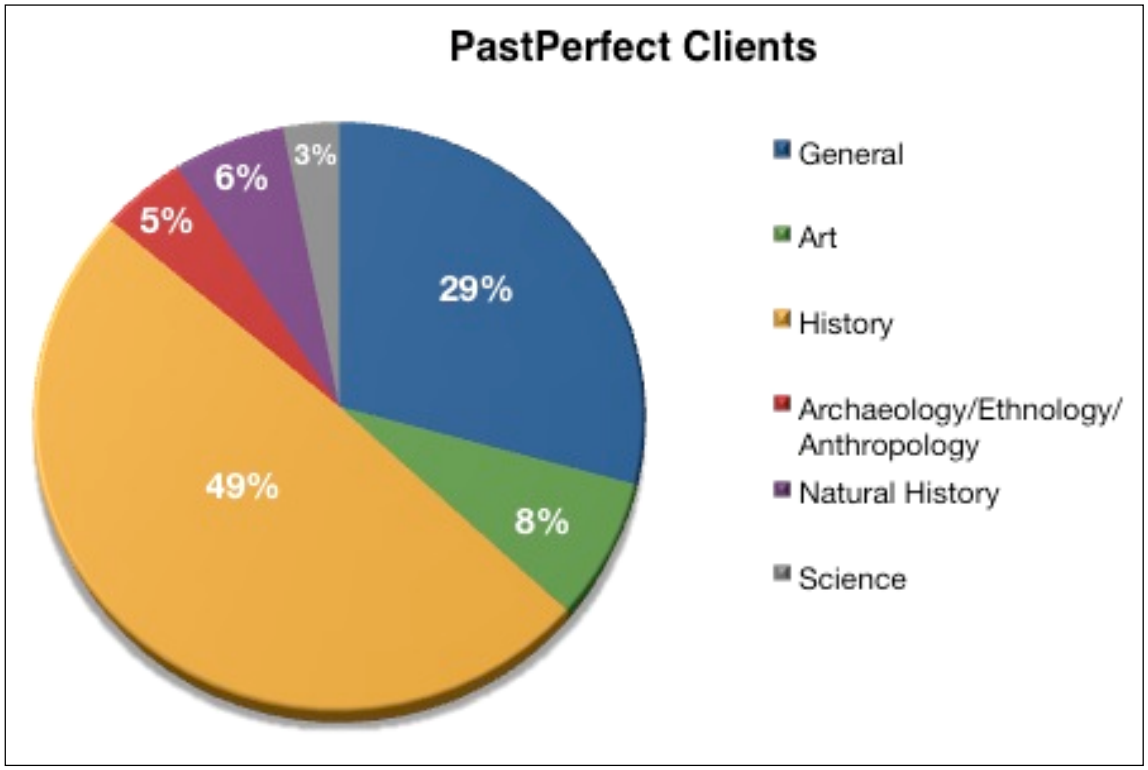
- *Cataloging:* For all of the cataloging modules there are tabs for location, condition, legal status, copyright, appraisal, and people/classes/subjects/search terms. The people field pertains to persons associated with objects. "Classes" serves as a finding aid and classification is hierarchical. "Search terms" provides a field to record names, words, and terms to research the database. In addition, there is a "Dublin Core" button to generate metadata for the record as a standard common exchange format for the Internet. The Dublin Core consists of 15 key metadata elements which describe a record in conventional terms in order to aid searches for digitized documents, pictures, and other media. It is used by libraries and endorsed by the Computer Interchange of Museum Information. The "AAT online" button is a link to a limited version of the Getty Museum's Art and Architecture thesaurus.
- *Objects Cataloging:* The objects cataloging module has tabs for archaeology, art, geology, history, and natural history. Each object type has special fields related to its particular needs in addition to fixed fields for all object types.
    - The archaeology screen view has several fields to record site and excavation information.
    - The art screen view includes additional fields for medium, signature location, maker's marks, school, and artist biographical information.
    - The geography screen view has fields for information related to rock and mineral specimens.
    - The history screen view has fields for recording information related to decorative art, ethnographical objects, furniture, machinery, and personal artifacts.
    - The natural history screen view is for cataloging paleontological, biological, or botanical specimens. It includes fields for taxonomy for which the lexicon can be modified and controlled to suit the needs of the particular collection.
- *Photo Cataloging:* The photo cataloging module is designed specifically for photograph collections and includes fields for photographer, photo type, film, and subject-related fields.

- *Archives Cataloging:* This module has sub-category tabs for "archives" (meaning documents), maps, music, and oral history. There is also an additional tab for container lists. The field names are based on the International Standard Archival Description rules.
    - The archives screen view has fields and sub-views for identity statement, context, structure, conditions of access and use, allied materials, and description control.
    - The maps screen view includes fields about the geographical area depicted and its physical characteristics.
    - The music screen view pertains to information concerning music recordings including artist/composer, genre, album title, record media, instruments, orchestra, conductor as well as information related to individual tracks.
    - The oral history screen view includes fields for an abstract/content, restrictions, narrator, interviewer, place and length of interview, release form, transcription information, recording media, and quantity.
- *Library Catalog*: The library module relates to information regarding books, pamphlets, newspapers, and magazines. It is intended for a museum's non-circulating library references and includes fields for author name, title, publisher, place published, edition, subjects, call number, LCCN number, and ISBN number.
- *Accessioning:* The accession screen has a print Deed of Gift and Thank You Letter button. Up to 4 donors can be linked to an object record.
- *Deaccessioning:* To deaccession an item in PastPerfect all that needs to be done is to change the status of the object and PastPerfect transfers the object record to a separate deaccession file.
- *Lexicon:* PastPerfect includes a computerized version *of Chenhall's Revised Nomenclature* in order to aid consistent data entry and classification. PastPerfect allows for revisions of the lexicon. It also has a thesaurus for natural history specimens.

- *ezMARC:* Allows users to import and export records from MARC 21 into PastPerfect for any of the cataloging modules.
- *Condition/Conservation*: In PastPerfect there is a space to record maintenance notes and set alerts for when an object needs maintenance. Condition fields are controlled by the authority file which includes definitions for terms (Stallbaumer 2004).
- *Loans:* PastPerfect has separate modules for incoming and outgoing loans, and loan agreements can be created right from the loan screen (PastPerfect Software 2009b).
- *Temporary Custody*: This module is specifically designed for objects in temporary custody and has fields to record source information about incoming objects and has a function to generate related documents. If an object is accessioned, PastPerfect can convert the temporary custody record into an accession record. If an object is returned, it moves the record into an archived file (Stallbaumer 2004).
- *Exhibitions:* PastPerfect has the ability to track in house and traveling exhibitions and has fields specifically for traveling exhibitions such as shipping and arrival dates, crating, transportation, handlers, insurance, venue addresses, and individual venue dates.
- *Contacts:* This module is for recording contact information for donors, members and volunteers. It maintains history for membership dues and donation history and has a mail-merge function for bulk mailings (PastPerfect Software 2009b). It has four components: contacts, lists and labels, campaigns and pledges, and receipts.
- *Search:* There are five methods for searching: search term, people, lexicon, keyword, and query command. Records can be searched within a specific cataloging module or across all of the cataloging modules.
- *Reports:* PastPerfect comes equipped with 200 predefined reports for which the layout can be modified. It also has a Report Maker tool so that users can create and save their own custom reports (Stallbaumer 2004).
- *Security:* Can be set on a case-by-case basis for different users (PastPerfect Software 2009b).

- *Multimedia:* Images can be manipulated once they are attached to the record file and uploaded directly from a scanner (Stallbaumer 2004).
- *Customization:* See Common CMS Features section.
- *Scatter Gather:* Provides ability to enter data on computers that are not connected to the network. It selects and transfers catalog records from one computer and merges it with another (PastPerfect Software 2009b).
- *Barcoding:* See Common CMS Features section.
- *Repatriation:* There is a repatriation screen for fields including type, date of notice, claimants, handling requirements, disposition, and authorization.
- *Fundraising/Campaigns:* Tracks up to 10 fundraising activities for each campaign, donations, track pledges and payments, related programs and events, and generates letters such as pledge reminders.
- *Virtual Exhibit:* Converts catalog records in PastPerfect to HTML format to post on the web (Stallbaumer 2004).
- *PastPerfect Online:* Creates web pages and acts as an online hosting service to publish catalog records onto a collections-based website using MWeb technology (PastPerfect Software 2009b).

Below is a chart representing a sample of PastPerfect Software's clients throughout the U.S. An extensive PastPerfect client list is available on the company's website (PastPerfect Software 2009a). A systematic sampling method was used to derive the sample for a total sample size of 65 institutions. University museums as well as historical societies with associated museums were included in the sample.



Prices for PastPerfect software are listed below per single user (PastPerfect Software 2009c):

- Basic Program: $870
- Multimedia: $370
- Barcoding: $125
- Scatter Gather: $330
- Virtual Exhibit: $420
- PastPerfect Online: $285, plus $440 for annual hosting
- Network Upgrade: 2-5 users is $495, 6-10 is $880, 11-25 is $1210, unlimited is $1540
- Maintenance Support: $345 for the first year and $430 to renew
- $85 per incident

Technical support services available for PastPerfect are listed below (PastPerfect Software 2009c):

- Data conversion ($50 per hour)
- Support (First year single user $345, network $425) (Annual Support $430 for single user)
- Training (Online $86 per session) (classes $124 per day) (Onsite $750 per day) (CDs $39 each)
- Customization

TMS 9.35 (Gallery Systems)

TMS is organized according to ten interlinked activity modules presented on the home screen: *Objects, Loans, Exhibitions, Shipping, Constituents, Media, Bibliography, Insurance, Events*, and *Sites*. TMS has an open architecture and can use either Oracle or Microsoft SQL Server as the underlying database so that it will run on Macintosh, Linux, or Windows operating systems (Gallery Systems 2009k).

The ten primary TMS modules are explained below:

- *Objects:* Includes information about any type of pieces in the collection including accessioning and deaccessioning.
- *Loans:* Tracks incoming and outgoing loans within the same module and links them to the object and constituent modules.
- *Exhibitions:* Cross references with incoming or outgoing objects, can track multiple venues, and planning notes.
- *Shipping:* Utilizes tabs for individual objects in the shipment, crates, sender and receiver, documentation, media and steps. This information is linked to the exhibitions and loans modules.
- *Constituents:* Contains data related to specific people or groups such as: artists, employees, donors, lenders, appraisers, auction houses, or other museums.
- *Media:* Supports digital files or physical media objects including: images, documents, web pages, video clips, sound clips, transparencies, slides, and prints. TMS also has an image viewer that allows images to be viewed next to each other as well as a zoom function. Records can have an unlimited amount of media files attached.
- *Bibliography:* Includes information about references and documentation such as catalogs, articles, manuscripts, and audio/visual media.
- *Insurance:* Tracks insurance policies through valuation information in the objects module.

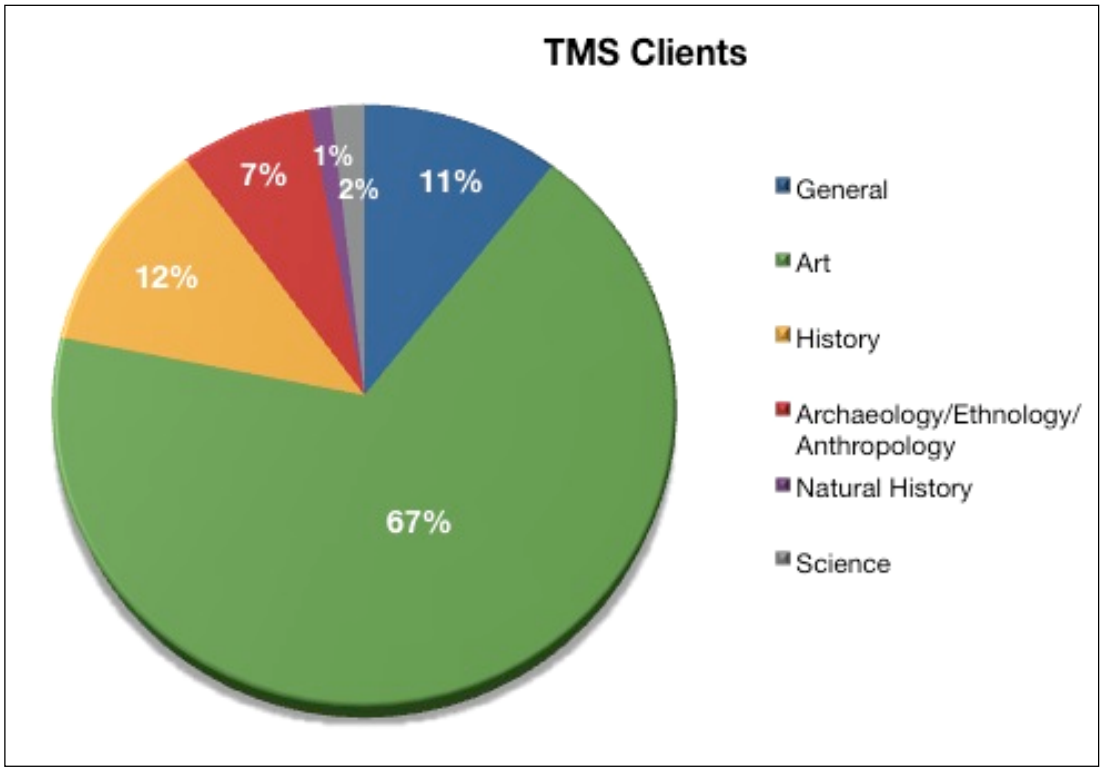
- *Events:* Information about events related to the collection such as openings, public programs, installations, or current events.
- *Sites:* Places maintained by the institution (Gallery Systems 2009h).

Additional TMS features are as follows:

- *Thesaurus:* TMS is preloaded with the Getty Research Institute's *Art & Architecture Thesaurus* and the *Thesaurus of Geographic Names*. Other thesauri can also be added. The thesaurus can be used to assist with narrowing search terms and for consistency purposes.
- *Conservation:* See Common CMS Features section.
- *Inventory Control:* Specifies locations for individual objects and tracks location changes over time.
- *Data entry:* Dimensions and currencies are automatically converted, function keys allow blocks of text to be entered in fewer keystrokes, cut-and-paste functions, and cloning of entire records.
- *Search:* TMS can be searched using several functions: find (object number, title, or maker), query assistant (search criteria can be modified with a step-by-step aide), and advanced query (can use multiple or grouped criteria, Boolean operators, or saved queries). Any individual field can be queried and searches can be saved for future use.
- *Reports:* TMS uses Crystal Reports and comes with 50 standard reports that can be modified. Custom generated reports can also be made.
- *Security:* There are multiple levels of access in TMS and users can be assigned to a number of security groups each having certain privileges.
- *Copyright:* See Common CMS Features section.
- *Import/Export Data:* See Common CMS Features section.
- *Circulation:* Manages and tracks visual resources and is barcode compatible.
- *Customization:* Display screens can be customized so that users and departments only have to see relevant information for their needs.

- *Display Modes:* Records can be viewed a number of different ways: label copy, thumbnails, lists, lists with images, data entry screen, and hierarchy display.
- *Relationships:* All modules are linked to each other and some relationships can also be user defined.
- *Barcoding:* See Common CMS Features section.
- *eMuseum:* Publishes TMS records on the museum's website, kiosks, and the intranet. It allows for complete control over which parts of the record will be published online. The standard version allows information from up to two modules in TMS to be published online (Gallery Systems 2009g).

Following is a graph depicting Gallery Systems' clients in the U.S. and Europe that use TMS. Gallery Systems provided a list of TMS clients through the company's website by the author's request (Gallery Systems 2009f). Only museums and galleries that have a permanent collection were included in the count for the purposes of this paper for a total of 169 institutions.



Prices for TMS software are listed below:

- Basic Software: $4000 per license for 1-10 users (note: price of each license decreases as number of users increases)
- Yearly Maintenance: $750 per user (Gallery Systems 2009i)
- eMuseum Standard: $10,000 plus $2000 for annual maintenance (Gallery Systems 2010)
- Barcode: $2000 for up to 5 users
- Library search and import tool: $1500 for up to 5 users (Canadian Heritage Information Network [CHIN] 2003)

The following technical support services are available for Gallery Systems products (Gallery Systems 2009i):

- Requirements Assessment
- Project Planning and Management
- Data conversion ($1200 per day)
- Configuration
- Customization
- Web design
- Digital imaging
- Technical consulting
- Training (at Gallery Systems site $1500 per student) (onsite $1500 per day) (Online $1200 per day)
- Support

EmbARK 7.0.1 (Gallery Systems)

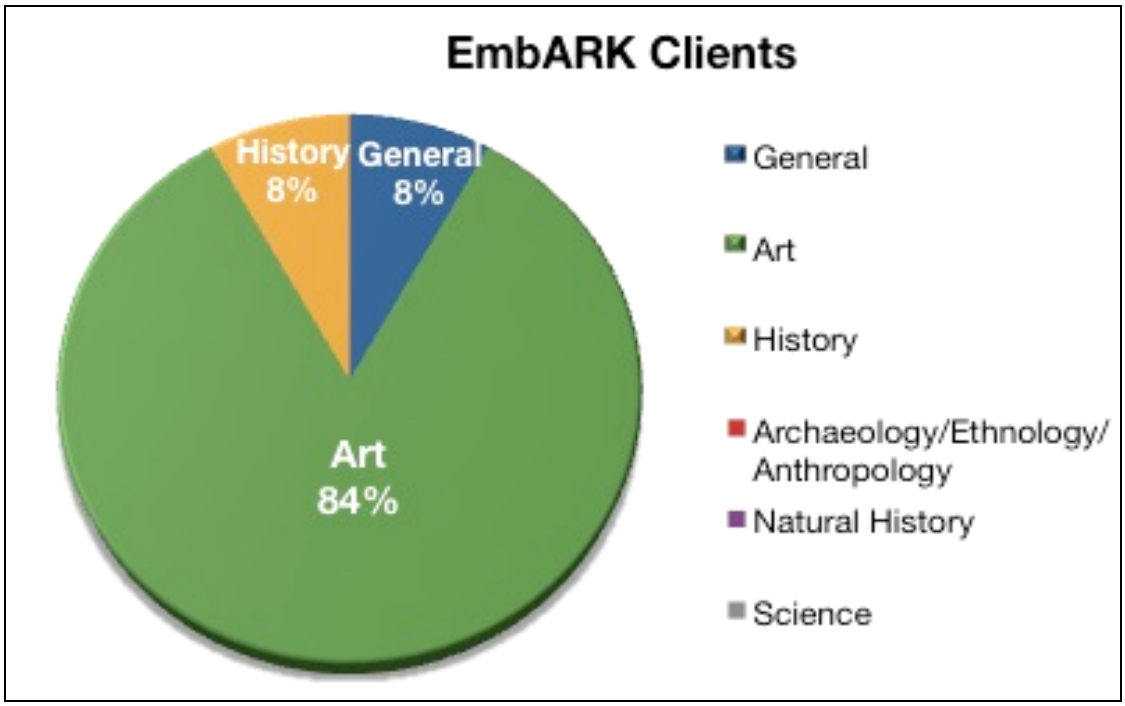
EmbARK is available in two variations: Cataloger and Collections Manager versions. The Cataloger version has only the basic functions necessary to organize images, record technical information about objects, and reporting. Records are grouped according to thematic portfolios or searched comprehensively. Collections Manager includes all the functions of Cataloger, plus it can track an object's history and use, acquisitions, conservation, exhibitions, loans, shipping, and valuations (Gallery Systems 2009j). EmbARK is based on the 4th Dimension database system which can be used on a Macintosh or Windows computer (Gallery Systems 2009d).

Below is a list of EmbARK's Cataloger and Collections Manager features:

- *Cataloging:* See Common CMS Features section.
- *Accessioning/Deaccessioning*: Collections Manger version only.
- *Thesaurus:* Existing thesauri can be imported or a thesaurus can be constructed. Keywords can be attached to objects by a hierarchy of terms to assist searching.
- *Conservation:* Collections Manger version only.
- *Data Entry:* Layouts can be customized for task-specific data entry for object records and fields can be rearranged. Dimensions are automatically converted, and date fields recognize a range of words so that they can be entered in a natural language. EmbARK also includes a global search and replace function and can create duplicates of entire records to prevent repetitive data entry for similar records like cataloging a tea set or shipping.
- *Location/Move Control*: Collections Manger version only. A list of locations can be produced for the museum and each object's location can be tracked.
- *Exhibitions Management:* Collections Manager version only. It tracks loans, shipments, insurance, associated employees, and venues.
- *Searching:* Same as TMS.
- *Reports:* EmbARK comes with 40 reports or the museum can make its own.
- *Security and Authority Control*: In order to control vocabulary, EmbARK includes choice lists in data entry fields, which only certain users can modify. Records are protected by having password-only areas of access. It also allows certain records to be marked as confidential so that only specific users can see them.
- *Copyright:* See Common CMS Features section.
- *Media/Imaging:* EmbARK supports any type of image file that can be opened by QuickTime.

- *Source Management:* Allows digital images that are linked to records to be managed, moved, renamed, or copied from within the database. Images can also be opened in picture-editing programs.
- *Import/Export Data:* The import module updates records in a data file and links them to related files in order to ease data conversions and allow for batch updates. The export module can be used to allow wider access or increase the integrity of the data.
- *Circulation Module*: Same as TMS.
- *Customization:* Files, fields and menus can be renamed and redefined. Field definitions can also be added for online users.
- *Public Access Mode:* Can be used in galleries to show information about objects and artists for searches or create portfolios organized hierarchically. It can also be used internally for easy navigation and serves as the interface for visitors.
- *Web Kiosk:* Publishes certain collections information in the Cataloger or Collections Manger database onto the museum's website. Web Kiosk allows for zooming and supports high-resolution images (Gallery Systems 2009a).
- *Arthur:* A browser that allows images and data to be shared on read-only media formats or published on an in-house public access kiosk (Gallery Systems 2009j).

The chart below shows Gallery Systems clients according to museum type which use either version of EmbARK. The client list was provided by Gallery Systems at the author's request through the company's website (Gallery Systems 2009b). As with TMS, only museums and galleries that have a permanent collection were included for a total of 86 institutions.



Prices for EmbARK software are as follows (Gallery Systems 2009c):

- Basic Software: $1000 for Cataloger, $2000 for Collections Manager per single user license
- Annual Maintenance: $500 for Cataloger, $1000 for Collections Manager per license
- *Art & Architecture* Thesaurus: $375
- *Chenall's Nomenclature*: $100
- Web Kiosk: $5000
- Web Kiosk Annual Maintenance: $1000

Technical support services offered for EmbARK are below (Gallery Systems 2009c):

- Data Conversion ($1000 per day)
- Training ($1000 per day)
- Installation ($1000 per day)
- Consulting ($1500 per day)
- Customization ($190 per hour)

For other technical services available for Gallery Systems products see the TMS section.

Argus 3b (Sydney PLUS - Questor Systems)[*]

Argus is organized into five primary tables: activities, objects, lexicon, site, and party. It is a four-part architecture for record types, associated tabs, "SuperFields," and tasks. Record types can be made for each table and identify the type of record and the placement of "SuperFields" and the order in which tabs are shown. The fields shown can vary according to each record type. Argus also has an Activity window for managing transactions and events such as accessions, deaccessions, pre-accessions, incoming loans, outgoing loans, exhibitions, shipping, and insurance. Activity functions also can be assigned to different record types (Questor Systems 2009b).

Argus can run on a variety of underlying databases: Oracle, Microsoft SQL Server, or Sybase and works on Windows, Macintosh, or Lenox operating systems. Oracle and Microsoft SQL Server are recommended for large institutions with technical staff. Questor recommends that small to mid-sized institutions use Sybase for which Questor can provide technical support (Questor Systems 2009e).

Argus features are described below:

- *Cataloging:* See Common CMS Features Section
- *Accessioning:* See Common CMS Features section.
- *Deaccessioning:* Argus notes if an object has ever been considered for deaccessioning even it was not actually deaccessioned.
- *Pre-accessioning:* If an object saved as a "pre-accession" record is accessioned, Argus can transfer information in the record to its accession record and renumber the object automatically when its status changes.

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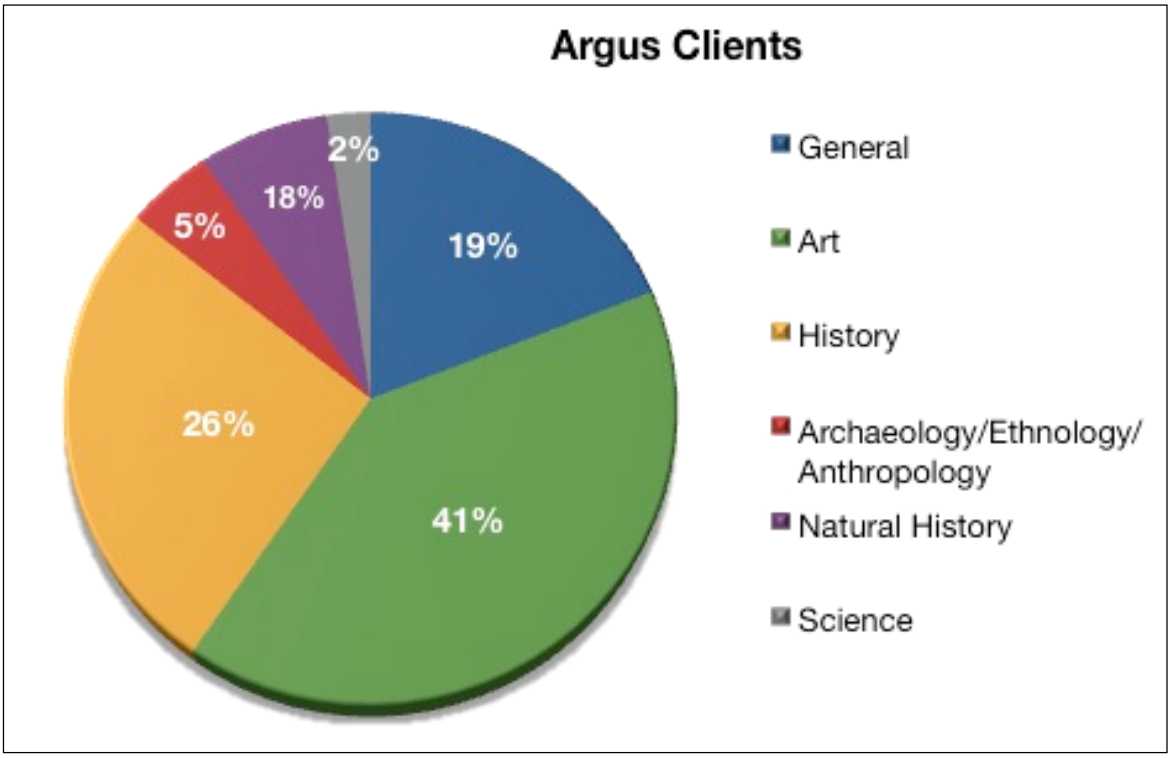
[*] Questor Systems was bought by System PLUS as of March 29, 2010

- *Data standards:* The record types and fields in Argus are flexible enough so that basic data guidelines can be followed for different types of collections but has wiggle room for individual preferences.
- *Data Control:* Allows users to implement standard cataloging criteria through database controls and online help for consistent categorizing.
- *Authority Control:* Provides authorities for specific fields or data sets. They can be either flat tables or hierarchical, locally written or integrated as pre-made tables. It can make users choose from a particular vocabulary during cataloging.
- *Lexicon:* Users may create their own lexicon or an established thesaurus can be uploaded. Argus supports many standard lexicons. Lexicon terms are organized hierarchically (Questor Systems 2009e).
- *Tasks:* When a record or activity is created, users can make checklists of tasks and procedures associated with that type of record. Argus can track due dates, status, and which employees are assigned to tasks (Questor Systems 2009b).
- *Data Entry:* Each field can be validated during data entry including "SuperFields" and system fields by drop-down lists, indexed text, controlled vocabulary, multiple values, and date controls (Questor Systems 2009d).
- *Interface:* Argus has different tools and features accessible for each user group to make it more intuitive and manageable.
- *Location:* Argus can track the history of an object's location as well as the purpose of the move, who moved it, and when it was moved. A location can be assigned as an object's normal storage location or other location types.
- *Related Records:* There is a special tab in Argus to record information about related objects. Argus supports part-to-whole and intellectual relationships.
- *Valuation:* Tracks the values of objects since the time they were acquired as well as appraisal information.
- *Condition/Conservation:* See Common CMS Features section.

- *Loans:* Incoming and outgoing loans are considered separate activities by Argus. Reports can be generated directly from loan records. Outgoing loans can be treated as single transactions or complex transactions with more than one venue. When objects are returned from loan, Argus's *Update Locations Wizard* can change their locations in a batch update, which is an uncommon feature in CMSs.
- *Exhibitions:* See Common CMS Features Section
- *Transportation:* Receipts can be generated directly from the shipping record.
- *Insurance:* See Common CMS Features section.
- *Processing:* Activities can be managed at several different levels and stages from a proposal until it is finalized (Questor Systems 2009b).
- *Search/Query:* Argus can run a query by example or a query by form in Boolean, range searching, wildcard searching and string searching. Searches can also be saved.
- *Reports:* Argus comes with over 150 reports, which are regularly maintained, and new reports are added over time. Questor can create custom reports for a fee or clients can modify or create their own reports with PowerBuilder report writer software. Argus also works with some other third-party report writer software, such as Crystal Reports Writer.
- *Security:* Individual fields, records, menus, and processes are all password protected so that only certain levels of users can modify them. System administrators can view a record of users' database activities.
- *Media/Images:* Nearly all image types are supported and are integrated with records without further necessary configuration.
- *Import/Export:* Argus is Open Database Connectivity (ODBC) compliant so that data can be exported and viewed with other applications such as desktop publishing or accounting software.
- *QScan32:* This is an optional add-on module that specifically manages images and multimedia and integrates them with collections management records (Questor Systems 2009d).

- *Customization:* Argus provides "SuperFields," which clients define themselves, and client-defined processing for transactions. The number of SuperFields for each record is unlimited (Questor Systems 2009e).
- *Rights & Reproductions:* Users can create a Rights & Reproductions record for each request which is given a tracking number. The request record is linked to the object record. There are Charges and Payment tabs to keep track of all related fees. An invoice or bill can be generated directly from the record with report writing software (Questor Systems 2009b).
- *Referential Integrity:* Argus can detect dependencies and notifies the user. It will not let users make changes in the database that are not made to all the necessary areas (Questor Systems 2009d).
- *Wizards:* Argus is equipped with several wizards for updating locations, creating new records, and "to do" lists (Questor Systems 2009b).
- *Bar coding:* See Common CMS Features section.
- *Web Access Module:* Makes Argus collections data available through a web browser so that information can be accessed by staff through an intranet without having to log onto Argus. In addition, visitors can view collections information on a web kiosk or the museum's website. Users define what specific information to publish and make available to the public (Questor Systems 2009e).

A graph illustrating a breakdown of Argus clients according to the type of museum is below. A selective list of Argus clients is on the Questor Systems website (Questor Systems 2009c). Argus users who responded to the survey were included as well as historical societies with museums associated with them. A total of 42 institutions were included in the sample.



Prices for Argus software are listed below (CHIN 2003):

- Basic Software: single user $4000-8000, additional users $2500-$5000 each
- Software Annual Maintenance: single user $1140, additional users $900 each
- Web Access Module: $7000 plus $1260 for annual maintenance
- Image Acquisition System: $4000 plus $720 for annual maintenance
- Barcode Module: $2000 plus $360 for annual maintenance
- Conservation Module: $4000 plus $720 for annual maintenance
- Sites Module: $5000 plus $900 for annual maintenance

Technical support services available from Questor Systems are as follows (CHIN 2003):

- Training ($1200 per day for essentials)
- Data Conversion
- Help Desk
- Consulting ($125 per hour)
- Customization ($125 per hour)

Re:discovery 8.11 (Re:discovery Software)

Like PastPerfect, Re:discovery is organized according to the type of collection. It has a *Museum Collections* module and an *Archives* module. The *Museum Collections* module is further broken down into *Cultural Resources* and *Natural History* directories. The *Archives* module is specially designed with archival specialists' needs in mind (National Park Service [NPS] 2006). Re:discovery can be used with Microsoft Visual FoxPro 6, Microsoft SQL Server 2005, or Oracle databases so that it is compatible with Windows, Macintosh, or Lenox computers (Re:discovery Software 2010).

Features of Re:discovery are described below:

- *Cataloging:* Different classes of objects have different cataloging screens.
    - The *Museum Collections* module has *Cultural Resource* and *Natural History* directories. The *Cultural Resource* directory contains tools for managing and cataloging history, art, ethnology collections and manuscripts. The *Natural History* directory is meant for geology, biology, and paleontology collections.
    - In the *Archaeology* module there are five types of records: site, context, master context, artifact, and object.
    - The *Archives* module is for cataloging manuscripts, books, maps, photographs, and letters. It supports hierarchical and item level only cataloging. It also includes a reference library with bibliography fields, circulation functions, and is compatible with MARC standards (Re:discovery Software 2010).
- *Locality Associated:* Users can document location data for natural history objects and information about the site where specimens were originally found. This module can also be used for Cultural Resource collections but it does not link to Cultural Resource object records.

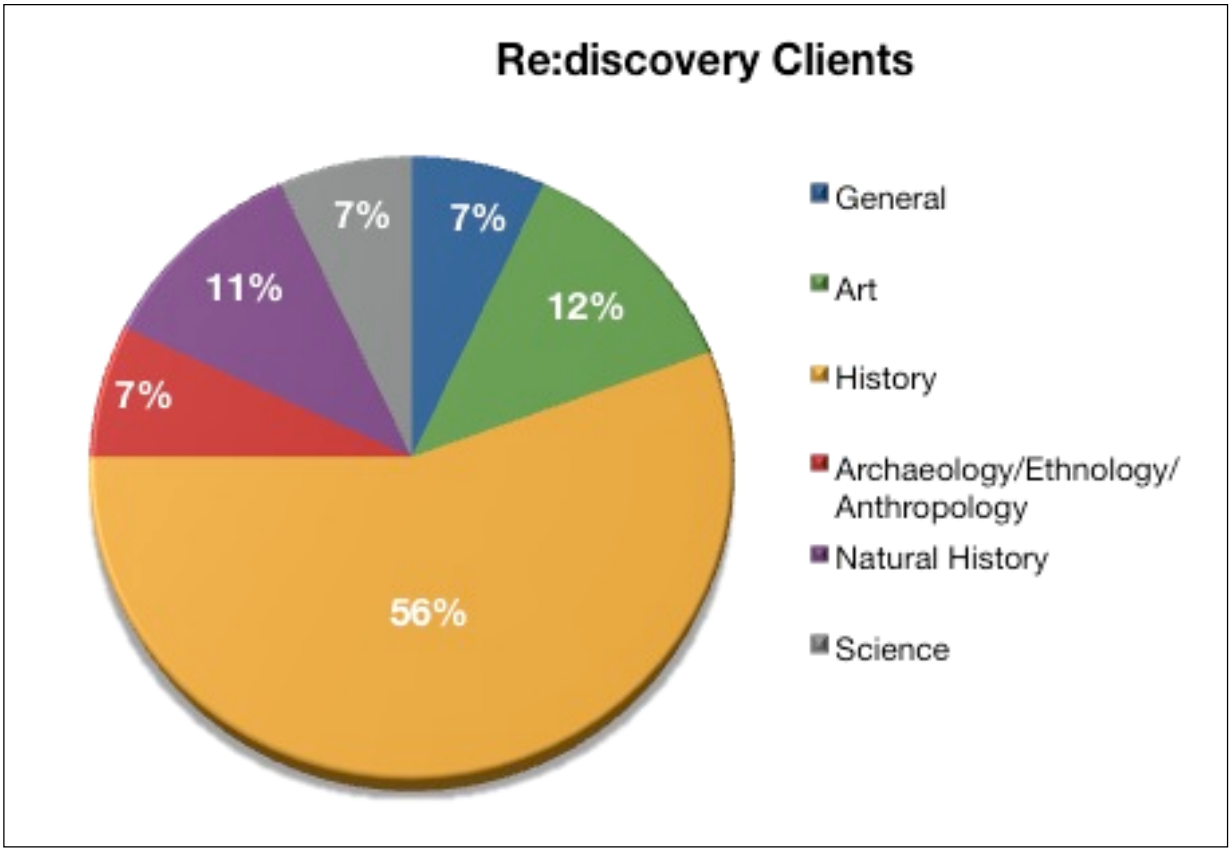
- *Artist/Maker/Figure Associated:* This module is for recording biographical information about the people who made an object and prominent figures who used or owned the object (NPS 2006).
- *Accessioning/Deaccessioning:* See Common CMS Features section.
- *Data Entry*: Re:discovery tools for data entry include: on-screen authority table update, default and carry-over values, modify/append all, global search and replace, quick entry, auto-completion fields, and on-screen lookup (Re:discovery Software 2010).
- *Lexicon*: Re:discovery comes with thesauri for *Revised Nomenclature for Museum Cataloging*, *Art & Architecture Thesaurus*, NPS Classification Terms, Hierarchical Classification Online, and Integrated Taxonomic Information System. Users may add specific park lexicons.
- *Conservation/Condition:* See Common CMS Features section.
- *Preparation/Treatment:* Documents and tracks the preparation and treatment of specimens in the Natural History directory (NPS 2006).
- *Maintenance:* Users can schedule and track routine object maintenance which can be associated with object records, staff, and location (Re:discovery Software 2010).
- *Exhibitions:* See Common CMS Features section.
- *Loans:* There are separate incoming and outgoing loans modules which includes shipping and insurance information.
- *Names and Addresses*: Keeps track of contact information pertaining to individuals and institutions associated with objects in the collection as well as researchers who wish to access the collections (NPS 2006).
- *Search:* Re:discovery allows for intuitive word searches similar to performing a Google search. There is a Quick Search which allows users to search terms or phrases from the Button Bar and an Advanced Search to limit the search to specific fields or sets of data with the option to perform a Boolean search or use lexicon to extend the search to related, broader, narrower or proper terms. The concordance lists show terms that are actually in the records and their frequency. Users can select which modules and sub-

modules to search from with "Global Search." An Advanced Filter allows users to limit the amount of data to records that meet particular fields values. Searches can be saved for later use.

- *Find Specimen:* This is a special tool that can be used for natural history objects to search them by taxonomic terms (Re:discovery Software 2010).
- *Reports:* Re:discovery uses Quick Report so that users can generate and design an unlimited number of report templates. It comes with 150 report templates including those required for the National Park Service. The report templates included cannot be modified unless they are exported to a word processor.
- *Security:* Re:discovery is protected through a system of user login names and passwords. The system administrator determines which users can add, modify, and delete data in each directory. There are general rights and specific rights (NPS 2006).
- *Audit Tracking:* Allows system administrators to view all changes and additions made to records at the user, record and field levels.
- *Director's Summary:* Records summary information about the museum's collections and activities through a secured webpage.
- *Copyright:* See Common CMS Features Section
- *Media/Imaging:* See Common CMS Features section.
- *Import/Export:* Records in the Archives module can be exported to MARC format.
- *Barcoding:* See Common CMS Features section.
- *Inventory/Location:* See Common CMS Features section.
- *Interface:* All modules and tools can be accessed from one screen (Re:discovery Software 2010).
- *Restrictions:* This module is for documenting restrictions that limit access or use to culturally sensitive objects. Multiple object records can be linked to a restriction record.

- *NAGPRA*: This is used to record inventory information about human remains and funerary objects as well as activities related in order to comply with NAGPRA (Native American Graves Protection and Repatriation Act).
- *Public Search:* Allows researchers and non-staff to search collections records through their web browser. It has a similar interface as most search engines (NPS 2006).

The chart below represents the types of museums as well as historic sites and monuments across the country that use Re:discovery by percent. A total of 72 institutions were included. A selective list of Re:discovery clients can be found on the vendor's website (Re:discovery Software 2009a).



Below is a list of prices for Re:discovery per single user:

- Basic Software: $2560
- Annual Maintenance: $460
- Images: $920, plus $170 yearly maintenance
- Structured Lexicon: $920, plus $170 yearly maintenance
- Barcode: $920, plus $170 yearly maintenance
- Conservation Services Module: $1640, plus $300 yearly maintenance
- Core of Discovery: $920, plus $170 yearly maintenance
- Library/Archives Module: $2560, plus $460 yearly maintenance
- Archaeology Module: $2560, plus $460 yearly maintenance
- Slide Library: $2560, plus $460 yearly maintenance
- SQL: $920, plus $460 yearly maintenance
- Library search and import: $920, plus $170 yearly maintenance
- Web/Public access Module: $5130, plus $920 yearly maintenance (CHIN 2003)
- Single User license: $980 ($375 per additional license)
- Support for first year: $270
- Annual support: $340
- Per incident: $95 (Re:discovery 2009b)

Technical support services available from Re:discovery are as follows (Re:discovery

Software 2009b):

- Subscription and onsite installation: $540 per year
- Support (1.5% of license cost)
- Data Conversion ($90 per hour)
- Training ($829 per class or $100 per hour for web or phone)
- Customization ($150 per hour plus .5% of total customization cost)
- Consultation
- Web interface Configuration Services

Vernon CMS 5.0.13 (Vernon Systems)

Vernon CMS has four primary modules: *Cataloguing, Activities, Browser*, and *html Export*. Each module can be purchased separately. The *Cataloguing* module covers the basic functions of multimedia, location, and object documentation. The *Activity* module is for loans, exhibitions, conservation, acquisitions, and workflow tools. Rather than focusing on an individual object, activities module focuses on the life cycle of an event so that any amount of objects within an activity can be managed together. *Vernon Browser* exports object records in the database online and the html export module is for publishing collections' records on kiosks, the Internet, and intranets. The underlying database for Vernon CMS is OpenInsight, which runs on Windows or Linux operating systems (Vernon Systems 2008).

The Features of each module are explained below:

- *Cataloging Module Features*
  - *Object File:* Contains general cataloging information. Each aspect has high-level general fields and specific fields for more detailed information. This also includes a registration function to track the history of an object from pre-acquisition to deacesssioning. The registration function also has fields for aspects such as record status, attributions, restrictions, copyright, insurance, valuation and condition. Object records can be linked to related people, places, events, and other objects. There are special fields for recording field collection.
  - *Person File:* Supports data related to historical figures and contemporary people, groups, and companies. Vernon also supports genealogies, relationship to other people, people related to objects, multiple contacts, mailing lists, and includes biographical fields where a curriculum vitae can be entered. It also keeps track of each person's responsibility concerning the database itself.

- *Event File:* Records information related to important historical events. It is organized hierarchically to allow users to include sub-sets. Event records can be linked to objects and people that are related to the event.
- *Site File:* Supports information related to historic and geographic places such as: latitude and longitude, altitude, depth, access details, facilities, management, habitat, conditions, usage, conservation, and geological information.
- *Documentation:* Vernon supports documentation information related to books, archives, film, video, and sound recordings. It can also be used as a library cataloging system (Vernon Systems 2009d).
- *Photo/Audio-Visual:* A database for information about any type of audio-visual media such as: photographs, digital images, video and sound.
- *Thesaurus:* Vernon supports hierarchical structures and particular data can have different authorities. *Chenhall's Nomenclature* and the *Art & Architecture* Thesaurus are also available separately. Other types of established thesauri can be formatted for Vernon by the company (Vernon Systems 2008).
- *Data Entry:* Information can be imported from a previous system or entered from paper records by staff. Whole records can be duplicated when there is a lot of common data between records. Specific data entry windows can also be built in a format similar to paper records.
- *Location/Inventory:* Vernon Supports sub-parts and object grouping as well as batch updates. Users can record four aspects of location: current, usual, last confirmed, and history. Location changes are made with a *Movement Transaction* Function to record the date and time, authorizer, mover, notes, reason, parts, and the new location so that a location history can be kept. It also can find objects that were at a specific location during a specific time to reconstruct what was in a room or storage location, record common inventory details, not allow certain objects to be moved, record movements at other sites, and produce movement reports.
- *Data Retrieval:* Searches can be performed either through a quick search or a query window.

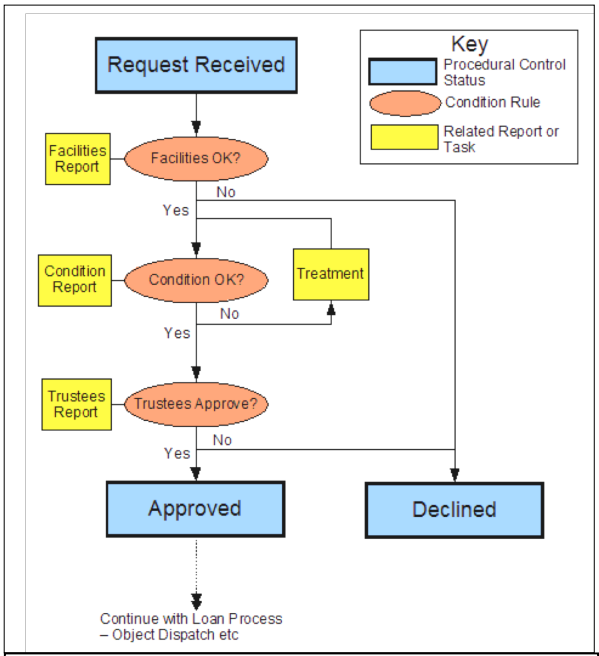
- *Reports:* The reporting tool takes the user step-by-step to generate a report. Reports are completely customizable and users have complete control over the format and layout of reports. They can be exported to Microsoft Office Suite applications. Report templates can be saved. Vernon can generate three types of reports: listings, exports, and Word Merges.
- *Authority Files:* Users can create a word or phrase that will be the authority for how it should be entered. Whenever a particular word or phrase is entered, after the authority for it is set, Vernon makes sure it matches the authorized terminology. Authority controls ensure that data is entered consistently, saves time when entering the same data, saves on storage space, prevents any type of incorrect term from being entered, and makes maintenance easier. The data in authority files are shared across disciplines and functions. There are three different types of authorities: simple, thesauri, and complex as well as over 200 authority files such as place, materials, period, classification, and location.
- *Security:* Tracks system use with functions for rollback of unwanted changes, redo, and undo. System privileges can be set individually or by groups. Security can be set at the field level, for performing processes, creating, deleting, viewing, or modifying specific data. The Audit Tool keeps track of all changes that have been made to data by whom, when, and how (Vernon Systems 2009d).
- *Imaging/Multimedia:* Media files are integrated into the system but not imbedded into Vernon. There is no limit to the number of images that are linked to an object record and vice versa (Vernon Systems 2008).
- *Import/Export Data:* Vernon can display related documents from other applications directly. Imports from MARC bibliographic records are supported. Vernon records can also be linked with documents in Microsoft Office applications in an "External Files" field.
- *Interface:* Vernon uses standard Windows shortcuts and convention. Authority files can be viewed as a list, hierarchy, or searched. During data entry, users can easily switch between the authority file window and data entry screens.

- *Customization:* Users can rename any field.
- *Barcoding:* See Common CMS Features section.
- *Diary:* Keep track of tasks, assign tasks, track costs related to the collection, and 'To-Do" lists. Standard costs for specific tasks can be entered into the system so Vernon will automatically insert them.
- *Online Help:* Help available includes window help, field help, and word search.
- *Variable Length Fields:* Fields and records can expand or contract as information is added or deleted instead of having a fixed amount of lines so that extra space is not shown or running out of space is not a problem.
- *Multi-Value Fields:* Multiple entries can be made for a field. They can be grouped to keep them aligned in Edit Tables.
- *Data Dictionary:* Every field is defined in the data dictionary so that data is entered, accessed, and displayed consistently by other applications. Definitions can also be made for data that was not manually entered but can be calculated based on the information entered by the user. These fields act the same as ones the in which data is entered by the user
- *Search:* See Common CMS Features section (Vernon Systems 2009d).

▪ *Activity Module Features*

- *Acquisitions:* Accession number formatting is user-defined. This activity is also for tracking proposed acquisitions.
- *Conservation Treatments:* Treatment and condition reporting are considered separate functions in Vernon.
- *Condition Reports:* See Common CMS Features section.
- *Loans:* Incoming and outgoing loans are treated as separate activities. Loans can be renewed, another loan record automatically created, and a new loan agreement generated based on the information already in the system.
- *Exhibitions:* See Common CMS Features section.

- *Traveling Exhibitions*: Allows multiple venues for an exhibition to be managed separately and document changes. Each venue is linked together as part of the overall exhibition record.
- *Transport/Movement:* Used for both internal and external movements. This function can be linked with loans and exhibitions' records or be considered an independent event.
- *Entry/Exit:* This activity is to document objects entering or exiting the museum for any reason as well as generating incoming and outgoing receipts.
- *Insurance:* Records can be linked to specific objects or loans and the total amount for an exhibition can automatically be calculated.
- *Rights & Reproductions:* See Common CMS Features section.
- *Linkage:* Each activity acts as a separate function but they are linked to form an activity "cluster" for applications that are related. It allows users to view related activities and objects through branching. Object records can be copied from one activity to another to save time when they undergo related activities.
- *Procedural Control:* Ensures compliance of processes at every step. Users create their own set of rules. Procedures can differ for different situations. Users will see an error or warming message when performing something not in compliance with the established rules. When the necessary data is entered, Vernon can be set to automatically perform an action. Procedural Control can also document all activities, steps, rules, reports, and explanatory notes. An activities life cycle can be mapped out visually as well. In addition, Procedural Control can include

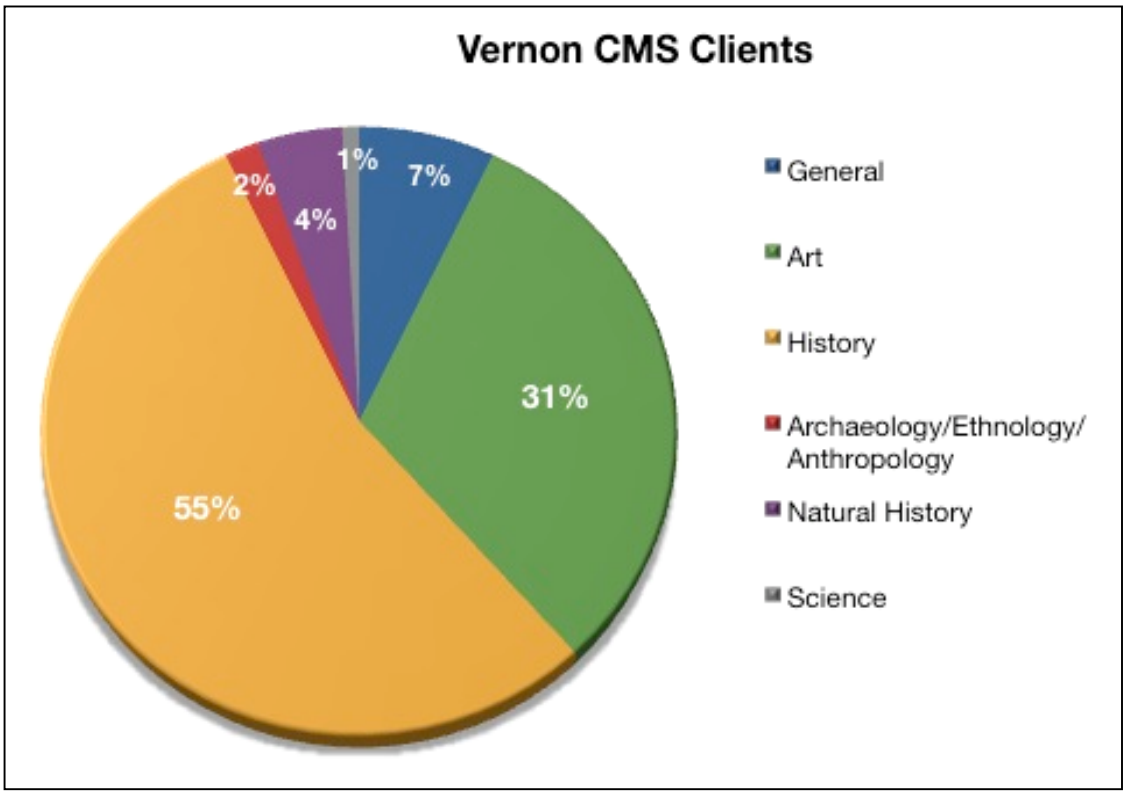


Activities Cycle
From Vernon CMS Brochure

manual tasks outside of Vernon (Vernon Systems 2009b).

- *Browser Module Features*
  - *Web Access*: Integrates selected object records in the Vernon database with the museum's website. The html coding can be customized to fit with the website's design. Separate search pages can be created for each collection.
  - *Highlights:* Create tours of the collection to provide context and a gateway to the rest of the collections.
  - *Search:* Users can perform a simple keyword search of the collection or an advanced Boolean search of certain indexes within a specified collection type. Collections can be grouped in multiple ways by the client museum.
  - *Multiple Views:* Users can determine how they want to view their search results. Search results may be displayed in detail view, label view, lightbox view, or list view.
  - *Shortlists:* Allows users to save their search results within a session.
  - *Directory List:* A list of objects on view to the public which are searchable through a search engine.
  - *Google Analytics Integration:* Option to have Google automatically keep statistics about the museum's website usage (Vernon Systems 2009c).
- *HTML Export Module:* Allows clients to create catalogues from records in Vernon CMS for the public to view online based on what information is selected to be displayed by the client. Vernon records can also be made available on an intranet as read-only access for researchers and staff while still protecting private information. This feature can also be used to make catalogues available on CDROMS for the public or to display selected records related to exhibitions on web kiosks in the museum (Vernon Systems 2009f).

The chart below shows a breakdown by percent of the types of museums worldwide that use Vernon CMS including historical sites and historical societies with associated museums. Art galleries were included only if they have a permanent collection. A full client list for Vernon CMS can be found on the company's website (Vernon Systems 2009a). A total of 112 institutions were included for the chart.



Prices for Vernon CMS modules are listed below (Vernon Systems 2009e):

- Cataloging Module: $4500
- Activities Module: $6500
- Browser Module: $8000
- HTML Export: $1500
- Additional Licenses: $2000
- Thesauri: $300 each for single user, $600 multi-user (*Art & Architecture* and *Revised Nomenclature*)

Below is a list of support services available from Vernon Systems (Vernon Systems 2009e):

- Data conversion ($900 per day)
- Customization ($900 per day)
- Training ($900 per day)
- Annual support: 20% of current cost of Vernon licenses held

KE-EMu 4.0.01 (KE Software)

There are two versions of KE-EMu available. One has only cultural collections-related features and the other has features for both natural history and cultural collections (KE Software 2009i). KE-EMu is organized into ten primary management processes modules, which are all connected to the central cataloging module and linked to each other. The other nine management modules are: *Accessioning/Deaccessioning, Condition Check, Conservation, Loans, External Movements, Events/Exhibitions, Location/Internal Movements, Valuations,* and *Insurance/Indemnity* (KE Software 2009g). The underlying database engine of KE-EMu is KE Texpress, an object-oriented database management system. It can be used on Windows, Unix, or Linux servers and will run on Macintosh computer work stations (KE Software 2009e).

The ten primary management modules are explained below:

- *Cataloging:* EMu only displays fields that are relevant to an object's associated discipline in addition to a common set of fields. Disciplines are organized in a hierarchical manner. The museum category includes natural history, cultural collections, art, and special collections sub-categories. All types of objects, however, are still within one catalog module. EMu fully supports object components and specimen lots as well as derivative media. Within the cataloging module there is a suite of supporting modules.

- *Collection Events/Sites:* Used for recording information related to where objects were originally collected including fields for: collectors, date of collection, expedition, locality, geography, mapping coordinates, altitude or depth, and the conditions at the time of the collection.
- *Copyright:* See Common CMS Features section.
- *Bibliography:* Used for recording bibliographic references.
- *Parties:* Record contact and bibliographic information concerning people involved with the museum in some way such as: artists, donors, lenders, borrowing institutions, collectors, staff, researchers, conservators, or carriers. EMu is compatible with the *Getty Union List of Artists' Names* and supports individuals known by more than one name so that artist names are entered consistently and different names for the same individual are recognized as such.
- *Thesaurus:* EMu supports the Getty's *Art & Architecture* Thesaurus, Library of Congress Subject Headings, *Thesaurus of Geographic Names*, and *Union List of Artist Names* as well as other discipline and user-defined thesauri and it complies with ISO Z39.19 standards. ISO Z39 was developed by the Library of Congress and is often used by libraries for integrated library systems and bibliography software. Thesauri are built into the search facilities so that it allows for browsing, terminology manipulation, searching equivalent terms, and narrowing terms. Any field can be made to be controlled by the thesauri (KE Software 2009d).
- *Taxonomy:* Used for recording detailed information about taxa at any level and allows users to search using taxonomic names as well as common names. EMu also supports hybrids, synonyms, and homonyms (KE Software 2009c).

- *Accessioning/Deaccessioning:* Accession numbers may be determined by the user or automatically assigned by the database. EMu can generate a summary of all objects within an accessioned lot and used to schedule collections committee meetings. Only specific authorized users may access deacessioned objects' records.

- *Condition Check:* Can be used to schedule condition checks.
- *Conservation:* Fully incorporates images and videos of before-and-after conservation treatments as well as documents.
- *Location/Internal Movements:* Maintains a full history of location changes within the museum. Both fixed and moveable locations are supported and may be organized hierarchically. Moveable locations, such as boxes, are placed in fixed locations, such as cabinets, so that when a fixed location is changed for a container the location for all individual objects within that container can be changed as a batch update in EMu.
- *Valuations:* See Common CMS Features section.
- *Insurance/Indemnity:* Documents insurance policies, policy number, insurance company, value covered, assessor, renewal date, claims history, specific transactions and which objects are covered.
- *Loans:* Incoming and outgoing loans records are under the same module. EMu can generate loan forms from the database and scanned electronic copies of loan documentation can be attached to the loan record.
- *Shipments/External Movements:* Tracks shipments into and out of the museum for any purpose such as loans or conservation. There are two types of shipment records: request to collect and request for dispatch. Receipts and other shipment-related documents can be produced with EMu.
- *Events/Exhibitions:* Records in this module can be linked to records in the loans and shipments modules. It can also be used to track traveling exhibitions, research projects, and other events as well as statistics about the event (KE Software 2009g).
- *Multimedia:* The multimedia repository acts as its own system which can be referred to by all other modules and adheres to the Dublin Core Metadata Standard. Digital collections are also supported (KE Software 2009i).

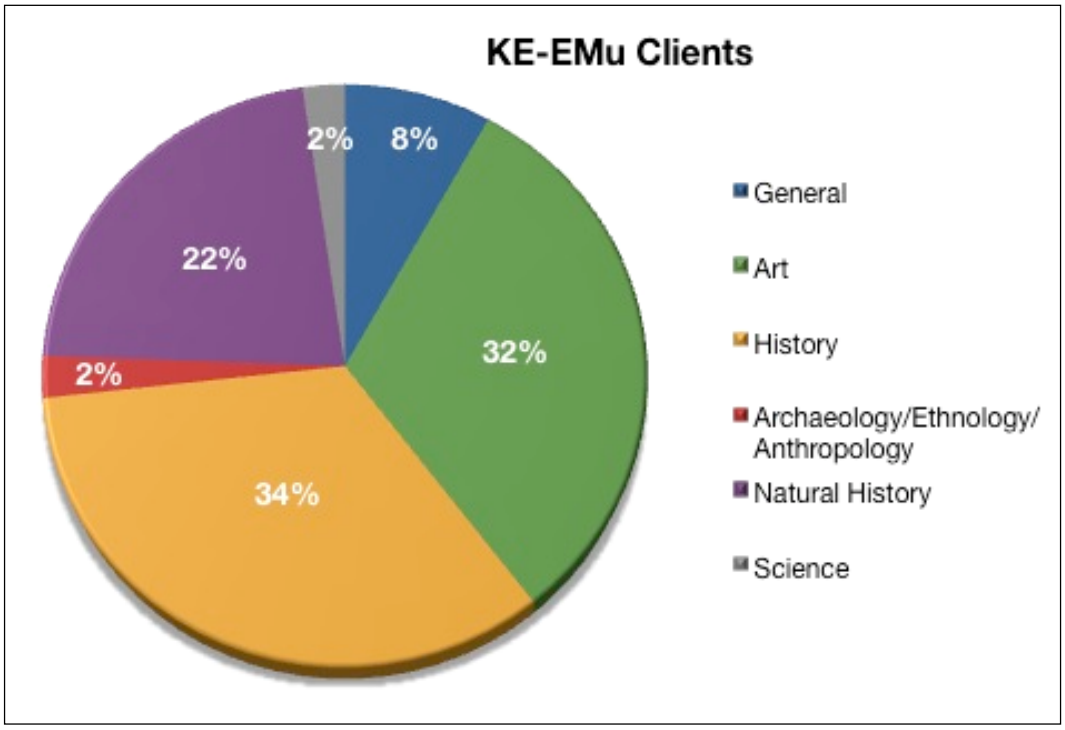
Additional KE-EMu features are as follows:

- *Data Entry:* During data entry and upon saving there are numerous validation constraints performed. To facilitate accurate data entry users may: access lookup lists of acceptable terms through the authority list or arranged hierarchically, use the thesauri, use the ditto function to generate new records based on similar existing records, as well as use other Windows-like functions (KE Software 2009k).
- *Grouping Module:* Allows users to make a group of object records according to a common theme.
- *Search:* Individual fields within EMu are searchable and all records types are searchable at once. EMu can be queried using terms, words, phrases, proximity searches, ranges, groups, phonetic searches, morphology, and Boolean logic. Search results may be displayed in a variety of ways.
- *Reports:* EMu is integrated with Crystal Reports, which can be used to create templates and customize and modify reports. Users can preview the layout of a report without need to access the collection. EMu also comes with 100 pre-defined reports available in multiple formats.
- *Security:* Security can be set at the field, record, user, and group levels. Users are assigned system privileges by the database administrator. Access is centralized so that it does not matter what interface is being used to avoid anomalies.
- *Audit Trails:* EMu tracks and can generate reports on all actions and modifications performed according to username, date, database, and system resources (KE Software 2009i).
- *System Information:* EMu can automatically produce maintenance reports and have them e-mailed to the system administrator daily including: a list of upcoming activities, nightly maintenance, re-occurring reports, and a list of all databases and amount of records. Each activity report can be e-mailed to different employees responsible for the given activity (KE Software 2009g).
- *Import/Export Data:* See Common CMS Features section.

- *Customization:* An uncommon feature of EMu is that its modules are separable so that third party systems may be used for certain functions (KE Software 2009b).
- *Interface:* EMu's interface is similar to that of Windows so it will be familiar to many users. The specific fields that are shown on the interface can be modified for each type of collection so that only the relevant fields are visible for a particular collection. However, all types of objects and fields within the cataloging module are searchable at once (KE Software 2009i).
- *MvWISE Barcoding:* See Common CMS Features section.
- *Workflow Management:* Institutional processes can be specified and tasks may be assigned to staff with activity due dates. EMu has an e-mail notification system to remind staff about upcoming and overdue tasks with a daily *To Do list* (KE Software 2009g).
- *Object Locator:* This rare feature allows users to see the exact physical location of individual objects in real time in their collections storage on floor plans of the museum, plan exhibition layouts, design tours, and create disaster recovery plans.
- *Locality Maps:* EMu can also be used to view the location of a group of specimens on a world map and create a distribution map of species in the collections. Users have the ability to zoom, pan around, and ask for additional information on specific areas (KE Software 2009h).
- *Statistics Module:* This new and uncommon EMu feature generates statistics regularly about the institution's use of EMu and its applications and can produces summary reports. It also allows users to manually add statistical data (KE Software 2009j).
- *Narratives Module:* This rare module allows users to write in-depth descriptions and narratives about objects combining exhibitions, objects, people, places, multimedia, and events. The narratives module is useful for a variety of functions such as: writing exhibition labels, brochures, research papers, virtual exhibitions, and descriptions for online collections. It includes fields for title, author, abstract, references to EMu records, and content in HTML format. All narratives available online are indexed so that the public can search them (KE Software 2009c).

- *MVWISE:* Allows staff to view and update collections information in EMu with a hand-held computer (KE Software 2009h).
- *KE Portal:* Publishes user-selected collections information onto the web or museum's website. Sets of data published online outside or within the museum's intranet can be different. KE-EMu also offers a web interface so that data published to the Internet may be accessed from a wireless device with a browser. KE Software provides a portal of its own so that museums all over the world can see each other's records through their databases using EMu as a gateway (KE Software 2009i).

Below is a chart which depicts institutions that use KE-EMu worldwide. A list of KE Software's clients is available on the company's website (KE Software 2009f). Art galleries that have a permanent collection as well as historical societies with associated museums were included.* A total of 86 institutions were counted.



* For the purposes of this study, museum components that are part of the Army History Unit of Australia, Hull Museums Service, Salford Museums, and Lancashire County Museum Services were each counted as one institution/client.

There are two types of licenses; one for cultural collections modules and another for natural history collections, which includes cultural history modules. There is a minimum of two licenses and additional licenses are sold in increments of five (KE Software 2009e). Following are the costs of KE-EMu as of 2010 at the single-user rate, assuming no customizations, provided directly by the vendor for the purposes of this research:

- Basic Software: $5,280 for Cultural History, $5,808 for Natural History (note: price of each license decreases as number of users increases)
- Annual Maintenance: $1,056 for Cultural History, $1,162 for Natural History (20% of license fee)
- KE Portal: $8,333 (single data source), plus $1,667 for yearly maintenance

A list of support services offered by KE Software is below (CHIN 2003):

- Support
- Training ($1000 per day)
- Customization ($125 per hour)
- Data Conversion ($125 per hour)
- Consultation ($125 per hour)

IV. INTERPRETATION AND ANALYSIS

Museum collections management and registration practices have come a long way since the time of the card catalog systems; as have collections management databases. In the 1960s, the first collections databases acted simply as computerized versions of the physical card catalogs with the same inherent problems of them or even exacerbated some of them. With the advent of the relational database and the more graphically sophisticated personal computer in the 1980s, the advantages of a computerized system started to become truly significant. The relational database led to the arrival of the commercial collections management system (CMS) in the mid-1980s. It was not until the mid-1990s that commercial collections management databases started producing software for Windows computers and personal computers became more affordable that they began to become a popular choice among museums. It is important to keep in mind the general purposes of a collections management database while reading this section. Even though collections management systems now have many more bells and whistles since they first became available; their primary function is still to assist institutions with keeping track of their collections electronically. To put it simply, CMSs are relational databases wrapped with a friendlier graphical user interface with pre-programmed fields and functions specifically designed with collections and a museum's needs in mind.

Today there are at least 20 different commercial systems for museums to choose among. With all of these choices available selecting the "right" system for a museum can be an overwhelming task. What the "right" system is, however, will be different for every institution depending on its type(s) of collections, needs, financial resources, the hardware available, and the staff's technical abilities. There is no such thing as the perfect CMS.

Choosing a system is a matter of being aware of each system's limitations and, if they are acceptable or not, and what features the institution believes are necessary for its particular combination of needs. This section will analyze and compare seven popular commercial CMSs: PastPerfect, The Museum System (TMS) and EmbARK, Argus, Re:discovery, Vernon CMS, and KE-EMu. For each system: prices will be compared, its features will be analyzed, the advantages and disadvantages based on the survey results will be reviewed, the client breakdown charts in the previous section will be interpreted, and finally the author's overall impressions of the system in comparison to the others. To protect the respondents' anonymity, the organization will be represented by the museum type and a logical number.

Choosing a System

Before choosing a system, the museum must first carefully review several factors and keep these in mind during the entire selection process. According to Quigley these are: what information is to be stored on it, who will enter this information, how, why, who may use this information, the technical specifications of the hardware in use, potential institutional growth, and cost (Quigley, et al. 1998). Today, nearly all commercial CMSs allow for virtually an infinite number of records. The limit depends on the amount of hard drive space available on the server and the amount of data entered in the fields, not the software itself. The system should be flexible enough to allow the institution to start with the information already available and expand upon it. It also needs to be secure enough to make sure that only certain authorized people can enter, edit or view data. Lastly, it is preferable to purchase the hardware after the software has been chosen, however; if this is not possible, the museum needs to make sure the hardware it already has can support the

system's software (Quigley, et al. 1998). These issues will be addressed in the sections that follow.

It is difficult to predict the financial health of any software company or future technological trends, however; in order to mitigate the effects if the vendor of a given CMS goes out of business there is a simple solution to import the data into another database if necessary. All of the databases that are to be reviewed here, and nearly all in general, are able to export the data into a spreadsheet. From the spreadsheet, the data can be imported into another database. Once the data is imported into the second database it can be fine-tuned.

Price

Below is a chart comparing the prices of the software that will be reviewed. The price of the basic software package and the total cost for these systems are both indicated in the chart since the price ranking would be different depending whether the institution purchases only the basic software package or all available modules and features. This decision will depend upon the unique needs of the individual institution and its financial resources, among other variable factors.

The price indicated for all of the basic software packages are calculated at the single-user rate and includes one user license. The total price for each includes the cost of the basic software package and one user license, plus all modules and features, web-kiosks, and one year of maintenance and annual support fees at the single-user rate. It does not include the price of any third-party software or hardware. The prices for both versions of EmbARK and KE-EMu are included in the chart. It must be kept in mind that while the

underlying database is included in the cost of the basic software package of PastPerfect, EmbARK, Vernon CMS, and KE-EMu; the underlying database must be purchased separately for TMS, Argus, and Re:discovery. Since the client may choose the underlying database this additional cost will vary and was therefore excluded for the purposes of this study. *

Collections Management System	Basic Software Package	Total
PastPerfect	$870	$2,745
TMS	$4,000	$20,250
EmbARK (Cataloger)	$1,000	$7,975
(Collections Manager)	$2,000	$9,475
Argus	$4,000	$31,100
Re:discovery	$3,480	$28,150
Vernon CMS	$4,500	$25,200
KE-EMu (Cultural History)	$5,280	$16,336
(Natural History)	$5,808	$16,970

For the basic software package alone or the total cost, PastPerfect is the least expensive CMS in this study. The most expensive commercial system in this study for the basic software package is KE-EMu and for the total cost it is Argus.

* All prices are as of 2010 except for Argus and Re:discovery which are from 2003 because the software vendors could not be reached for a current price quote. The prices of all other CMSs can be found on the vendors' websites and may vary slightly from this chart since exact price quotes depend on the arrangement between the software company and the individual institution.

PastPerfect 4.0 (PastPerfect Software)

PastPerfect is generally reputed as the 'small history museum database.' Let us take a closer look now to see if this is really accurate. The first element of PastPerfect that will be examined is the features.

Features Analysis

An uncommon characteristic of PastPerfect is that its primary modules are all related to cataloging. The only other database with a similar overall organization is Re:discovery. However, Re:discovery's cataloging breakdown is significantly different and does not include archives, photographs, and library materials. Most other databases, such as TMS or Argus, are organized according to management activities such as objects, loans, or shipping and do not have separate cataloging screens for different types of objects. The fact that PastPerfect has special modules specifically designed with archival and library materials in mind as well as museum objects shows that this CMS is probably well suited for general museums with various types of collections. Also one of the benefits of PastPerfect's design is that once a cataloging category is selected for an object that cataloging screen becomes the default display screen so that unnecessary fields are not visible to make the interface cleaner when displaying search results and for data entry.

However, a disadvantage of this organizing structure is that it forces the museum to choose a specific cataloging category while the same object can be considered to belong to more than one category at the same time. This may hinder museums from thinking about their collections in an interdisciplinary fashion. For example a piece of pottery can be thought of as an art or an archaeological object. Having to choose a category may pose a

difficulty for institutions that consider themselves general museums while this may not be as much of a problem for museums that think of themselves as a particular type of museum and usually catalog their objects accordingly. For example, an art museum may think of a piece of pottery as art and classify it as such without much inner debate because it considers itself an art museum so the fields in the *Art Cataloging* screen would best satisfy its needs regardless of what else a piece may be considered.

PastPerfect has several features that may make it well suited for institutions that can be considered museum and library hybrids. In addition to an *Objects Cataloging* module it has special *Archives* and *Library* cataloging modules for a non-circulating library with a button that links the program to the Library of Congress Online Catalog. However, it does not include specific support for the Library of Congress Subheadings like KE-EMu. In addition, PastPerfect can automatically format records according to the Dublin Core standard and import or export records from a MARC format. However, there were several complaints from the survey respondents about the *Archives Cataloging* module, which will be discussed later.

A feature of PastPerfect geared toward history collections is that its built-in thesaurus uses *Chenall's Revised Nomenclature*. However, History Museum #25 feels that "Its vocabulary control is present but rudimentary." While it has a link to the Getty's online *Art & Architecture Thesaurus* and other thesauri can be added, art related thesauri are not built-into the system. Most other CMSs though have the *Art & Architecture* thesaurus built-into the system. It also lacks the commonly used *Thesaurus of Geographic Names* and the *Union List of Artist Names* which are frequently used by art museums. This complete lack of built-in art thesauri does not make PastPerfect very well suited for art collections

compared to other systems like TMS or EmbARK. Although it must be kept in mind that, as History Museum #25 puts it, "Nomenclature and other lexicons should be the least of one's concerns when evaluating a CMS. Every commercial CMS available accommodates standard lexicons, but they differ in how much control you can exercise over the way data entry people input the data."

While PastPerfect does include a natural history thesaurus, it lacks significant features that would benefit natural history museums that other CMSs have that may not make it the best choice for natural history museums. For example, it does not have a *Find Specimen* feature like Re:discovery or KE-EMu's *Taxonomy* feature or other special features which allow users to search for natural history specimens according to their scientific or common names.

Unlike many other CMSs, PastPerfect comes equipped with its own report writer software so there is no need for clients to separately purchase other third-party report writer software in order to create their own reports. Most other systems require the client to purchase separate report writer programs to create additional reports for the database as a plug-in. However, PastPerfect's *Report* feature is not especially designed to work with third-party report writer software, unlike most other CMSs. Therefore this may be an issue for a museum that particularly wants to use other report writer software, like Crystal Reports.

In order to include photographs or other multimedia in the PastPerfect database, clients must purchase this feature separately, while the multimedia feature comes standard with most other CMSs. Unlike most other systems, images may be edited or manipulated within PastPerfect even after they have been attached to a record. Usually once an image

file is attached to the database, it cannot be edited any further without having to reattach the file. The image-editing software in PastPerfect may not be as sophisticated (or complicated) as other image-editing specific software like Photoshop. Museum #9, for example, commented in the survey that, "image manipulation is limited." Therefore, if an institution has very high standards concerning the quality of its images, PastPerfect's built-in image-editing software may not be suitable for heavy image editing anyway.

PastPerfect's *Fundraising/Campaigns* feature is unique to this system. The *Contacts* feature also helps to track museum membership and works with the *Fundraising* feature. This would be beneficial for small museums with a limited staff where one person performs multiple functions since it combines collections management and development functions into one system. Interestingly, three relatively small historical institutions commented in the survey on how they liked these features. This feature may not be very useful for medium-sized or larger institutions where museum functions and staff are more specialized and segregated.

Another uncommon characteristic of PastPerfect is that the *Temporary Custody* feature is actually separate from the loans component. These functions are usually combined in other databases. This would be advantageous for museums that frequently receive objects into temporary custody for various reasons and want to keep track of them separately and further distinguish them from incoming loans within the database.

The *Scatter Gather* feature is also unique to PastPerfect. This feature would be especially advantageous for institutions that manage multiple buildings and sites but want all of the objects to be in one database as well as for a museum in which all of the

computers may not be connected to the network since PastPerfect can combine the records from different workstations.

Interestingly, seven of the PastPerfect respondents reported that they found it well suited for history or small museums. Historical Society #3 commented that PastPerfect "contains all the fields we need as a general history museum." History Museum #15 confirms this saying that it "fits the majority of our needs as a history museum." History Museum #11 felt that PastPerfect is "much more manageable than TMS and better-suited to our small institution" and explained that it has "more fields than we could ever use." Furthermore, History Museum #25 believes that "Past Perfect is extremely good for what it is… a system designed for small collections, small museums or collections that do not require the management of complex data." Although, this may also imply that PastPerfect may not be the best system for large collections that have "complex data." One institution remarked that it is "essentially an all-in-one- museum system" and the survey respondent for History Museum #8 summed up her review of PastPerfect by saying that, "It's like Prego… 'it's in there.' Everything from soup to nuts for a small museum." Museum #22, on the other hand, commented in the survey that it is "not necessarily just for small collections." These comments reveal that while PastPerfect can be used for large collections, perhaps it is still better suited for smaller museums.

Benefits

One of the benefits of PastPerfect that stands out is its overall ease of use and user friendliness. Out of the 25 survey respondents that use PastPerfect, 19 (76%) commented that the system is easy to use, learn, or is intuitive. Institution #1, for example, reported

that "I have found that even people who are not comfortable using computers can learn to use this." University Museum #13 stated that PastPerfect is "the easiest database for our student workers." In comparison to other databases, one Arts Center commented on how this CMS is "much easier to use than FileMaker" which is a generic database also commonly used by museums. The author has also used both PastPerfect and FileMaker and agrees with this statement. When commenting on their Vernon CMS database, History Museum #26 said that "PastPerfect is easier to navigate and understand" than Vernon CMS. While answering the survey, History Museum #35 said that Argus was "not as good as PastPerfect."

There are apparently some aspects that may be a bit difficult to handle at first for users with little database experience. For example, Historical Society #10 felt that "some of the general design and placement of the data fields is not the best choice and has caused some confusion." Most respondents thought that running reports and searching were easy, however; there were also a few comments on difficulty with using the reports and search features. History Museum #14, for instance, stated that the reports feature is "clunky" and History Museum #6 thought that reports and research are "complicated" to run. Regarding the search feature, History Museum #4 said that PastPerfect's "searches can sometimes be difficult and doesn't allow for ease of use many times" and History Museum #15 commented that PastPerfect "cannot do query searches on loans or temporary custody" features.

Another benefit of PastPerfect is that because the underlying database is included with the basic software package, the vendor provides the technical support for not only the PastPerfect software but also the underlying database. Therefore, it is not necessary (but

perhaps helpful) for an institution to have an IT specialist on staff to coordinate the updates and maintenance of the underlying database separately. A respondent for Arts Center #19 explains, "it works well if you have a limited budget for software and no IT person on staff." This is unlike most other CMSs which require an IT specialist and separate maintenance for the underlying database. It is the author's opinion though that the underlying database for PastPerfect may not be as powerful or stable as some of the other major databases like Oracle. One survey respondent, for example, remarked that, "Windows' updates sometimes messes up the software" and another said that PastPerfect "requires frequent indexing and backing up otherwise it likes to shut down." These problems may be due to these museums' hardware; however, this flaw will be easily offset for the small museum since it would not be necessary to have an IT specialist.

Half of the survey respondents commented on the helpfulness and promptness of PastPerfect Software's technical support services and there were not any complaints about it. History Museum #18, for example, stated that, "support was AWESOME – friendly, helpful, and quick to return calls." University Museum #12 reported that PastPerfect "listens to suggestions for changes and occasionally makes these changes." It also appears that the vendor is "willing to modify and create custom modules" according to Museum #17. Museum #22 explained "we had PastPerfect convert our Access records and that went well." Based on survey respondents' comments, it seems that PastPerfect has very satisfactory technical support.

Ten of the survey respondents reported on the affordability of PastPerfect software, support, and updates. Art Museum #5 stated that "for the price it may be the best." These comments are supported by the fact that in comparison to all seven of the CMSs in this

report, PastPerfect is the least expensive for the basic software including all of the optional 'bells and whistles.' Therefore, PastPerfect may be preferable for institutions with a relatively low operating budget.

Disadvantages

One of the first, immediate limitations of PastPerfect is simply that the software can only run on Windows operating systems because of its underlying database. With most other systems; however, the client can choose the underlying database and therefore the software has the capacity to run on more than just Windows operating systems. Hence, this CMS will need to be eliminated from the options for institutions that do not have Windows operating systems on all of their staff's work stations.

PastPerfect may be considered a "jack of all trades and a master of none." History Museum #14 commented, "It tries to cover a lot of different types of collections so that it's not that well suited to any of them." History Museum #6 also stated that PastPerfect does not cover all types of collections that well. While this may be a problem for museums that specialize in a particular type of collection; this attribute actually makes PastPerfect suitable for general museums since it tries to cover a variety of collections but not in great depth. History collections may be an exception to this though because history museums seem to be happy with it as previously shown.

Four survey respondents were not satisfied with the *Archives Cataloging* module of PastPerfect. Museum #17 explains that "The Archives Catalog is geared to collections on the fonds level and many materials need to be treated on an item level" and it is "slightly cumbersome to use for individual document records." Historical Society #3 remarked that

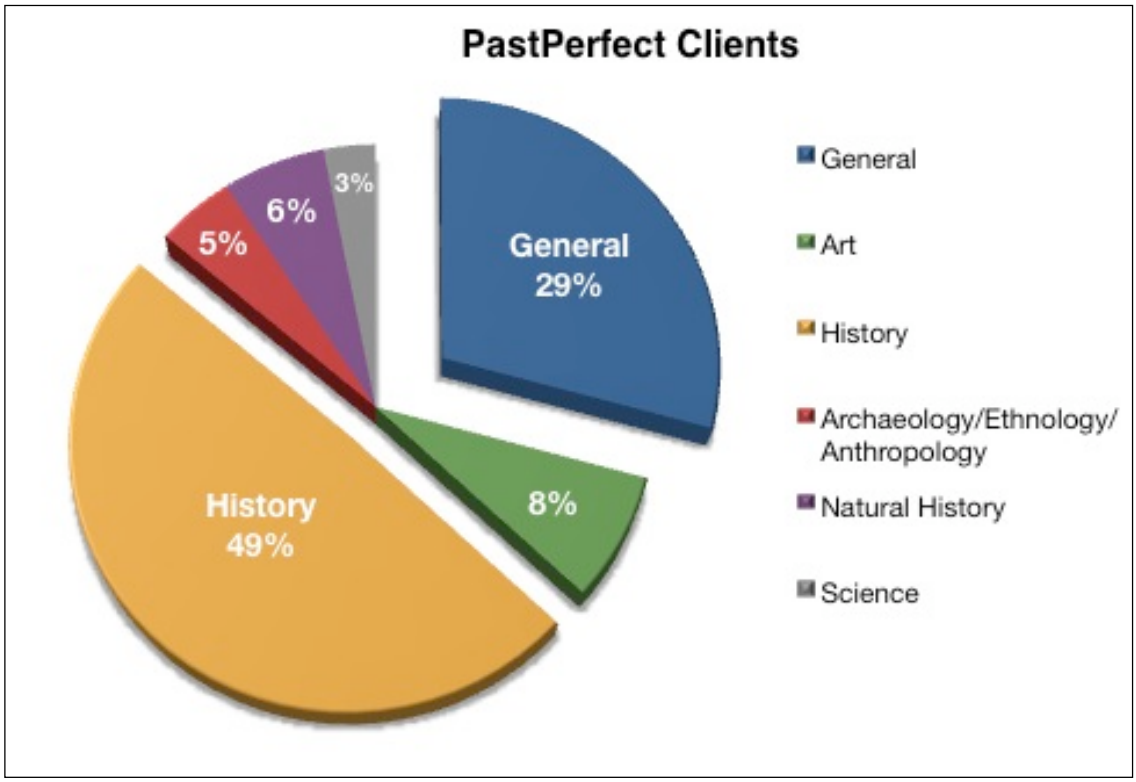
PastPerfect is "not designed for large archives," History Museum #15 complained that the "archives section does not meet our needs, " and Museum #16 remarked that their archivist "doesn't love it." This shows that PastPerfect may not actually be a great fit for institutions with a large archival collection.

It appears that PastPerfect may not be as flexible or customizable as some of the other CMSs such as Argus. Museum #22, for example, commented that it is "not as customizable as you can potentially have with something like KE-EMu." History Museum #15 complained that it "can't use the Temporary Custody portion because of how we number incoming donations as PastPerfect only allows sequential numbering." This problem may not be an issue for many other museums. History Museum #14 also remarked that the fields are not very customizable. However, Museum #17 has stated that PastPerfect allows for flexible location coding and two museums said that the lexicon is easy to modify.

Another potential disadvantage of PastPerfect is that according to University Museum #13, it lacks an object movement function for groups of objects that are not being moved as loans or for exhibition purposes. This may not be a major problem for most museums, however; it could be problematic for museums that often move large groups of objects for other purposes such as for conservation or research. A minor flaw in PastPerfect is that a maximum of four donors can be linked with an accession record. It is rare to have more than four donors connected with a particular object, but this could potentially be a limitation worth considering for some museums.

Clientele Analysis

Next, is a closer examination of PastPerfect users. Since nearly all these CMSs have predominantly history clients; most likely because there are more history museums in general, it is more helpful to think of it as which of these systems has the greatest percent of each type of museum (art, natural history, history, anthropology/archaeology, science, or general). The chart below shows a breakdown of PastPerfect's clients based on the client list on the company's website (PastPerfect Software 2009a).



Based on the author's sample, at 29%, PastPerfect has the highest percentage of general museums out of the seven systems reviewed here. PastPerfect also has a significant amount of history museum clients at 49%. In addition, there are a considerable amount of historical societies, 25%, with museums as well as university museums, 3%, which use PastPerfect software compared to other CMSs. Out of the seven systems

reviewed here, PastPerfect has the least amount of art museum clients by percentage. As a whole, this shows that PastPerfect is probably well suited for general and history museums as well as historical societies or universities with museums.

Overall

Based on user comments, it seems that PastPerfect is one of the easier systems to use in comparison to other CMSs. However, there may be some difficulty at first with a few features for novice computer or database users. Although, they will probably not be a problem for the average computer user. If an institution is especially primarily composed of novice and non-technologically savvy staff and cannot afford a technology specialist then PastPerfect will probably be the better choice out of the CMSs reviewed here. PastPerfect has the added plus of it being the least expensive out of the seven.

This system would be well suited for general museums because it has modules for history, art, natural history, archaeology, photographs, and archival collections but does cover any specific type of collection particularly well except for history collections. History museums that responded to the survey indicated that they were satisfied with PP overall. However, there were many criticisms of the *Archives Module.* Therefore, PastPerfect may not be the best system for museums with large archival collections. PastPerfect's features also indicate that it would be well suited for history collections such as the built-in *Chenhall's Revised Nomenclature.* It is noteworthy though that history collections and archaeology collections have some characteristics in common which means that PastPerfect may not be a bad fit for archaeology collections, especially if the museum has a

relatively limited budget. PastPerfect lacks features, however, that other systems have which does not make it particularly useful for other types of collections, particularly art.

TMS 9.35 and EmbARK 7.0.1 (Gallery Systems)

For the purposes of this study, TMS and EmbARK will be examined together since they have many similar features and attributes, and are produced by the same company, Gallery Systems. EmbARK is generally considered to be a 'junior version' of TMS and is meant to handle smaller collections, not to be confused with *TMS Light*, another Gallery Systems CMS. Next is an in-depth review of TMS and EmbARK's features, benefits, disadvantages, and clientele followed by the author's overall impressions of these systems.

Features Analysis

Like Argus, Vernon CMS, and KE-EMu, TMS and EmbARK are generally organized around activity or management modules instead different collection types like PastPerfect and Re:discovery. There is only one cataloging screen for all types of objects in TMS and EmbARK simplifying data entry and making it well suited for museums that have a mostly homogeneous collection with objects that have similar cataloging needs. For example, one TMS user commented on how she likes that the "object module format makes all major object-related data easy to see and access" and another respondent stated that TMS is "good for storing a lot of different information in one place." Likewise an EmbARK survey respondent remarked, "the system was designed for a more modest, focused collection." However, having only one object cataloging screen for all types of collections makes TMS and EmbARK not particularly suited for institutions that have multiple types of collections

with greatly varying cataloging needs in comparison to PastPerfect, Re:discovery, and KE-EMu.

Since TMS has an open architecture, like Argus and Re:discovery, the institution can choose the underlying database. Users cannot choose the underlying database of EmbARK, 4th Dimension, but both TMS and EmbARK can run on a variety of operating systems. Because users can choose the underlying database of TMS it must be purchased separately, adding to the cost. While commenting on PastPerfect, Arts Center #19 stated that TMS requires an IT person on staff, which further adds to the financial resources needed for this system. While, EmbARK does not appear to require an IT staff member, its underlying database's stability is not as proven or well known as the major database players, such as Oracle or Microsoft SQL.

TMS and KE-EMu are the only two CMSs reviewed here where incoming and outgoing loans are under the same module. Most other systems have separate modules/features for incoming and outgoing loans. In TMS users only need to check a box to delineate if a loan is incoming or outgoing and the fields will appear in the appropriate order. This simplifies data entry and searching for loans.

TMS has a built-in *Art & Architecture Thesaurus* as well as a *Thesaurus of Geographic Names* making it well suited for art collections. However, it does not have the *Union List of Artist Names* built-in, like KE-EMu. Nor does it have *Chenhall's Nomenclature*, natural history lexicons, Dublin Core standards, or MARC formatting built into the system. While these thesauri can be added on, they may not be as smoothly integrated with other features and functions. This makes TMS not particularly well suited for history, natural history, or archival collections. EmbARK does not come with any particular thesaurus, like Argus, but

the *Art & Architecture Thesaurus* or *Chenhall's Revised Nomenclature* can be added for an additional fee.

Benefits

TMS has a distinct entire module dedicated to shipping that is separate but linked to TMS's others modules. Many other systems, like EmbARK, PastPerfect and Re:discovery, incorporate transportation into their exhibition or loan features. This attribute will be especially beneficial to museums that frequently borrow or lend objects, have temporary deposits, especially large exhibitions, many temporary exhibitions, or exhibitions that frequently turn over since it is more robust to have an entire module dedicated to shipping than just a feature and provides a more direct access point to shipping information without having to go through an exhibition or loan screen.

TMS and KE-EMu are the only CMSs in this study that have a *Bibliography* module/feature for recording references and information about publications where an object has appeared. TMS has an entire module dedicated to this task, while KE-EMu's Bibliography feature is part of its *Cataloging* module. This tool is useful from a curatorial standpoint for researching objects for writing exhibition labels or as part of a catalog raisonné. It is also convenient for institutions that often have their pieces in their collections in published materials.

TMS has a rare *Sites* module for monitoring and keeping track of an institution's multiple locations. This unique module would be advantageous for museums that have smaller satellite museums, historical institutions that maintain multiple sites or have off-site storage facilities. TMS does not have a feature like PastPerfect's *Scatter Gather* so that

data on computers not connected to the network can be synchronized. But, according to Art Museum #60, computers off-site can access the database remotely through a VPN (Virtual Private Network) connection.

This database and KE-EMu are the only CMSs in this study that have an *Events* module for recording information pertaining to events related to the collection. This makes TMS more useful for a museum's development and education departments as well as helps to keep track of how an object is being used, how often, and how it is serving the institution's educational purposes.

EmbARK and TMS are the only CMSs in this study that have a *Circulation* feature for keeping track of the location of physical forms of media, such as transparencies. This feature is convenient for museums that frequently lend out their media to other institutions or move between departments within the museum. This can be especially useful during the digitization process if it is outsourced when media are constantly leaving and returning to the museum.

Unlike TMS, EmbARK is equipped with its own built-in report writer, according to EmbARK-user survey respondents. EmbARK's built-in report writer received mixed reviews. Art Museum #56 felt that it has "excellent built-in report writing that's user-friendly" making it a "better choice" for its staff. Art Museum #57, on the other hand, thinks that reports are "difficult to make or modify" in EmbARK and Art Museum #58 stated that report writing is "not easy to use for casual user." However, Art Museum #56's comments reveal that it is still less difficult than having to learn Crystal Reports, which is required to modify reports in TMS as well as Argus and KE-EMu. Regarding the user friendliness of report writing specifically, EmbARK seems similar to Re:discovery.

TMS has an especially robust *Exhibitions* module that is linked to the *Loans, Objects,* and *Shipments* modules. Art Museum #62, for example, commented that it is "especially good for coordinating large exhibitions with complicated loans and shipping - other systems are not quite as strong in this area." Although it does not have a special traveling exhibitions feature, like PastPerfect and Vernon CMS, TMS has the ability to track multiple venues. Therefore, TMS would be especially beneficial for museums that have particularly large exhibitions or frequent exhibition turn-overs. EmbARK, on the other hand, was not meant to handle large exhibitions, because the loans and shipments are combined under the *Exhibitions* feature, while loans are usually a separate feature and large exhibitions would require a more robust shipping feature.

Survey respondents comments on TMS's *Search* feature were very varied. Art Museum #64 felt that TMS's *Quick Search* is easy to use and the *Advanced Search* is thorough. Anthropology Museum #63 liked how TMS allows searching with different terms but complained that this can be difficult and slow. Art Museum #60 commented it is an annoyance that TMS cannot perform searches on null fields so that users can check where data still needs to be entered. Not many survey respondents commented on EmbARK's search feature. Only one institution felt that it is easy to search and another commented that EmbARK does not allow users to perform a word search on all fields at once. Therefore based on user comments it appears that Re:discovery has a more user-friendly search function since it is similar to a Google search.

TMS received mixed reviews concerning its user friendliness. Three of the seven survey respondents that use TMS felt that is easy to use for the average user. The author has had significant experience using TMS and also thinks that it is intuitive for the average

user. Only one survey respondent felt that data entry in TMS is "cumbersome and complex." Other comments about TMS's user friendliness concerned specific features. For example, Art Museum #65 remarked that the shipping module is difficult to use. The author, who can be considered an average-user, does not find this feature to be particularly difficult, but this may not be the case for users with little previous database experience. Art Museum #66 remarked it is "fairly easy to learn" but it is "somewhat convoluted to get to related information that you seek when in an object file." The author personally thinks that it is not difficult to find related information but it is not apparent at first. Set for release later in 2010, the new version of TMS has more of a familiar Windows-looking interface that may make it more user-friendly. TMS will probably be easy for the average-user but it may be tricky at first for novice computer users. Based on survey respondents' comments, TMS appears to be at about the same level as Re:discovery concerning user friendliness, more difficult than PastPerfect and EmbARK, but easier than Vernon CMS or KE-EMu.

Five of the six survey respondents for EmbARK felt that it is "easy to learn" and "very user-friendly." Art Museum #57 found that "volunteers, interns, and staff members have all been able to jump in and use it right away" but it is "difficult to go back and make corrections in some areas." Art Museum #56 remarked that EmbARK is "relatively easy to train people for basic usage," however it "Can be hard to train users for advanced usage." Compared to the other CMSs covered in this study, EmbARK seems to be one of the easiest and simplest to learn and will probably not even be difficult for novice computer users to learn. Based on survey respondents' comments, it appears that EmbARK may not be as easy to use as PastPerfect, but is more user-friendly than the others covered in this study.

It appears that EmbARK and Re:discovery are much more user-friendly in terms of attaching images and multimedia files compared to TMS. Four of the six survey respondents for EmbARK felt that it is "easy to link photos and documents to records" as Institution #54 remarked. In addition, Art Museum #57 commented that EmbARK is "designed around images" and Art Museum #56 stated it is "great for tracking media." EmbARK's *Circulation* feature further contributes to this attribute since it is useful for tracking physical forms of media. These user comments reveal that EmbARK is probably an excellent system for managing images and other media and will be especially useful for smaller institutions that have a large portion of their collection digitized or digital art, especially since the multimedia feature is a part of the basic software package, unlike PastPerfect. However, EmbARK does not have a built-in image editor program so digital images cannot be touched-up right in the database or a *Photograph* module like PastPerfect. As previously mentioned in the PastPerfect section, its built-in image-editing software is probably not as advanced as other software specifically designed for this purpose alone so that this lacking in EmbARK will probably not be a concern for museums that have very high standards of their digital media.

Gallery Systems received overwhelmingly positive reviews from survey respondents regarding their technical support services. Seven of the 13 (54%) respondents felt that "Gallery Systems provides excellent customer support" and "responds quickly to your questions or concerns." Art Museum #57 also remarked that Gallery Systems "seems to make design changes and updates based on user input" and Art Museum #62 stated the IT staff is "often able to customize their product somewhat to meet their clients' needs." The only complaint about Gallery Systems was that it "has a habit of

catering to the big name museums' needs." Related to support services, one respondent commented that she liked that "there are a large number of users to support one another" because "TMS is one of the most, if not THE most, widely used collections management databases." Similarly, one respondent for EmbARK also remarked that it is one of the "industry standards" and has a wide network of users. However, TMS and EmbARK are not alone in this element since there are also a significant amount of PastPerfect users.

Disadvantages

Reports cannot be modified or created in TMS without Crystal Reports software since TMS does not come with its own report-writer. According to seven respondents, Crystal Reports is not intuitive or user-friendly and requires some knowledge of SQL programming to be efficient. Art Museum #64, for example, stated, "Crystal Reports needs knowledge of SQL language and Crystal Reports to be used easily, not for beginners." This will be a downfall for museums that will want to modify the pre-made reports or a non-technologically savvy staff.

Another disadvantage of TMS is that it can be difficult to attach images or documents to the database, especially compared to EmbARK, Re:discovery, or PastPerfect. For example, Art Museum #60 remarked "it can be complicated to attach images and thumbnails" and Art Museum #64 stated, "the media module is confusing." The author has had significant experience with this particular area in TMS and has found that there is a learning curve at first for this aspect but it quickly becomes easier with practice. Novice computer or database users will probably have more difficulty with TMS's *Media* module.

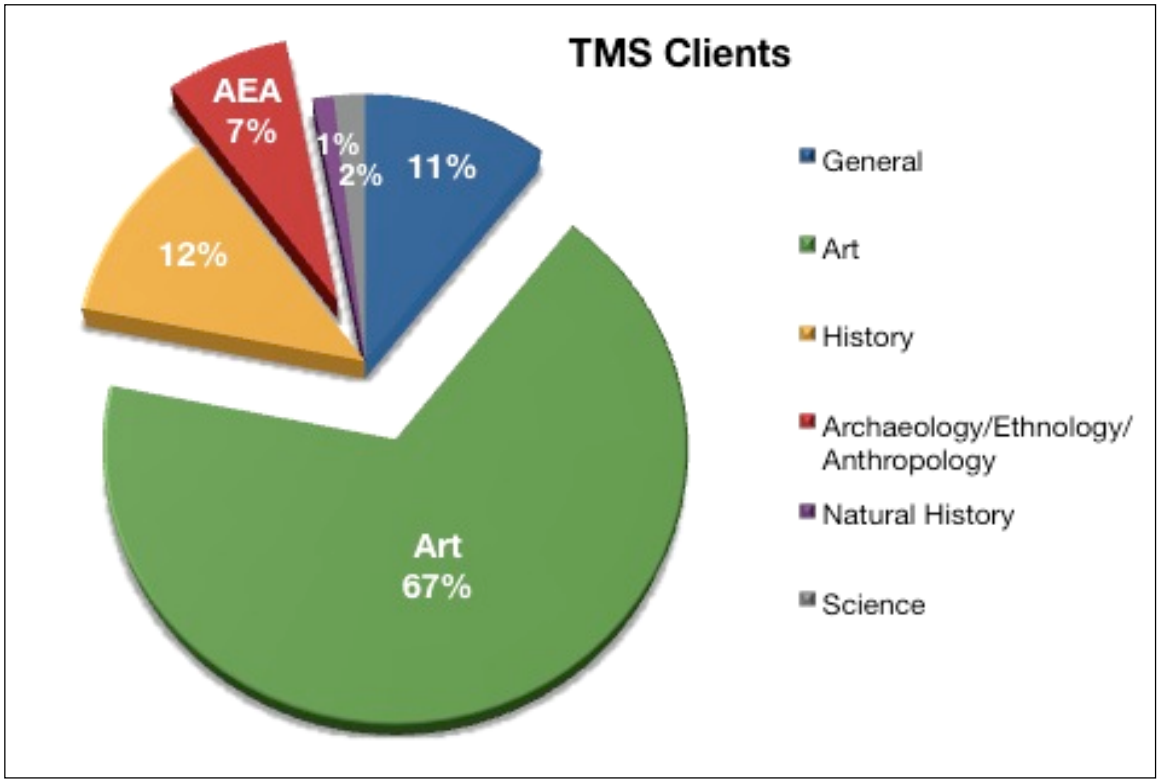
Regarding the customization of these systems, user comments reveal that TMS offers a "great deal of customization," but apparently it is difficult to do so, especially in the pre-defined fields. Art Museum #65 found that TMS is "adaptable and flexible enough to be used for collections with cotemporary art collections that may not fit into the norm" and Art Museum #64 likes how it has free text fields available to enter extra information, making TMS well suited for modern art museums or collections with unique cataloging needs. However, Art Museum #64 also felt that "data entry in some of the pre-made fields is made difficult due to a lack of flexibility in the field" and "user-defined fields are difficult to create." This may not be a problem though for a technically-savvy staff. According to Art Museum #60, customizations can be lost during upgrades and therefore need to be "tracked meticulously." However, for museums that do not find the need to customize the system a great deal, this concern will probably not present a problem. Museums with large varied collections that would require significant customization of their database may prefer Argus since it appears easier to customize. Although, Argus does not seem generally as user-friendly in comparison to TMS. The former does appear to offer more flexibility than PastPerfect, but it is not as user-friendly. Therefore, TMS would probably be well suited for a collection that requires only a moderate amount of customization with a staff composed of primarily 'average-users.' EmbARK, on the other hand, is probably easier to customize and change fields, according to survey respondents comments. However, these comments reveal that it is not meant to handle particularly large or varied collections.

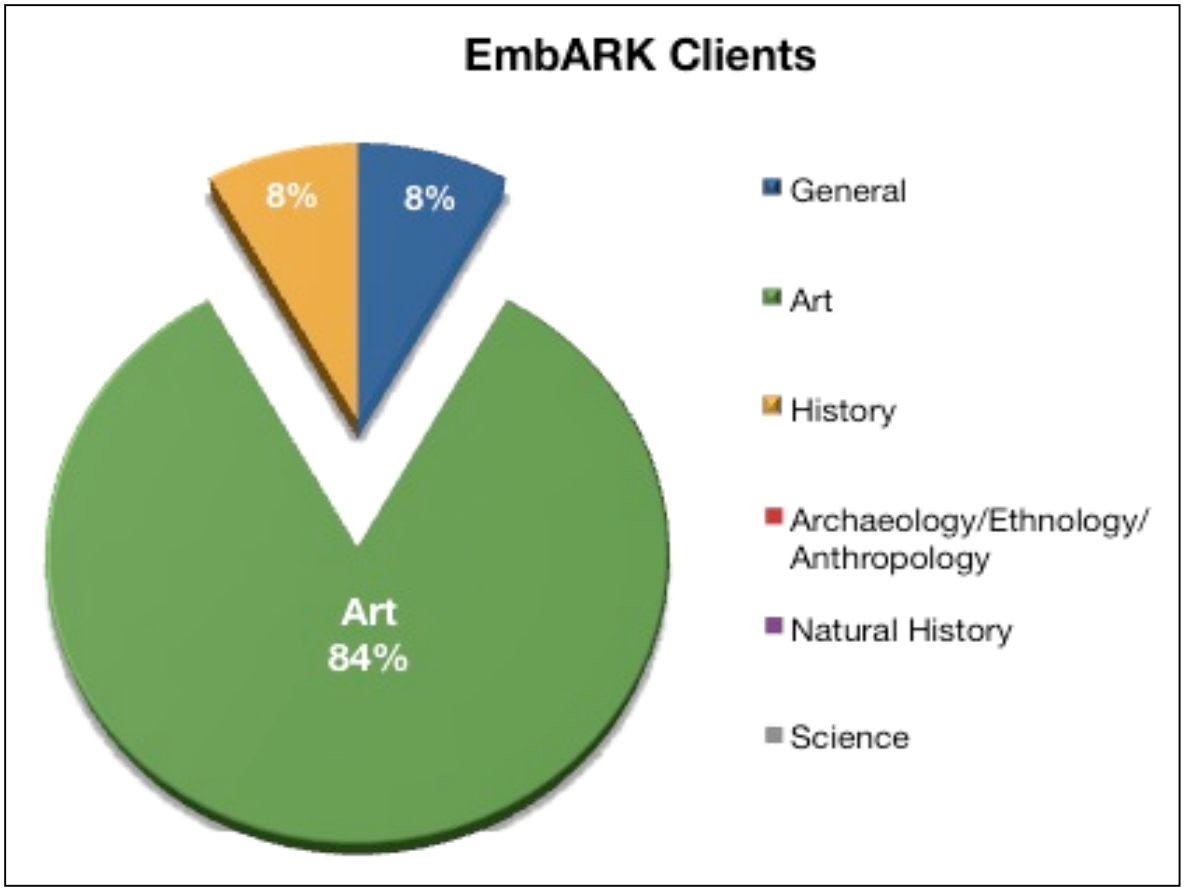
One particular survey respondent provided helpful insights into the import and export aspects of TMS. Apparently "exporting data is flawless if you have a well scripted report." Although data can be imported from other databases, "electronic exports can

sometimes be problematic." Data can also be difficult to import, according to Art Museum #60, and needs to be manually entered or the institution can have Gallery Systems do it for a fee. In addition, Art Museum #60 remarked "if you want TMS to talk with another program on a regular basis you need someone well versed in databases and programming." But since it is preferable to have an IT person on staff anyway for TMS this should not present another problem. Importing mass quantities of data from other programs may present a difficulty during the initial transfer of data to the database if the institution wants this to be done electronically, but after the initial import this will be a less frequent problem since after that any new information can be entered manually right into the system.

Clientele Analysis

Next, we will examine more closely the different types of museums that use TMS and EmbARK. Below is a chart that represents a breakdown of these systems' clientele by percent. This is based on the client lists provided by Gallery Systems (Gallery Systems 2009b; Gallery Systems 2009f).


TMS Clients
AEA
7%
1%
2%
11%
12%
Art
67%
General
Art
History
Archaeology/Ethnology/
Anthropology
Natural History
Science


EmbARK Clients
8%
8%
Art
84%
General
Art
History
Archaeology/Ethnology/
Anthropology
Natural History
Science

One can see that a clear majority of the clients for both of these CMSs are art museums. Just over two-thirds of TMS users and 84% of EmbARK users are art institutions. This shows that these systems are probably very well suited for art collections. Two survey respondents commented that TMS seems more geared toward art museums confirming this observation. Interestingly, Gallery Systems started as a commission to create a database for the Metropolitan Museum of Art (Gallery Systems 2009e). This origin in art collections is still reflected in Gallery Systems' products today in the overall architecture and features of their systems. For example, the only thesauri built into TMS are art related and both TMS and EmbARK's architecture is based on activity modules rather than having different cataloging modules for each type of collection like PastPerfect, Re:discovery, or KE-EMu. Although TMS has the same percent of archaeology/anthropology museums as Re:discovery, TMS does not have any particular features specifically designed for archaeology collections such as Re:discovery's *Archaeology* module and *NAGPRA* feature.

Overall Impressions

TMS or EmbARK are best suited to institutions that have primarily art collections. Neither one of them has any particular features especially designed for any other type of collection than art. For example, they do not have equivalents of *Find Specimen*, *Taxonomy*, *Repatriation*, *Preparation*, *Locality Associated* or *Figure Associated* features, a *Natural History*, *Archaeology,* or *Archives* module or a built-in natural history lexicon like KE-EMu, Re:discovery or PastPerfect. This would be a significant weakness for museums that have widely varied collections. However, by having only one cataloging module it makes data

entry and searching easier for museums which have generally homogeneous collections since it would be unnecessary for institutions with primarily art collections, for example, to have multiple cataloging modules.

TMS and KE-EMu have a few common characteristics: a similar overall architecture, both systems are very sophisticated and robust enough to handle large exhibitions. But, KE-EMu is generally designed more for natural history collections while TMS is better suited to art collections. TMS also appears more user-friendly than KE-EMu based on survey respondents comments. Moreover, TMS has a similar organization as Vernon CMS, and both are equipped to handle large exhibitions. However, TMS seems not as difficult to use in comparison and comes with more features built into the system making it less expensive if an institution wants all the 'bells and whistles.' It appears Vernon CMS may be more customizable and can handle a wider range of collection types than TMS.

TMS seems intuitive for the average-user but may be difficult for staff with little database experience. This CMS is not recommended for institutions with novice computer staff or cannot afford to have an IT person on staff. While it is not difficult to generate reports in TMS, creating them requires the purchase of Crystal Reports which is difficult to use without knowledge of SQL programming. Therefore, TMS is best suited for mid- to larger-sized museums that have primarily art collections with a staff composed of mostly average-users. In addition, it can meet the needs of institutions that would require a database that has some flexibility and can handle large exhibitions.

EmbARK is essentially a less robust, 'junior' version of TMS designed for smaller museums, primarily art museums, that mostly need a database for cataloging purposes and small exhibitions or exhibitions that do not frequently change. Although EmbARK has an

Exhibitions module for the Collections Manager version it is only very basic and not meant to handle large exhibitions like TMS. EmbARK is similar to PastPerfect in terms of its user friendliness but PastPerfect is probably better for handling exhibitions and a wide range of collection types.

Argus 3b (Sydney PLUS - Questor Systems)

Argus is one of the earliest commercial CMSs available for PCs out of the systems reviewed here. It is also known as one of the most powerful databases. However, this in part depends on the institution's choice of the underlying database. It has also been referred to as an older version of TMS to the author by Museum#37 and Art Museum #60. Following is an analysis of Argus's features, the pros and cons of the system, an analysis of Argus' clientele, and the author's overall impressions of this CMS.

Features Analysis

In terms of its general organization, Argus is similar to that of TMS, EmbARK, Vernon CMS, and KE-EMu since it is centered around the management modules instead of the different types of collections, such as PastPerfect or Re:discovery. However, Argus does not have as many primary tables as the others. In this way there is only one cataloging screen for all different types of objects.

A unique attribute of Argus is its *Pre-accessioning* feature. Specifically, it may be the only one of the databases reviewed here that can automatically renumber an object when its status is changed to be officially accessioned. This may not be a beneficial feature

though for museums which do not use the common numbering system of Year-Transaction Number-Object Number.

An uncommon feature of Argus is its *Related Records* tab. The only other system reviewed here that has a similar feature is KE-EMu's *Grouping Module*. This may be a useful feature for curatorial considerations when developing exhibitions and museums which have collections with very similar objects and want to show their connection in the database. It also appears that KE-EMu's version of this feature may be more developed since it has not just a tab but a whole *module* that is dedicated to this activity and can actually link entire object records together.

Another uncommon feature of Argus mentioned by Museum #38 in the survey is its *Tasks*, *Wizards,* and *Referential Integrity* features. These may be useful for institutions where many different people are involved with updating information in the database. Vernon CMS has similar features called *Diary* and *Procedural Control*. KE-EMu has a Workflow Management feature which is also similar to Argus' *Tasks*. *Tasks* is essentially the same as Vernon's *Diary*, except *Tasks* cannot automatically keep track of standard related costs like *Diary* or enforce compliance with a set of rules established by the museum like *Procedural Control*. The *Referential Integrity* feature in Argus though can make sure that changes are made to all of the necessary parts dependent on each other to prevent anomalies. These shortcomings, however, will not be a problem for institutions that do not wish to use their database for budgeting purposes or enforce an established order of performing tasks through the database.

Advantages

Institutions can choose from several different underlying databases the system will be wrapped around including Oracle, Microsoft SQL Server, or Sybase. This way the database will work on Windows, Macintosh, or Lenox operating systems. If the museum decides to use Sybase, Questor Systems itself can provide the support. This would be an advantage for mid- or small-sized institutions that cannot afford their own database administrator to coordinate the maintenance and support for the underlying database. Of all the systems reviewed here, Argus requires the least amount of processing power and hard-drive space for the workstations and the second least for the server requirements. Despite these relatively low technical requirements, according to Museum #36, Argus is still "powerful when it comes to managing data." This makes it easier for museums that have older computers to run Argus. Considering that Argus is one of the most expensive CMSs, if all optional features are purchased, this benefit may be diminished by the expense of the software itself.

Argus may be one of the most customizable CMSs available. Institutions can create an unlimited number of fields for each record. All of the survey respondents that are Argus users commented on the flexibility and the ability to easily customize the system as well as the variety of functions and features. Museum #38 remarked that Argus has "lots of shortcuts that you might not ever know about simply due to the complexity of the system." Related to this advantage, Museum #36 stated that Argus has the ability to link the appropriate fields to a certain type of collection and that this is its most significant advantage. Likewise, Museum #37 felt that Argus can "handle a wide diversity of objects."

These attributes are beneficial to museums that have a wide variety of collections or objects with special cataloging needs.

Argus received a mixed review from survey respondents concerning its ease of use. Museum #36 responded that Argus is "easy to understand and use" while History Museum #35 stated that it is "very easy to use with previous database experience." However, one museum felt that Argus' "screen layouts are not very user-friendly." Therefore, it appears that Argus will probably be easy to use for a staff of average-users but it may take longer to learn for database novices. Concerning ease of use, History Museum #35 also remarked that Argus is "better than MIMSY but not as good as PastPerfect." One Re:discovery user stated "we are old Argus users so almost anything will be better." User comments on all of the databases reviewed here lead the author to believe that Argus is perhaps not as user-friendly compared to Re:discovery, TMS, EmbARK or PastPerfect and may not be the best choice for institutions with mostly novice database users. In comparison, it does not appear as difficult as Vernon CMS or KE-EMu. Museums with staff that can be considered 'average-users' should not have a problem learning this system.

According to Museum #36 which has a very wide variety of collections, the most important advantage of Argus is that "it can link the appropriate fields to a defined collection type" so that only the necessary fields are visible for a particular object category. This ability is rare for CMSs in which cataloging is not separated according to collection type making it particularly useful for general museums that do not wish to have separate cataloging screens for different types of collections. Likewise, Museum #37 felt that Argus can handle a wide diversity of objects.

An additional minor benefit of Argus is that its *Rights & Reproduction* feature can automatically assign tracking numbers to copyright requests. This will be a useful feature for institutions that frequently receive numerous copyright or reproduction requests.

Disadvantages

Price wise, Argus is about the same as TMS for the basic software alone but the most expensive compared to the other six once all of the optional features are added together with the cost of the underlying database. If a museum does need to add optional features or modules then the cost is about the same as most of the others and this will not be as much of a concern for museums considering purchasing Argus.

Unlike any of the other six CMSs reviewed here, Argus does not have any particular thesaurus built into the system. Although standard lexicons can be imported into the database as a plug-in or manually, this means it will probably not be integrated into the search function as seamlessly as if it were built-in. It may also be difficult for novice computer staff to import a thesaurus without an IT specialist or requesting services from the vendor.

Similar to TMS, EmbARK, and KE-EMu, Argus clients cannot create or modify the report templates on their own without the use of third-party report writer software, like Power Builder or Crystal Reports, which must be purchased separately. According to Museum #37, these report writers are complicated to use for non-technologically savvy individuals.

Two of the four respondents felt that it is difficult to import or export data from the system without help from the vendor which Museum #36 thinks is a "big downside." This

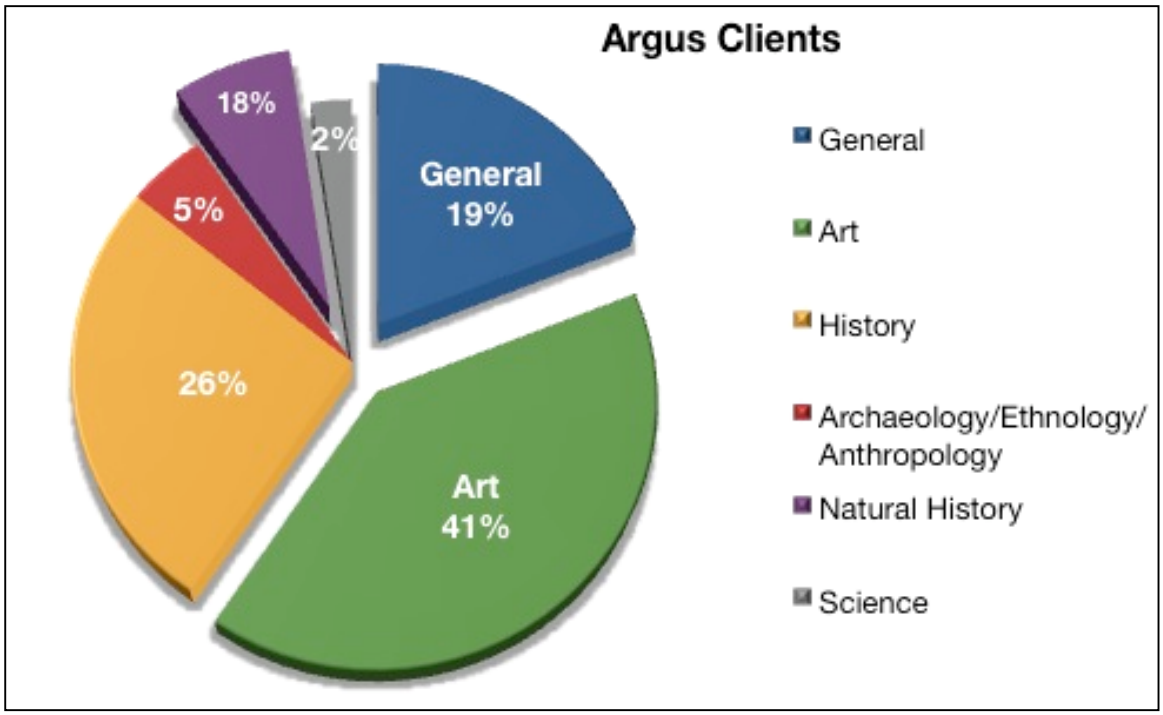
appears to be a somewhat common problem for CMSs in general since respondents that use KE-EMu and TMS also commented on this. Taken into consideration, importation may only be a significant problem when initially entering mass amounts of data into the system from other software programs. In that case, manual data entry may be easier. This option is more time consuming but less costly compared to having the vendor do it. Exportation, on the other hand, may require someone on staff with programming expertise or at least a technologically savvy staff as this usually happens more frequently.

Museum #37 stated that Argus does not have a specific shipping module. However, it does have a transportation feature. This will probably be problematic for museums that have a high frequency of incoming or outgoing loans or temporary deposits. The lack of this feature may not be as much of an issue though for institutions that only occasionally ship objects.

Concerning technical aspects, Museum #38 complained that Argus does not automatically save changes and "tends to shut itself down randomly." Not having the ability to automatically save data can be an annoyance when entering large amounts of data at a time, especially if it does unintentionally shut itself down. No other survey respondents mentioned this flaw so it may only be related to the equipment at this particular museum and not a problem of the database software itself.

Clientele Analysis

Following is a closer look at the percentage of each type of museum that utilize Argus based on the client list on the vendor's website (Questor Systems 2009c).



Argus has the second highest percentage (19%) of general museums, PastPerfect having the most. It also has the second highest percentage (18%) of natural history museums after KE-EMu. This shows that Argus may be a good fit for general or natural history museums. In addition, Argus has a significant amount of art museum clients, 41%, making it the third highest, by percent, of these seven databases following EmbARK and TMS. Therefore, it may fit some of the needs of art museums. Conversely, it has the third *least* percentage of history museums.

Overall Impressions

While Argus may service the second highest percentage of general and natural history museums, PastPerfect is significantly less expensive and, according to the survey respondents, easier to use. KE-EMu or Re:discovery still appear to be a better choice for natural history museums because of their particular features, such as a built-in natural history thesaurus, a natural history specific cataloging module, locality features, KE-EMu's *Taxonomy* feature and Re:discovery's *Find Specimen* feature. Their total costs are also less expensive than Argus. Concerning user friendliness, Argus appears to be less difficult than KE-EMu, but perhaps a bit more difficult than Re:discovery, based on survey respondents' comments. Argus also requires the additional purchase of and specific knowledge of report writer software in order to modify its reports while PastPerfect and Re:discovery have built-in report writers which are easier to use.

Although it has the third highest percentage for art museums, TMS or EmbARK still seem better suited for art collections due to their particular features and TMS's built-in art thesauri. Argus is equipped to handle exhibitions or larger collections than EmbARK but TMS is also just as well suited to these aspects and has a less expensive total cost than Argus. Report-writing has the same amount of difficulty for Argus and TMS since both require special knowledge and third-party report writer software to create or modify reports. It is also not as well suited for handling loans or deposits compared to TMS because of Argus's lack of a shipping module. These three systems are probably about the same regarding their user friendliness.

Argus may be the best suited system for museums that have highly varied collections and unique cataloging needs because it appears to be the most customizable and its ability to link fields with defined collections.

Re:discovery 8.11 (Re:discovery Software)

Features Analysis

Re:discovery is built around its four main cataloging directories (*Cultural Resources, Natural History, Archaeology,* and *Archives*) making it useful for museums with several different types of collections. Three of the seven respondents commented on the usefulness of having different directories for different collections. The only other database reviewed here with a similar overall organization is PastPerfect. Like PastPerfect though, this organization may present a difficult decision for some institutions, especially general museums, in that it forces them to choose a cataloging category when a given object may be thought of as more than one type. Although the categories in Re:discovery are more general. At a significant extra cost, Re:discovery has a distinct *Archaeology Module,* which is rare, while PastPerfect only has a separate tab for archaeological collections as part of the core program. This makes Re:discovery particularly well suited for archaeological collections. However, the *Archaeology* module costs significantly extra, while PastPerfect's archaeology tab is part of its core program.

Re:discovery also has an uncommon *Archives Module* which is similar to PastPerfect's *Archives Module* and is also MARC compatible. Re:discovery has the added benefit of its ability to track circulating materials while PastPerfect does not. This feature

makes Re:discovery beneficial to institutions that have many frequently circulating materials. But like the *Archaeology Module*, these also must be purchased separately and require their own maintenance.

The *Artist/Maker/Figure Associated* feature is unique to Re:discovery and would be useful for museums that have many objects that were once owned or used by famous historical figures at some point in time. This field would be especially beneficial for institutions that often organize exhibitions around these objects since it would be built into the search functions. However, it may be unpractical or unwieldy to store entire biographies or a catalog raisonné in the database as the maker of anthropological collections is often unknown.

Joining PastPerfect and Vernon CMS, Re:discovery is equipped with its own report maker so it is not necessary for museums to purchase third-party report writer software, which is often more difficult to use when creating their own reports. Art Museum MM, for example, stated "It is much easier to produce reports than with TMS that uses Crystal Reports which I found difficult and time consuming. You can build a custom report in a matter of minutes with Re:discovery." The feedback about Re:discovery's built-in report writer is split with two respondents commenting that report writing is easy and two others feel that it is "complex" and "requires huge amounts of training." This shows that the report feature may not be difficult for the average-user but may be difficult to learn for novices. However, unlike PastPerfect and Vernon CMS, the pre-made reports cannot be modified without exporting them to a word processor. Re:discovery included report templates that are required by the National Park Service (NPS) which is convenient for museums under the umbrella of the NPS.

Re:discovery has the most built-in thesauri, six, compared to the other six systems reviewed here covering history, art, natural history, NPS classification terms and is MARC compliant. This allows for a wide variety of lexicons to be integrated with the search and cataloging functions and makes it especially well suited for NPS museums. Few available systems also have built-in natural history lexicons. Therefore, Re:discovery is better equipped to handle natural history collections than TMS, EmbARK, Argus, or Vernon CMS. However, Re:discovery does not come with the commonly used *Union List of Artist Names* or the *Thesaurus of Geographic Names* making it not as particularly well suited to art collections compared to some of the other CMSs, like TMS. It also does not have Library of Congress Subject Headings, like KE-EMu, or necessarily support Dublin Core, or ISO Z39.19 standards like PastPerfect or KE-EMu. Therefore, it may not be the best choice for museums with large archival collections.

One of the primary attributes, and selling points, of Re:discovery is that it is compatible with federal agencies, and is especially used by the NPS. Furthermore, the vendor produces a special version of the software for NPS clients called ANCS+. Museum VN for example complained that, "They give priority to the NPS sites over those of us who are not one of their NPS clients" showing that Re:discovery Software is concerned with NPS clients and standards. While this catering is particularly beneficial to NPS institutions, it may leave other museums feeling neglected. This system also has a rare NAGPRA feature, NPS report templates, and is the only CMS that has NPS classification terms built-in to the system.

Benefits

Re:discovery has several rare features that make it particularly useful for natural history collections. The *Locality Associated* feature is similar to KE-EMu's *Collection Events* and *Locality Maps* features, but combined into one. However, unlike in KE-EMu, Re:discovery's *Locality Associated* only links with objects in the natural history directory. The *Find Specimen* feature will also be advantageous for natural history collections since it allows for searching by scientific names. KE-EMu has a similar feature called *Taxonomy* that allows for not only searching by taxonomic terms but also common names, synonyms, and homonyms. In this sense, Re:discovery has more features related to natural history collections than PastPerfect but those features are not quite as sophisticated as KE-EMu's equivalent features. This will not matter for museums that do not have natural history collections. Re:discovery seems more user-friendly compared to KE-EMu, based on survey respondents' statements, and this factor may counterbalance KE-EMu's greater sophistication for museums that do not have technologically savvy staff. The *Preparation/Treatment* feature is unique to Re:discovery and will be beneficial to museums with natural history specimens that were originally collected in the field when it was common to treat them with poisonous preservatives and insecticides.

The *Maintenan*ce feature is rare and would be convenient for museums that have objects which require frequent routine maintenance, such as demonstration instruments. This is especially useful for historic houses since it can be linked with locations and acts as an electronic cleaning schedule for staff to track and assign regular cleaning tasks.

Re:discovery's searching facilities are unique and provide multiple search options: Google-like word searches, *Quick Search*, *Advanced Search*, Boolean Search, and lexicon

searches. Anthropology Museum #41 commented on how Re:discovery has "Google-like search function searches across all fields, which is incredibly useful" and another respondent claimed "you can search items by exhibit which is very useful when looking for a grouping of objects." The only complaints were about certain aspects from respondents who still use older versions of the software that may have been resolved in the latest release. Re:discovery has similar search options as PastPerfect plus a *Find Specimen* feature for natural history collections, giving it an advantage over PastPerfect worth considering for natural history museums. However, Re:discovery does not have KE-EMu's queries by proximity, ranges, groups, phonetics, or morphology.

Two more rare and related features are *NAGPRA* and *Restrictions*. The only other system that has a repatriation feature is PastPerfect. Re:discovery is the only system covered here that has a *Restrictions* feature. These features would be advantageous for museums that have archaeology and ethnology collections with objects subject to repatriation or have special handling restrictions due to their sacred nature, such as Native American pieces. The ability to add a simple field to any CMS in order to note any restrictions would probably not be difficult and this feature alone would not be a strong advantage over other databases. Creating a repatriation feature, on the other hand, would entail more work and possibly having to ask the vendor for customization.

Four survey respondents commented on Re:discovery's potential for customization. Re:discovery received mostly positive reviews about its ability to allow for customizations. Art Museum #45, for example, tailored the numbering system to fit its needs. Natural History Museum #43 mentioned how fields can be customized for its different disciplines and Anthropology Museum #41 remarked that it can be easily modified for different users'

preferences. However, it appears Re:discovery may have a weak spot concerning customizing lexicons. Anthropology Museum #41 claimed to have had some difficulty with this aspect stating;

> "Our custom lexicon has presented some challenges--we experience odd 'bugs' in the lexicon because the functionality was designed specifically for our use and we populated it with our own terms which was a result of the design of Re:discovery not supporting the kind of functionality we wanted and our expectation that Re:discovery could deliver precisely what we wanted."

Overall, survey respondents seemed very satisfied with Re:discovery's technical support services. For example, Natural History Museum #43 commented that its "Tech help is wonderful and very quick to help you when you are at a loss on how to do something. Usually I get someone right away and get immediate service." The only complaints were that Natural History Museum #43 felt that Re:discovery Software gives priority to NPS sites over other institutions and has taken at least two years to update their clients' systems to the new Proficio version. While this may pose a problem for non-NPS museums, it is an advantage to NPS museums since the NPS is one of Re:discovery's major clients. Although, Anthropology Museum #46 thought that Re:discovery provided "poor technical support for bugs."

Re:discovery received mixed reviews regarding its user friendliness. Five of the eight respondents felt that it is easy to use and navigate and one respondent commented on how she likes the overall layout of the screens. Anthropology Museum #41 stated that Re:discovery's "Windows-like navigation enables easy (both visually and intellectually) movement between directories and modules." However, the same person described how it takes many mouse clicks for basic data entry due to all of the verifying prompts resulting in "excessive clicking." Anthropology Museum #41 also complained that, "Many fields contain

fields within a field that open to show additional content. The concept is great, but in reality, when these fields open, some don't show you enough of the field which requires the user to manually widen the field before data entry." Natural History Museum #40 thought that Re:discovery is "Non-intuitive for non-database savvy catalogers" and Science Museum #39 felt that its "complexity makes it unwieldy." Interestingly, this latter respondent also remarked, "We are old Argus users – so most anything will be better!" Related to this, a few museums also commented on the ease of importing media to the database with two stating that it is simple and one felt it to be a "cumbersome process." It is important to note that some respondents are still using older versions of Re:discovery, which does not look as much like the Windows interface compared to the new Proficio update. The reason for this will be explained later. Overall, it seems that the average user will find Re:discovery easy to understand, especially the Proficio version, while there may be a bit of a learning curve for beginners. Based on user comments of all the systems, it appears that this system may be more user-friendly than Argus, Vernon CMS, and KE-EMu, about the same as TMS, but not quite as easy compared to PastPerfect and EmbARK.

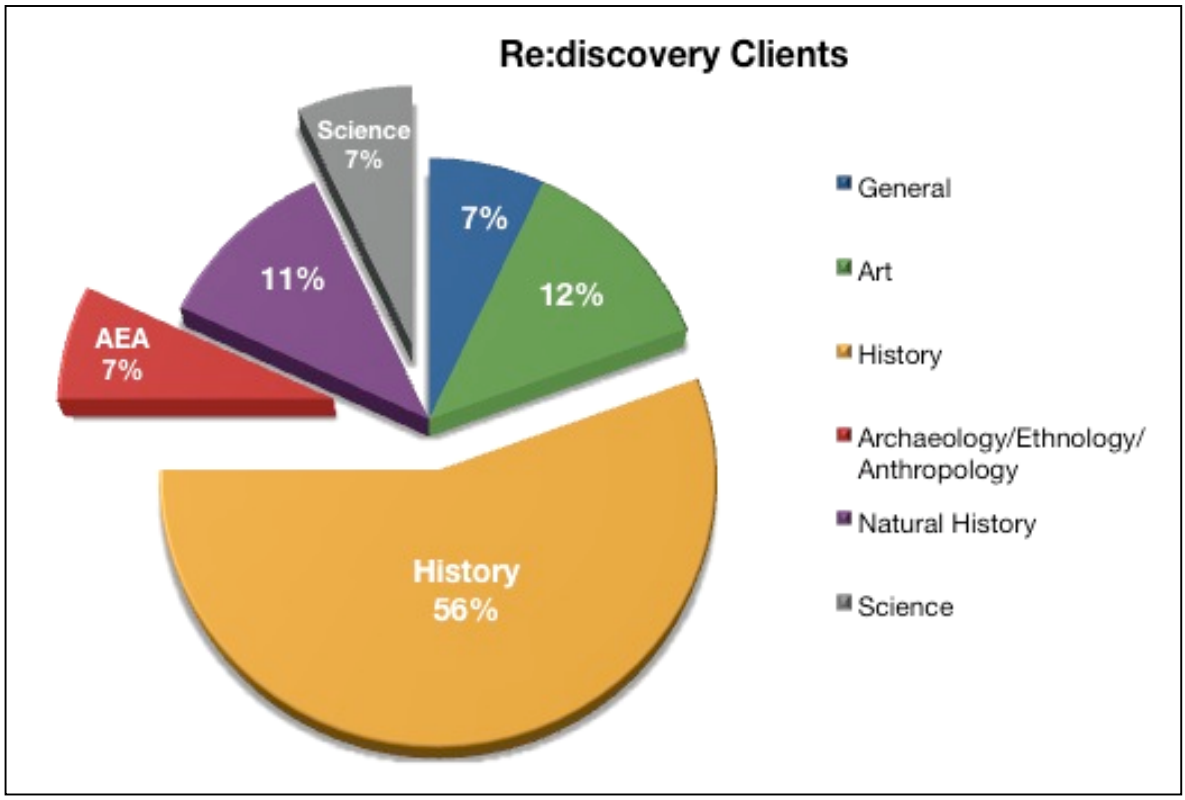
Disadvantages

Two institutions complained about the overall costs of the software and the expense of having to buy any additional modules separately. Out of the seven CMSs reviewed here, Re:discovery is actually not one of the more expensive systems for the basic software but it is the second most expensive system when all additional features are taken into account. Re:discovery is especially expensive for institutions that need to purchase the optional

imaging and structured lexicon features as well as the Archaeology, Archives, Library, or Conservation modules.

Clientele Analysis

Next is a closer look at the breakdown of Re:discovery's clients by percent based on the client list provided on the company's website (Re:discovery Software 2009a).



Re:discovery and TMS have the highest percent of anthropology and archaeology museums (7%) out of the seven systems here. However, Re:discovery has more features specifically designed for archaeology collections, such as its *Archaeology Module* and *NAGPRA* feature. It is interesting to note, as mentioned in the History section, and probably not a coincidence, that Re:discovery Software actually started out as a commission to create a database for Monticello, which has history and archaeology collections

(Re:discovery Software 2009c). This institutional origin is still reflected in Re:discovery's features today. It also has the highest percentage of history and science museums at 56% and 7% respectively. Although Re:discovery only has the third highest percentage of natural history museums at 11%, KE-EMu and Argus being the first and second, it has more features specifically for natural history collections than Argus, such as *Find Specimen* and *Locality Associated*. Re:discovery has the second least amount of art clients at 12%, the first being PastPerfect, and one of the least for general museums at only 7%. Therefore, it seems Re:discovery may not be as well suited for art collections or general museums compared to other CMSs.

Overall Impressions

Overall, it appears that Re:discovery is well suited for archeology, anthropology and natural history collections as well as history and science collections. This is not entirely surprising since archaeology collections have similar attributes as natural history collections since both are excavated and natural history museums often included anthropology collections and history collections due to the common nature of the objects. Re:discovery's natural history features are very similar to Ke-EMu's, specifically its *Find Specimen* and *Locality Associated* features, and both have built-in natural history lexicon. However, Re:discovery has the added benefit of a *Preparation/Treatment* feature and seems to be more user-friendly than KE-EMu based on survey respondents' comments making it more suitable to a non-technologically savvy staff. Although, these particular features can only be linked to natural history collections in Re:discovery while KE-EMu does not appear to have this limitation. However, Re:discovery's *Archaeology* module may

have its own similar features for objects specifically in the archaeology objects directory. The total cost of ownership of Re:discovery is significantly more expensive than KE-EMu, but the price of the basic software is less expensive because many of Re:discovery's modules and features such as the *Archaeology* and *Conservation* modules, lexicon, and multimedia features are sold separately while KE-EMu's basic software package is more inclusive. This may not be a disadvantage though for institutions that only need to purchase the basic software.

Re:discovery's particular features also make it especially well suited for archaeology collections, such as its distinct *Archaeology Module* and *NAGPRA* feature. PastPerfect also has some of these natural history and archaeology features, such as a built-in natural history lexicon and *Repatriation* feature, but they do not appear to be as sophisticated as Re:discovery's features and while Re:discovery has an entire module dedicated to archaeology collections, PastPerfect only has separate tabs. Re:discovery's *Archaeology Module* is not included with the basic software package and costs extra unlike PastPerfect's archaeology tab. This will not be as much of a problem though for museums that do not have large archaeology collections. However, PastPerfect also does not have an equivalent of *Find Specimen* or *Locality Associated* features like Re:discovery. On the other hand, PastPerfect received better reviews from survey respondents than Re:discovery in terms of user friendliness. Therefore, Re:discovery would be well suited for museums with primarily archaeology/ethnology, natural history, or history collections, a staff primarily composed of at least average level computer users and a higher budget. Institutions that have mostly novice database users and very limited financial resource may find that PastPerfect's user friendliness and lower cost outweighs the benefits of Re:discovery's

particular features. The author cannot adequately compare Re:discovery's *Archive* and *Library* modules to PastPerfect's equivalent modules at this time because Re:discovery survey respondents did not comment on these particular features. Future research comparing archival and library features more in-depth, among the different CMSs, would benefit institutions with large archival and object collections since the literature is lacking in this area.

While Re:discovery can be used for art collections, TMS is much better suited for art museums since Re:discovery has many features that are unnecessary for art collections complicating data entry. Re:discovery and TMS appear to be about equal concerning user friendliness based on survey respondents' comments. In addition, the cost of TMS is significantly less when their prices are adjusted to reflect the inclusion of the same features since TMS comes with more features in its basic software package than Re:discovery, such as multimedia, annual support, thesauri, and a user license. Overall, KE-EMu is recommended for museums with natural history collections that have especially large or frequently changing exhibitions, and a technologically savvy staff.

Vernon CMS 5.0.13 (Vernon Systems)

One survey respondent, a history museum, seems to think that Vernon CMS is more geared toward natural history or archaeology collections. Another general museum believes it is more associated with cultural or art collections. Natural history, art, and history collections have different cataloging needs. So let us now more closely examine the features, benefits, disadvantages, and clientele of Vernon CMS to figure out which type of collections Vernon CMS is actually best suited for and which institutional needs it satisfies or falls short on.

Features Analysis

Vernon CMS's overall architecture is built around four primary modules: *Cataloging, Activities*, *Browser*, and *HTML Export*. It is similar to KE-EMu, TMS, EmbARK, and Argus in the sense that the overall architecture is focused more on the life cycle of an object rather than cataloging and there is only one cataloging module for all types of collections. Vernon CMS is most similar to Argus because their databases do not have as many primary tables compared to KE-EMu and TMS. Unlike PastPerfect and Re:discovery, Vernon's Cataloging module does not appear to be broken down into different directories or screens for different types of collections. This organization does not force museums to choose a specific object category, but it also implies that the cataloging fields will not be tailored for different types of objects. Art Museum #32 remarked he liked that "groups of like materials can be nicely linked together" but it is not clear how this can be done in Vernon. Although Vernon offers fields for recording excavation information, it is not as robust as KE-EMu, Re:discovery, or PastPerfect in this respect. Nor does Vernon seem to have Argus'

ability to link specific fields to defined collections. Therefore, Vernon CMS is probably better suited for institutions with relatively homogeneous collections.

Vernon's *Documentation* feature allows information related to archival collections and books to be recorded. Like PastPerfect, its import function supports MARC bibliographical records. In addition, Vernon also allows metadata about photographs and audio-visual materials to be recorded. This combination of features appears to make Vernon satisfactory for archival collections at first glance but PastPerfect actually has entire modules dedicated to archives, photographs and library collections. Three survey respondents for this system commented on how Vernon is not well suited to archival collections. History Museum #28, for example, stated "it is more difficult to use [Vernon] CMS for archives and photographs." Likewise, Art Museum #32 felt "it is not a database which can or should be used for organizing archival collections…" and History Museum #26 thought its "use with a manuscript collection might be tedious." These survey respondents' comments show that perhaps Vernon is not actually that well suited for large archival collections. It does have features designed for archival collections so it may be able to adequately cover small archival collections. This should not be a concern, therefore, for institutions that do not have large archival collections.

The basic software package does not come with any thesauri, but Vernon supports *Chenhall's Nomenclature* and the *Art & Architecture Thesaurus* as optional additional features. This makes Vernon equipped to handle history and art collections. Although, TMS and KE-EMu offer more art thesauri built-into their systems. Vernon does not have a natural history lexicon built-into its system as does PastPerfect, Re:discovery, or KE-EMu.

While other lexicon can be added to Vernon it must be done by the company at possibly some expense.

Vernon's *Activity* module has a *Procedural Control* feature to ensure compliance with user defined sets of rules. This feature is useful for large institutions that often have interns or volunteers performing data entry since it can document all steps taken. Interestingly, one survey respondent stated, "if you are primarily using volunteers, I would suggest staying away from Vernon." This feature would be unnecessary and possibly an annoyance for particularly small institutions where one person performs multiple functions that are ordinarily done by people in several different departments.

Benefits

The *Cataloging* Module in Vernon includes a *Person File*, *Event File,* and *Site File* which makes this CMS useful for history museums. The Person File is similar to Re:discovery's *Artist/Maker/Figure Associated* feature and therefore has the same issues. Vernon's *Person File* is not just meant for recording information about historic figures and artists but acts as the database's address book for contemporary people and organizations as well. This combination of historic and contemporary people within the same feature could potentially lead to confusion, especially when running searches.

Vernon has the unique ability to show users what a specific room or storage location looked like at a certain time period, based on the location information entered into the database. This function is especially useful for museums that have period rooms, during a move, have frequently changing exhibitions, or just frequent object moves. It can also be helpful when performing an inventory. The *Location* feature supports batch updates and

object grouping like KE-EMu, which is beneficial for institutions that store multiple objects in the same container.

This CMS is equipped with a built-in report-writer so that it is not necessary for museums to purchase third-party report-writer software. Like PastPerfect, its report writer can not only be used to create reports, but the report templates that come with the software can be changed without requiring them to be exported to another application. Re:discovery's *Quick Report*, on the other hand, necessitates its built-in templates be exported to a word processor for modification. By allowing users to customize the report templates within Vernon and save them, the user does not have to export them to another application every time a report template that requires modification is generated. This is an advantage for institutions that want to alter any built-in report templates since it can be a significant time saver. Six of ten (60%) survey respondents expressed their satisfaction with Vernon's report-writer. For example, History Museum #27 felt "Reports are so extremely easy to do" and History Museum #28 stated, "[Vernon] CMS can generate great reports on almost anything." The only complaint was about the "difficulty of formatting reports."

The *Diary* feature in Vernon is similar to Argus' Tasks and Wizards, and KE-EMu's *Workflow Management* functions also making it beneficial for larger institutions where the work is more dispersed to keep track of assigned tasks. *Diary* has the added unique benefit of offering museums the opportunity to enter standard costs into the database so that Vernon can automatically keep track of the costs associated with common activities such as shipping, crating, and loan fees.

Vernon's *Activity* module has separate but linked *Exhibitions, Traveling Exhibitions, Loans, Transportation,* and *Entry/Exit* features. This is beneficial for museums that have relatively large or frequently changing exhibitions, or a traveling exhibitions program. Incoming and outgoing loans are treated separately by Vernon similar to PastPerfect, Argus, and Re:discovery. It is uncommon that loans in Vernon are kept separate from other reasons an object may enter or exit the museum. This may be useful for institutions that frequently receive temporary deposits. The only other CMS in this study that also has a separate feature for temporary deposits is PastPerfect.

The *Web Browser* module has several unique features. Users can design tours of collection highlights and generate a list of pieces on exhibit. Vernon also allows virtual visitors to view search results in multiple ways and save their search results. These features are not as sophisticated as KE-EMu's *Narratives* module which encourages museums to add interpretations to their online collections.

Seven of ten (70%) survey respondents expressed their satisfaction with Vernon Systems' technical support services. Art Museum #33, for instance, remarked "the Vernon staff have consistently provided great service throughout the years" and History Museum #26 felt "Technical support is very good at answering any questions and working with your IT department." This same respondent also commented that because the vendor is located in New Zealand there is a time delay for getting a problem fixed. According to another respondent Vernon Systems now offers 24/7 technical support. Furthermore, History Museum #27 stated "don't just eliminate a system because it isn't located in the same country."

A minor unique feature of Vernon is that it has variable length and multi-value fields. In this regard, the system offers the flexibility of allowing all necessary data or even entire reports to be entered within a field without having to worry about running out of space. If there is no data in a field it contracts for a cleaner interface. It also allows for multiple entries to be made within a field so all related information can be included in the database when a situation warrants it.

Disadvantages

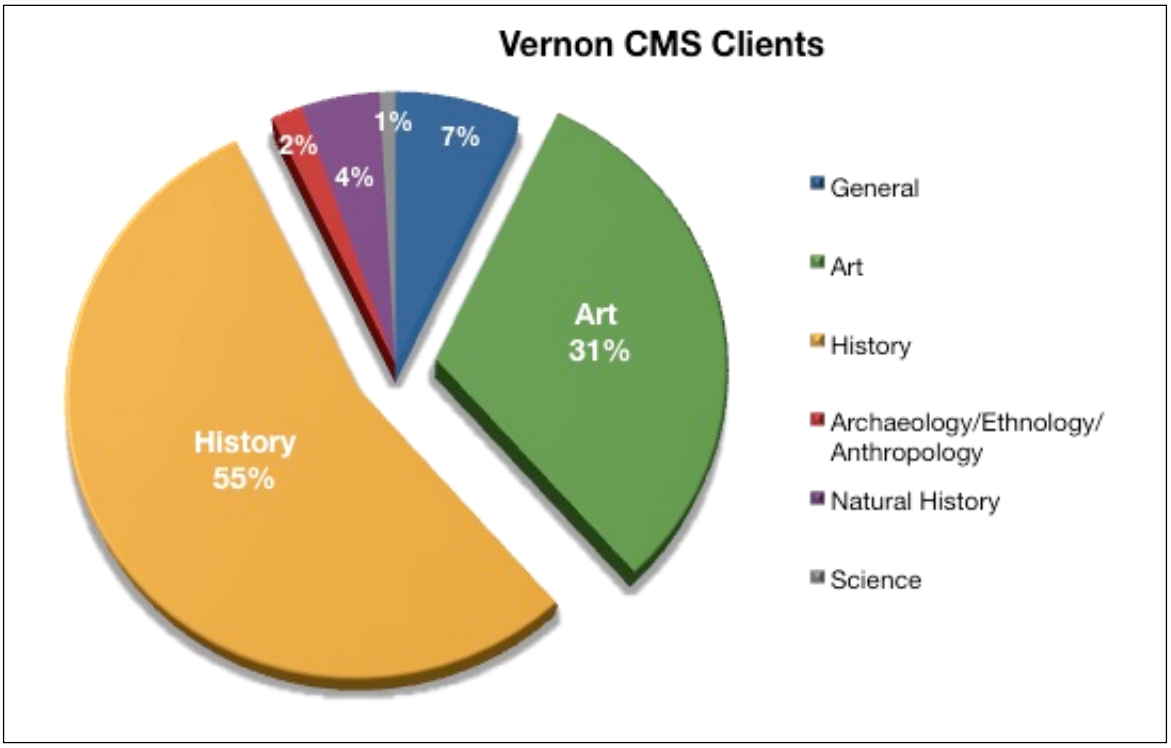
Vernon CMS is one of the less user-friendly systems in the study but is probably not as difficult to learn as KE-EMu. Only half of survey respondents felt that Vernon is easy to use or user-friendly. Whereas Art Museum #33 thinks that it is "fairly simple to learn," others felt it was "not overly user-friendly," and "complicated to learn." Furthermore, Art Museum #32 commented that people who are not comfortable using computers "…have had trouble learning the system." History Museum #26 advised, "if you are using primarily volunteers I would suggest staying away from Vernon but if your volunteers are pretty computer savvy they will get the hang of it." This respondent also felt "PastPerfect is easier to navigate and understand." Furthermore, Institution #67 complained, "learning the system beyond basic cataloging functions is difficult and requires training." Therefore, this system is recommended for museums that have relatively technologically savvy staff or at least primarily average-users.

Two survey respondents complained, "the software and the support fees are pricey." Indeed, of the systems reviewed in this study, Vernon CMS is actually the second most expensive for the basic software following KE-EMu. This is because each module needs to

be purchased separately and the basic software only includes the *Cataloging* module. For the total cost, Vernon is the third most expensive compared to the other six CMSs reviewed here.

Clientele Analysis

Following is a closer examination of the types of museums that use Vernon CMS. The chart below is based on the client list on the software company's website (Vernon Systems 2009a).



At 55% Vernon CMS is only slightly behind Re:discovery in terms of percent of history museum clients but has a higher percent than PastPerfect. It does not have a special cataloging screen or directory for history collections like either of these systems, nor is it as user-friendly. Although, its exhibitions-related features are more robust than Re:discovery's or PastPerfect. Whereas Vernon's total cost is much higher compared to

PastPerfect, it is a little less expensive than Re:discovery's total cost. Vernon CMS also serves a significant amount of art museums with 31% art clients. However, it is only ahead of Re:discovery and PastPerfect in this area. EmbARK or TMS would probably still be the better choice for art museums with TMS's built-in art thesauri and just as robust exhibitions-related modules, their significantly lower total cost, and either of them are more user-friendly.

Overall Impressions

Vernon CMS is probably well suited for history museums that would need a robust system to handle large exhibitions or frequently changing exhibitions with a relatively technologically savvy staff. Although, Vernon has more robust exhibitions-related features, less technologically savvy staff may feel more comfortable using the much more user-friendly PastPerfect or Re:discovery. Vernon CMS's more sophisticated exhibitions features may not be enough to outweigh the time needed to learn the system for a less computer savvy staff or its expense. This system may not be very well suited for institutions with widely varying collections compared to PastPerfect or Re:discovery. Several survey respondents complained about their dissatisfaction with Vernon's archival features showing that it is probably not very well suited to museums that have large archival collections. PastPerfect survey respondents were just as disappointed with its *Archives* module.

One survey respondent thought that Vernon CMS seems geared toward natural history or archaeology collections. The author disagrees with this statement. This system does not appear to have any features designed particularly with these types of collections

in mind. For instance, it does not have a built-in natural history lexicon, the equivalent of KE-EMu's *Taxonomy* or *Locality Maps* feature, Re:discovery's *Find Specimen, Preparation/Treatment* features, or PastPerfect's *Repatriation feature*. Vernon's *Sites File* is similar to Re:discovery's *Locality Associated* feature though. Nor does Vernon CMS have a special screen, directory, or module for natural history or archaeology collections like PastPerfect, Re:discovery, or KE-EMu. While Vernon could handle art collections, it is not quite as well suited to them compared to TMS or Argus and it is less user-friendly.

KE-EMu 4.0.01 (KE Software)

Features Analysis

With respect to the overall organization of the system, KE-EMu is similar to TMS, EmbARK, Argus, and Vernon CMS in that its primary modules are management activities instead of being based on the type of collection. Although EMu has only one cataloging module, it is broken down hierarchically according to discipline in a way similar to Re:discovery and PastPerfect making it useful for institutions with diversified collections. As mentioned previously in the PastPerfect and Re:discovery sections, this may be problematic for general museums in that it forces them to choose a specific cataloging category for objects when they may be looked at in an interdisciplinary manner. While this characteristic is useful for museums with several different types of collections, it may become unwieldy for those with more homogeneous collections. Unlike Re:discovery, the archaeology portion of the *Cataloging* module is included in EMu's basic software package and does not cost any extra but the Natural History version of EMu is more expensive.

Re:discovery has a separate module dedicated to archaeology collections while EMu's archaeology cataloging is just a part of its Cultural History *Cataloging* module. EMu will only display the associated fields with a discipline so users do not have to view unnecessary fields, like Argus. Museum #48 liked the fact that EMu has the "ability to hide tabs in the *Catalog* module that are not needed for specific collections."

EMu includes a number of built-in art related thesauri and is the only one that has the *Union List of Artist Names* as well as supports Library of Congress Subheadings and ISO Z39.19 standards. However, it does not appear to have Chenhall's Nomenclature built into the system making it not particularly well suited to history collections. Although EMu has the *Union List of Artist Names* built into its system, unlike TMS, it has many features that are unnecessary for art collections which may only serve to complicate data entry, especially for museums that collect only art. While one may think this system is well suited for institutions with archival collections because it supports the Library of Congress Subheadings and ISO Z39.19, Art Museum #51 complained that it is "unable to effectively manage and integrate archive and library information." There were also a number of complaints about PastPerfect's *Archives* module and Vernon CMS's archives features showing that none of the systems in this study appear particularly well suited to handle both objects and archival collections.

EMu has several uncommon features that make it well suited for natural history collections: *Collection Events, Taxonomy*, and *Locality Maps*. Museum #48 commented on how she liked that EMu "Records specifics related to expeditions or field work," (*Collect Events*), "Enables full and GIS recording of archaeology and paleontological site information" (*Locality Maps*), and that "scientific objects have fields for associated

taxonomies" (*Taxonomy*). Re:discovery has very similar features, as previously discussed in the Re:discovery section, such as *Find Specimen* and *Locality Associated* but they can only be linked with objects in the Natural History *Cataloging* module while EMu does not have this limitation. The *Collection Events* and *Locality Maps* features also make EMu particularly useful for archeology collections, which have some similar cataloging needs as natural history collections in terms of recording information about their excavation and original location. While PastPerfect has a cataloging tab for natural history collections, it lacks many of the features mentioned here that make EMu particularly well suited for natural history collections. These features seem to be more robust than Re:discovery's equivalent features, but this also makes EMu more complicated to learn as we will explore more later.

As previously mentioned, EMu has separate but linked *Loans, Shipment*, and *Events*/*Exhibitions* modules similar to TMS's. This uncommon characteristic also makes EMu well equipped to handle especially large exhibitions or frequent exhibition turn-overs. EMu's incoming and outgoing loans are also under the same Loans module like TMS. Unlike TMS, EMu's *Exhibitions* and *Events* components are combined under the same module. This could potentially lead to confusion concerning non-exhibition related events organized by departments other than Registration or Exhibitions that use the database for their own purposes.

EMu also has a function like TMS's so that entire records can be duplicated to save on repetitive typing when generating similar records. This feature is useful for cataloging groups of the same types of natural history specimens. This system has validation constraints for confirmation during data entry like Re:discovery. This is beneficial for

institutions that often have volunteers or interns performing data entry to ensure consistency and accuracy but it slows down the process, as one respondent complained about this attribute for Re:discovery.

Benefits

Since KE Software created its own database, Texpress, and it is included in the basic software, it also provides the technical support for it. For TMS, Argus, and Re:discovery, on the other hand, the underlying database must be purchased separately, and therefore, the vendor does not provide the support for it. While Texpress is not well known compared to Oracle or Microsoft SQL, survey respondents gave it positive reviews. Art Museum #53 stated that the database is stable and has an "elegant" design. Art Museum #51 also thought that it is stable and has a "beautiful database backend and design." Although, according to this respondent it is "not set up for Unicode, making different scripts impossible." Unicode is what allows characters to be translated into the alphabet sets of different languages. This could be a problem for institutions that have archival collections or objects with titles or names in a non Latin-based language.

EMu's *Accessioning* feature has the rare ability to automatically assign accession numbers, like Argus, and the unique capability of creating a summary of an accession lot. This makes it convenient for institutions with vastly growing collections to keep track of the assigning accession numbers.

This system has the uncommon capability of being able to support both fixed and movable collections so that objects housed in movable locations, such as a box or other container, can be grouped together for the purpose of tracking their location. This way

their locations can be changed in a batch update preventing repetitive data entry. This function is very useful for natural history or archaeology objects since multiple pieces, such a bones or pottery sherds, are often combined into a single movable container. Vernon CMS's *Location* feature has similar abilities.

EMu's *Grouping* Module is similar to Argus' *Related Records* feature in that users can link object records according to their preferences. In this way object records that are part of the same collection or are similar intellectually can be viewed together which is useful for any type of collection. Interestingly though, Historical Society #52 complained that EMu is "not geared toward materials managed as collections, rather than discrete items." However, most CMSs, except for EmbARK, are geared toward cataloging objects as individual pieces and not as collections.

EMu's *System Information, Workflow Management*, and *Statistics* module are beneficial to especially large museums since they can track how the database itself is being used and by whom. The *Workflow Management* feature is similar to Argus' *Tasks* and *Wizards* and Vernon CMS' *Diary* features. This is the only CMS in this study that has a *Statistics* module to automatically generate statistics about the museum's use of the system. While these features may be useful for large institutions, they are probably unnecessary for small museums.

The *Object Locator* feature is also unique to EMu, or at least no other system reviewed here has it. It is especially helpful for designing exhibitions and disaster recovery plans in physically large institutions. Although, larger museums are often more compartmentalized and different departments sometimes use separate databases.

EMu is quite possibly the only CMS that has a *Narratives Module* allowing for more description and interpretation to be included with a museum's online collection for virtual visitors. Lack of interpretation with online collections is a frequent criticism of museums and this feature helps to alleviate this problem and enhances visitor outreach initiatives. The *KE-Portal* feature has the unique attribute of offering KE clients an opportunity to share its collections online with other museums that use KE-EMu software and the public. This characteristic is beneficial for facilitating inter-museum collections-based research and can help museums find loans for their exhibitions, thus promoting the circulation of cultural material.

Four of seven (57%) survey respondents for EMu reported their satisfaction with KE-Software's technical support services. Historical Society #52, for example, stated "KE staff is very passionate about their products and keen on working with customizers to achieve their objectives" and Art Museum #51 felt that KE Software has "really responsive and helpful staff." The only complaint regarding KE Software's technical support was from one historical society that thought "KE could do better in the training department and showing people exactly what needs to be done to transfer data from their old program to EMu" and "there are ways to export information… but training is not offered." Along these lines, Anthropology Museum #49 complained, "data is not easily exportable." This seems to be a common issue with most of the CMSs in this study.

Disadvantages

EMu appears to be the least user-friendly system in comparison to the other six reviewed in this study. Only two of seven (29%) of survey respondents felt that EMu is

easy to use. Five of seven (71%) respondents, on the other hand, had complaints about the user friendliness of this system. Anthropology Museum #49, for example, thought EMu has a "stiff learning curve" and is "not intuitive." Likewise, Museum #48 remarked, "data entry can be somewhat overwhelming to new users because of the number of modules" and Historical Society #50 commented, "a good deal of staff training and daily use is required to become both timely and proficient in using EMu as a database for permanent collections information and media." In addition, two respondents called it "cumbersome." Other complaints concerned specific aspects of the database. Museum #48 mentioned that tabs in the *Catalogue* module will only appear if there is data in them which has caused confusion and Historical Society #50 stated "not all of the fields are intuitive as far as how to enter information or cross reference data, especially where the *Parties* and *Catalog* modules are concerned." KE-EMu requires the use of Crystal Reports to create or modify reports in the database, like TMS and Argus. As previously mentioned in the TMS section, Crystal Reports is not user-friendly and requires knowledge of SQL programming to be efficient. It is imperative to realize that the issues mentioned by these respondents may not actually be problematic for institutions primarily composed of a relatively technologically savvy staff.

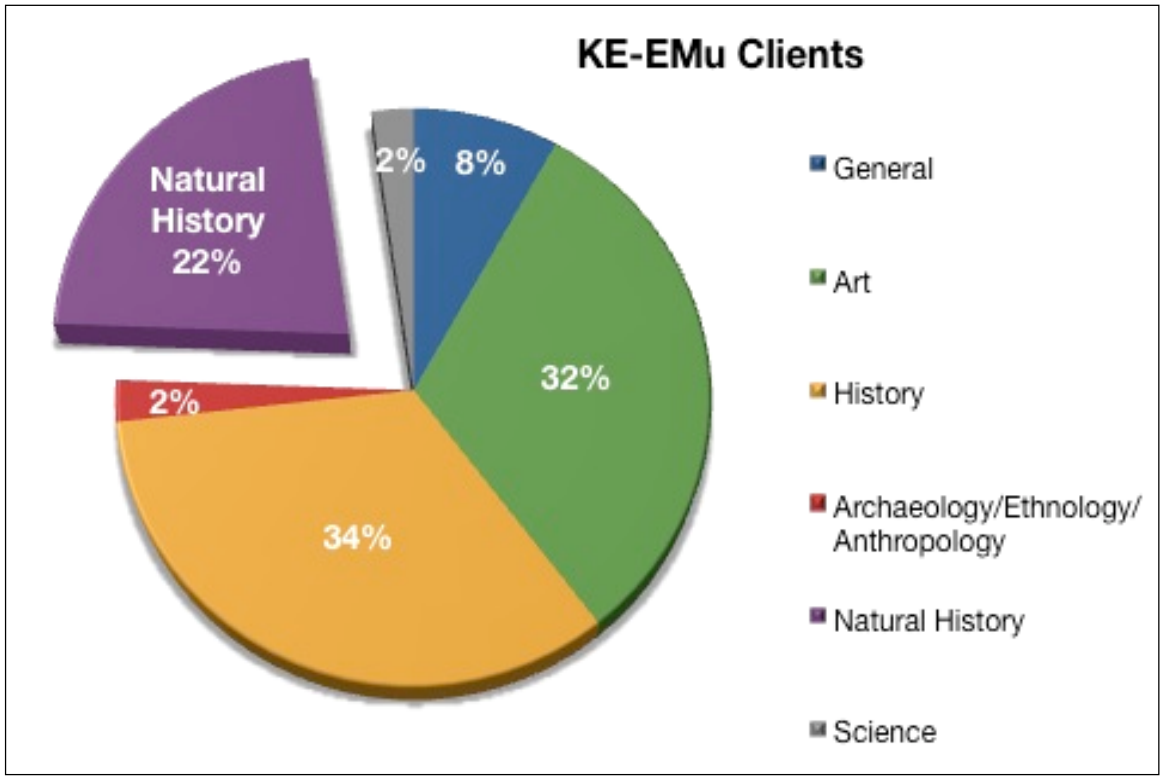
The customization of EMu received mixed reviews from survey respondents. Historical Society #50 commented "it can be customized with respect to its cataloging module design" but complained that "once a screen (called tabs) is set, there is no way you can modify it. It has to be done through KE, possibly at some expense." Anthropology Museum #49 also felt that EMu is "not customizable to any great degree by the customer." Another EMu client, on the other hand, thought it is "easily customizable with help from KE

staff." This shows that while EMu offers some degree of flexibility and customization, it may be difficult to do without technical support from the software company.

Finally, one of the basic disadvantages of EMu is the initial expense of purchasing the software. Historical Society #50, for example, complained, "the cost of the program is considerable and additional user licenses are expensive." Luckily, the price of licenses for EMu are tiered so that the cost of individual licenses decreases the more licenses are purchased, according to the author's personal communication with the vendor. Indeed, KE-EMu is actually the most expensive system for the core program. However, the total cost of ownership is the third least expensive because the basic software includes all of the features, except the *KE Portal.* The expensiveness of the basic software may be a disadvantage to institutions that do not need all of the 'bells and whistles' of a CMS, but since it is inclusive of so many features, it is beneficial to museums that would purchase all available features.

Clientele Analysis

Below is a chart showing a breakdown of the different types of institutions that use KE-EMu by percent based on the client list provided on the vendor's website (KE Software 2009f).



At 22%, KE-EMu has the greatest percentage of natural history clients compared to all of the systems reviewed here. While Argus comes close at 18%, EMu has far more features designed specifically with natural history collections in mind, such as *Taxonomy, Locality Maps,* and *Collections Events*. Although EMu has only 2% archaeology/anthropology museums as clients, the features that make it well suited for natural history collections are also quite useful for archaeology collections. EMu does not appear to have a repatriation feature like Re:discovery or PastPerfect which would be highly beneficial for archaeology collections. EMu also has a significant amount of art and history institutions as clients at 32% and 34%, respectively; but other systems have a much greater percentage of these types of museums and features more suited to them.

Overall Impressions

KE-EMu is clearly one of the best systems for natural history collections. Not only does it have a number of features for natural history collections, it also has the most natural history clients by percent of the CMSs in this study. Although PastPerfect has a natural history screen in its *Objects* cataloging module, it does not have features equivalent to EMu's *Taxonomy, Locality Map,* and *Collection Events* features. PastPerfect is a great deal less expensive and much more user-friendly though.

EMu has several similar features in common with Re:discovery such as its *Find Specimen* and *Locality Associated* features but they are more sophisticated and robust. Its *Locality Associated* and *Collection Events* features are not limited to any particular type of collection, while Re:discovery's equivalent features are limited to the natural history directory. Natural history museums often have archaeology collections, and it seems EMu is the best equipped to handle both of these types of collections within the same database. EMu does not appear to have the equivalent of a *NAGPRA* feature like Re:discovery or a special *Archaeology* module, making Re:discovery perhaps still the better choice for archaeology museums. This lack of a repatriation feature may be inconvenient for museums with Native American objects subject to repatriation. Nor does EMu appear to have an equivalent of Re:discovery's *Preparation/Treatment* feature, but this type of information could be recorded in the *Conservation* section and alone does not warrant eliminating EMu from consideration for natural history museums. EMu also appears better equipped to handle large exhibitions compared to either PastPerfect or Re:discovery and is centered around management modules as opposed to cataloging modules. This

database also has the added advantages of its unique *Narratives* and *Statistics* modules and web portal uniting collections across different museums that use the *KE Portal*.

This system is less user-friendly than PastPerfect or Re:discovery and would probably be frustrating for non technologically savvy staff to learn. In short, EMu is only recommended for institutions with staff that are predominantly average users and preferably a relatively technologically savvy staff. The core program of Re:discovery is less expensive, but once other costs are considered EMu can provide a better return on investment. This will be an advantage for institutions that want to purchase all the 'bells and whistles.'

Whereas KE-EMu and TMS have several characteristics in common such as their overall structure and robust *Exhibitions*, *Loans,* and *Shipping* modules; EMu is more geared toward natural history collections and can probably handle a wider diversity of objects. TMS, on the other hand, is better suited for art or relatively homogeneous collections due to the nature of their cataloging modules. EMu is also more expensive and less user-friendly than TMS.

V. BEST PRACTICES

Collections management practices have evolved over the past 50 years and continues to change to keep museums accountable to the public trust to the best of their abilities. They have gone from paper and pencil and the minds of the staff, to hierarchal databases run on bulky mainframes, to the generic relational database, and now sophisticated collections management systems that can even track exhibitions run on PCs and servers all in the attempt to meet industry standards and public expectations of making collections information readily available.

However, even now there is still much room for improvement. There still seems to be a general lack of a satisfactory system to catalog both objects and large archival collections within the same database and to meet the needs of museum-library hybrids. Now there is the additional challenge of cataloging and electronically storing born-digital art collections that are meant to be interactive and constantly changing.

When considering a collections management-specific database for either a new institution or reevaluating your present database requirements, all due diligence should be given to the various strengths and weaknesses to each of the generally available software products in relation to your museum's collection, the historical development of the software as well as the technical abilities of the institution's staff. The total cost of ownership and any optional add-on modules or features also needs to be considered since some core software packages are more inclusive than others. It is recommended that museums first request a trial version of the software from the vendors of the systems under consideration before making a final decision.

One must also keep in mind when selecting a collections management system that a few of the software products were originally developed as a commission for a specific museum's cataloging needs. Nearly all software companies advertise that their system can be used for any type of collection. While this is somewhat true, they are actually geared more toward certain types of collections in comparison to others. As in most cases the perfect software product is nearly nonexistent since every institution has a different combination of needs and what they consider unacceptable flaws. But with properly prioritized requirements, institutions should be able to find the best fit for their particular needs.

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Appendix A – Original Questionnaire

Dear RCAAM Listserv,

I am a graduate student in Seton Hall University's Museum Professions program conducting a preliminary survey on collections management databases for my thesis work on why museums choose certain collections management databases, the pros and cons of a few of the most popular databases, what types of collections they are best suited for, user friendliness, cost comparison.... ect. I will use the results of this survey for case studies and may ask a few respondents for further information on their particular collections management database. If your museum uses a general database (or is planning to switch to collections management specific software), please respond if you like since this will still provide useful information for me. All responses will be kept anonymous.

Please respond off the Listserv. If you would like to know the results of the survey feel free to e-mail me.

Name of Museum (please include department if different departments use different databases):

Collections Management Database (example: The Museum System, Past Perfect, FileMaker):

How long has your museum used your current database?:

How long have you personally used this particular database?:

Types of Collections in museum or department (list all that applies):

Approximate Size of Collection in museum or department:

General Database Pros:

General Database Cons:

Thank you for your time and cooperation,
Elana Carpinone

Appendix B – Hardware Requirements

The system hardware requirements have been included because it may be an important consideration for museums that have older computers. More information can be found on the individual vendors' websites. The system requirements are the same for all software packages except where noted.

The minimum workstation requirements are:

- 300MHz processer for Argus, 500MHz for TMS, 600MHz for Re:discovery Vernon CMS and KE-EMu, 1 GHz for PastPerfect, 2GHz for EmbARK.
- 512MB RAM or 2GB RAM for Windows Vista, 256 MB for EmbARK, 128MB for KE-EMu.
- Hard-drive space for software: 50MB for Argus, 140MB for PastPerfect, 200MB for EmbARK, 300MB for TMS, 500MB for Re:discovery, 10GB for Vernon CMS

The minimum server requirements for most systems that will have more than one user are:

- 2GHz Processor, 300MHz for Argus, 500MHz for every 5-10 concurrent users for KE-EMu.
- 1GB RAM for PastPerfect and TMS, 100MB per user for KE-EMu, 128MB for Argus, 512MB for Re:discovery and Vernon CMS, 2GB RAM for EmbARK
- The amount of storage space required depends on the number of records and images.
- Supported database server.

Appendix C – Features Matrix

Key

Does not appear to have feature = ☐
Feature costs extra = *
Performs feature lower than average = ○
Unique Feature = ★

Has feature = ✓
Performs feature better than most = ●
Feature has average performance = ⭘
Cost: Low = $ Medium = $$ High = $$$

	PastPerfect	TMS	EmbARK	Argus	Re:discovery	Vernon CMS	KE-EMu
Object Cataloging	✓	✓	✓	✓	✓	✓	✓
Separate Cataloging Screens	✓				✓		✓
Special Archives Cataloging	✓				✓*	✓	✓
Special Library Cataloging	✓				✓	✓	
Photographs/ Audio-visual Cataloging	✓			✓		✓	
Chenhall's Nomenclature	✓		✓*		✓*	✓*	
Art & Architecture Thesaurus	✓	✓	✓*		✓*	✓*	✓
Thesaurus of Geographic Names		✓					✓
Union List of Artist Names							★
Natural History Lexicon	✓				✓*		✓
Taxonomy					✓		✓
Dublin Core Compatible	✓						✓
MARC Compatible	✓				✓		
ISO Z39.19 Compatible							★

	PastPerfect	TMS	EmbARK	Argus	Re:discovery	Vernon CMS	KE-EMu
Locality Associated					✓	✓	✓
Person Associated/ Biography	✓	✓			✓	✓	✓
Historical Events Associated						★	
Excavation Data	✓				✓		✓
Location in Museum	○	⊙	⊙	⊙	⊙	●	●
Grouping				✓			✓
Accessioning/ Deaccessioning	⊙	⊙	⊙	●	⊙	⊙	●
Multimedia	●*	⊙	●	●*	⊙*	⊙	●
Media Circulation		✓	✓				
Search	⊙	⊙	⊙	⊙	●	⊙	●
Condition/ Conservation	●	⊙	⊙	⊙*	●*	○	●
Contacts	✓	✓			✓	✓	✓
Insurance	○	●	○	⊙	○	⊙	⊙
Reports	⊙	✓*	⊙	✓*	✓	●	✓*
Repatriation	✓				✓		
Bibliography		✓					✓
Copyright	✓	✓	✓	●	✓	✓	✓
Security	✓	✓	✓	✓	✓	●	✓
Barcoding	✓*	✓*		✓*	✓*	✓	✓
Import/Export Data	✓	✓	✓	✓	✓	✓	✓
Customization	○	⊙	⊙	●	⊙	⊙	⊙
Loans (Together or Separate)	S	T	T ○	S	S	S	T
Temporary Custody	✓					✓	

	PastPerfect	TMS	EmbARK	Argus	Re:discovery	Vernon CMS	KE-EMu
Exhibitions	⭘	●	○	●	⭘	●	●
Shipping	○	✓	○	✓	○	✓	✓
Events		✓					✓
Fundraising	★						
Multiple Sites		✓		✓			
Tasks				✓		✓	✓
Procedural Control						★	
Web Kiosk		✓*	✓*	✓*			
Web Portal	✓*	✓*	✓*	✓*	✓*	✓*	✓*
Narratives Module							★
Statistics about Database Usage						✓	✓
Total Cost	$	$$	$	$$$	$$$	$$	$$

Appendix D - Survey Results

Database	Pros	Cons	Other Comments	Museum/ Collection Size
Past Perfect	easy to learn for even not tech savy people	Windows updates sometimes messes up software	We are pretty happy with PastPerfect	Instiution #1
	easy to use	random errors		200,000
	company tech support is very helpful			
	affordable			
	easy to run reports			
	easy to research			
	ability to gather data from other comps			
	scatter/gather feature is useful with different sites			
	user friendly		I LOVE PastPerfect	History Center #2
	great report print-outs			30,000
	Inital price	slow network speed		Historical Socoiety #3
	support costs	Not designed for large archives		180,000
	upgrade prices are resonable			
	very user friendly			
	Contains all the fields we need as a general history museum.			
	easy to edit	search can sometimes be difficult and doesn't allow for ease of use many times		History Museum #4
	easy to teach			15,000
	Loading of pictures and data			
	Reasonable price		first designed for history museums	Art Museum #5
	efficient		For the price it may be the best.	8,000
	easy to use			
	great support			
	very user-friendly			
	Inexpensive	Reports and Research are complicated		History Museum #6
	Easy to use	Not all types of collections are covered well		120,000
	Great customer service			
	Excellent response to improvements			
	Ease of use	Requires frequent indexing and backing up otherwise it likes to shut down		History Museum #7
	Good for history collections			5,000

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	specific catalog needs		It's like Prego … "it's in there", everything from soup to nuts for a small museum	History Museum #8
	search capabilities			5,000
	ability to design or redesign a form or report			
	membership and contact records and cross referencing to catalog items			
	campaign records			
	security levels			
	compatibility with Excel			
	capability to perform email "blasts"			
	Patient and gracious support team with good response turnaround			
	Easy to use	Image manipulation is limited		Museum #9
	lots of pictures can be uploaded	lexicon is limited though can be manually added to		95,000
	easy way to make general forms	would benefit from an "alarm" for items that come due		
	useful for exhibit planning			
	addresses multi-format collections	some of the general design/placement of datafields isn't the best choice and has caused confusion	if it isn't being used the way it was designed, it isn't the right db for the institution	Historical Society #10
	affordability			10,000
	eventual online access			
	easy to use user's manual			
	more fields than we could ever use		much more manageable than TMS and better-suited to our small institution	History Musuem #11
	links up with Virtual Exhibit			1,000
	Very affordable			University Museum #12
	does the same type of workflow processes as other collections management systems			30,000
	includes imaging			
	allows for web based access to records			
	company listens to suggestions for changes and occasionally makes these changes			
	Updates are free and downloadable			
	Very intuitive			
	helpful tech support			
	the easiest database for our student workers	no object movement function! that works like the loan and exhibit tabs for groups of objects		University Museum #13 6,000

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	User friendly	Fields aren't customizable		History Museum #14
	nice looking screens	It tries to cover a lot of different types of collections, so it's not that well suited to any of them		20,000
	ability to link multiple photos and audiovisual clips to records	Reports are clunky		
	Fairly easy to get database online			
	Fits the majority of our needs as a history museum	Archives section does not meet our needs	Overall, we are happy with PastPerfect.	History Museum #15
	Easy to use	Cannot do query searches on Loans or Temporary Custody		15,000
	Inexpensive	Have to customize or create certain reports to meet collections needs		
	Good tech support	Can't use Temporary Custody portion because of how we number incoming donations as PastPerfect only allows sequential numbering		
	PastPerfect Online	Loan records not in alpha/numeric order		
	Keep track of membership and donations			
	Easy to use		my archivist doesn't love it	Museum #16
	easy to learn			49,700
	Easy to correct mistakes			
	Easy to use for data entry and queries	The Archives catalog is geared to collections on the fonds level and many materials need to be treated on an item level		Museum #17
	Integrated donor, accession and loan catalogs	Archives catalog slightly cumbersome to use for individual document records		100,000
	Flexible location coding and flagging for temporary locations, loans and exhibits			
	Exhibit tracking with internal artifact lists, photographs			
	Easy to modify the Lexicon – uses Chenhall's Nomenclature			
	Able to set user access to different levels and control data entry			
	Great tech support, will modify and create custom modules			
	Easy to input data			History Museum #18
	good images with records			15,000
	reports were simple and logical			
	Support was AWESOME - friendly, helpful, and quick to return calls.			
	much easier to use than FileMaker		need IT person on staff for TMS	Arts Center #19
	works well if you have a limited budget for software and no IT person on staff			

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	easy import from access			History Museum #20
	support is good, fast and cheap			20,000
	REALLY receptive to suggestions for new features			
	love the image management feature as it ties in w/ the ease of cataloging and researching		essentially is an all-in-one museum system	Institution #21
	very user friendly and easy to implement (above)			
	offers easy cropping of images to create derivatives for use with the People Bios for genealogy searchers			
	integrated membership contacts and fundraising features tied to the collections			
	fair amount of flexibility for reports	not as customizable as you can potentially have with something like KeEmu	not necessarily just for small collections.	Museum #22
	custom fields		We had PastPerfect convert our Access records and that went well.	48,000
	good and affordable tech support			
	affordable		This program is a true gem in my book.	Institution #23
	good tech support			
	easy to learn			
	very cost effective			Museum #24
	intuitive to use			12,000
		I think you might be surprised by what other systems can do, much more elegantly than PastPerfect. Yes, these things can be done but it is very clunky.	Past Perfect is extremely good for what it is….a system designed for small collections, small museums or collections that do not require the management of complex data.	History Museum #25
		Vocabulary control is present but rudimentary.	Nomenclature and other lexicons should be the least of one's concerns when evaluating CMS. Every commercial CMS available accommodates standard lexicons, but they differ in how much control you can exercise over the way data entry people input the data.	
			The CMS you choose must fit YOUR needs. You will be most pleased with your choice if you sit down and assess what data you collect and what procedures you need to automate. THEN find a CMS that does most of those things.	
			So do your own homework. Critically evaluate how you use and manage and assign data. Then find the system that does it best for you.	

Database	Pros	Cons	Other Comments	Museum/ Collection Size
Vernon CMS	works with citrix	IT is in New Zealand, time difference causes delay in getting problem fixed	geared toward Natural History and Archaeology Museums	History Museum #26
	able to create reports	search field is difficult to Navigate	use with a manuscript collection might be tedious	36,400
	can do bulk updates	a bit complicated to learn, but it gets easier	PastPerfect is easier to navigate and understand	
	large system	If you are using primarily volunteers I would suggest staying away from Vernon		
	Tech support very good at answering any questions and working with your IT depart	if your volunteers are pretty computer savvy they will get the hang of it		
	Reports are so extremely easy to do	it did take some time to learn the program	the more we use it the more we absolutely love it	History Museum #27
			don't just eliminate a system because it isn't located in the same country	
	Vernon provides good customer service through many avenues	It is more difficult to use CMS for archives and photographs		History Museum #28
	CMS can generate great reports on almost anything	It is not overly user-friendly		22,000
	There are so many fields of information – it is almost limitless	There are so many fields of information – it is almost limitless		
	they now have technical staff 24/7 to answer questions	The company is based in New Zealand - Vernon does send staff to the US sometimes, training opportunities are mostly through teleconferencing		
		The software and the support fees are pricey		
	SPECTRUM compliant	Need to invest in good training to use all of it's features	It's usually associated with cultural or art collections, but we have found it equally suited to all collecting departments at QM	Museum #29
	robust			1,050,000
	Very good, reliable software.			
	very good personal customer support			
	customisable for our varying needs			
	relatively inexpensive			
	ability to import records using XML			
	Reasonably easy to use as it has a typical Windows interface, but it becomes more difficult as you delve deeper into it's capabilities.			

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	There are many "bells and whistles"	There are too many "bells and whistles." We have minimal data in most records and have no need of the multitudes of fields and screens.	They were able to take an Argus database, a File MakerPro database and an Excel spreadsheet of about 23,000 entries and combine them.There were no glitches in system when we began our "live" entries.	History Museum 30
	There is; a text search which is invaluable for our wide ranging collection	The system for moving location records is very cumbersome - each record, if moved individually has about 11 fields or entries which must be completed.		100,000
	excellent customer relations			
	assist us on many small and large problems			
	their response time is terrific			
	I like the way information is organized in the database.	expensive	Vernon Systems is pretty sophisticated and due to the size and type of collections we have, we do not use many of the system's functions.	History Museum #31
	I find it to be intuitive.			7,000
	I also like the search and reporting functions			
	The customization of queries and reports is a great asset when working through collection projects and issues.		Overall, I really like working with Vernon Systems. It has been challenging to our IT staff at times, but it has served my needs quite well.	
	I also like how information and photos are displayed.		We use PastPerfect for non-collection functions at my museum and I always prefer working in Vernon versus PastPerfect.	
	groups of like materials can be nicely linked together	Older staff have had trouble learning the system.	it is not a database which can or should be used for organizing archival collections, but it works great for collections of art and objects.	Art Museum #32
	The web-browser component for on-line access is easy to use and the graphics can be customized in house to match a Museum's visual identity.			29,951
	There are three levels of query which can be used to retrieve information. The most useful of the three is a query function which incorporates Boolean terms for easy creation of reports.			

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	The database is very flexible and easy to customize according to particular collections	The interface with Microsoft Word and specifically, the Macros function has been difficult.		Art Museum #33
	The query function is quite intuitive	Some of the authority fields are so specific that our curators have difficulty asking quick, more general questions		20,000
	Technologically, the program has great potential and continues to grow.	The program does not have the ability to search on a like word if a term is misspelled in the Quick Search function		
	Vernon is fairly simple to learn and most of our users are very happy with it.	users who have very basic (beginner) computer skills require a tutorial.		
	The Vernon staff have consistently provided great service throughout the years.			
	Ease of use	Difficulty of formatting reports		Art Museum #34
	flexibility			18,000
	excellent customer service/tech support			
	Though they are in New Zealand, the Vernon team is very accessible and wonderful to work with.			
	Customizable	learning the system beyond basic cataloguing functions is difficult and requires training.		Institution #67
	Fairly intuitive and user-friendly	The most inconvenient aspect of using Vernon is that there is not a US representative, and the company is based out of Aukland. It makes additional training cost-prohibitive and live support difficult.		12,000
	Good support			
	Functional and flexible reporting			
Argus	Completely customizable	time difference for maintenance calls	Better than Mimsy	History Museum #35
	very easy to use with previous database experience		not as good as PastPerfect	30,000
	powerful when it comes to managing data	need to purchase the software and training in Powerbuilder or Crystal to develop reports	Even after using the system for years I'm still learning its capabilities.	Museum #36
	can create fields	can't import and export data from the system on our own without paying	the import/export is a big downside	1,043,400
	can link appropriate fields to a defined collection type. This is the biggest advantage that I feel that Argus has.	I'm concerned about the health of the company	may switch to Re:discovery because of compatibility with federal agencies	
	ability to manipulate lists and create carts			
	easy to understand and use			
	Easy to customize to our specific needs	Hard to export data		Museum #37
	handles wide diversity of objects	Doesn't have a shipping module		2,000,000
	Easy to add new fields	Screen layouts not very user-friendly		
	lots of functions	Report writing software is complicated		

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	Very customizable	No autosave	lots of shortcuts that you might never know about simply due to complexity of system	Museum #38
	huge variety of functions and features	tends to shut itself down randomly		57,500
	task wizards			
	multiple lexicon authorities			
Re:discovery	all disciplies on one database	complexity makes it unwieldy	we are old ARGUS users - so most anyhting will be better!	Science Museum #39
	extensive room for complete records	forms require huge amounts of training		2,000,000
	Compatibility with Federal Agencies	Expensive to maintain		
	built in backups			
		Expensive to add relevant modules		Natural History Museum #40
		Non-intuitive for non-database savvy cataloggers		750,000
	Google-like search function searches across all fields, which is incredibly useful	many "clicks" are required to accomplish basic data entry and there are too many layers of verifying your actions that require excessive clicking		Anthropology Museum #41
	importing images is incredibly simple and fast	reports are complex and not inherently user friendly		250,000
	Windows-like navigation enables easy (both visually and intellectually) movement between directories and modules	our custom lexicon has presented some challenges--we experience odd "bugs" in the lexicon because the functionality was designed specifically for our use and we populated it with our own terms. which was a result of the design of Re:discovery not supporting the kind of functionality we wanted and our expectation that Re:discovery could deliver precisely what we wanted. I also felt like we were led to believe they could do this, but in end, communication was an issue when it came to our customizations		
	you can easily copy content from one record to the next new record AND you can easily paste content in one field from the previous field	many fields contain fields within a field that open to show additional content. The concept is great, but in reality, when these fields open, some don't show you enough of the field which requires the user to manually widen the field before data entry		
	technical support has been prompt and very helpful	some of the supplementals seem redundant		
	Re:discovery staff willingness to work with us on customizations	overall there seems to be more "bugs" in the system than one would expect.		
	Re:discovery migrated our data from our old Access database to Re:discovery; this process was went very smoothly.	the lexicon in general are not as sophisticated and effective as they could be; for instance, lexicons populate down, not up		

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	the visual layout of the screens overall; specifically, I like the list pane because it allows for quick browsing and sorting and can be easily updated to each user's preferences; it's also a very quick and easy way to sort records by different criteria			Anthropology Museum #41
	ease of export from list pane to multiple formats			
Version 6.2	the company worked to help customize the user interface	you cannot make changes to "filtered" records. You can in a "tag file", so you would have to filter your records, then create a tag file, and then set the tag file in order to perform edits.	Re:discovery is every bit as powerful as the others.	Art Museum #42
	company was not too large	Others here at the museum do not feel it is as user friendly as it is not using a Windows interface but I believe it is mainly because they do not use the database on a daily basis as I do.		4,200
	They have remained very helpful over the years			
	It is easy to use			
	It is much easier to produce reports than with TMS that uses Crystal Reports which I found difficult and time consuming. You can build a custom report in a matter of minutes with Re:discovery.			
Version 6.3	Very easy to learn and user friendly.	Not as good a research tool as it is a collections management tool (this from our curators). Personally, I think it functions very well for the research I do. But the curators would prefer more sort options, which they could have had if they wanted to pay extra the curators would like to sort on all fields, which given the number of fields and fields within fields, is not possible.		Natural History Museum #43
	Customizable fields	looks complicated		21,000,000
	different discipline screens (fields on one screen change depending on the discipline) This is the main reason we choose this program.	Curators are intimidated by the number screens for each catalogue record.		
	we could customize to accommodate the different databases/fields each discipline had	they give priority to the NPS sites over those of us who are not one of their NPS clients, which I don't like. they have been switching versions for over a year now.		
	Plenty of memo fields that allow for large documents from word to be cut and pasted into them. Which is nice for analysis results			
	History is kept for some fields			
	supplemental data capturing is nice			
	Tech help is wonderful and very quick to help you when you are at a loss on how to do something. Usually I get someone right away and get immediate service.			

Database	Pros	Cons	Other Comments	Museum/ Collection Size
older version	able to create different directories for our different types of collections	attaching images to records is a cumbersome process.	Overall, the software suits our needs and we are happy with it	Museum #44
	customized with different fields where necessary.	some of the sort features for searches are not that good		61,600
	able to add to the nomenclature as necessary			
	searches and reports are easy to conduct.			
	The technical support is very timely and helpful.			
Version 6.2	Proficio is easy to navigate and is user-friendly.	with a very specialized collection Proficio may have too many options.		Art Museum #45
	It is custom designed to our particular numbering system.			15,850
	Downloading images to Proficio is easily done			
	you can search items by exhibit which is very useful when looking for a grouping of objects.			
	The technical support is great. Very helpful staff.			
	Easy to use and sort information	Cannot show more than one image at once		Anthropology Museum #46
	Ability to filter and run reports.	poor technical support for software bugs		28,270
	Depth of fields.	no simple transfer to online function.		
KE-EMu	Windows based	cumbersome to switch between modules	used Crystal Reports	Natural History Museum #47
	easy to use			1,500,000
	Provides one platform for all types of information			
	allows to scan and upload images as well as documentation related to the collections			
	has bibliography and narrative modules			
	Allows all disciplines of museum to fully catalogue objects	data entry can be somewhat overwhelming to new users because of the number of modules		Museum #48
	scientific objects have fields for associated taxonomies	Some tabs in the Catalogue Module will only appear if they have data in them, can be confusing		2,500,000
	Separates accessioning process from cataloging process with links between them			
	Enables full and GIS recording of archae and paleontological site information			
	Records specifics related to expeditions or field work			
	distinct modules for conservation, exhibition/events, multimedia metatags, scientific taxonomy			
	data from old database is recorded in Administratative tab so info isn't lost			
	multiple means and places to attach e-docs, images, and multimedia			
	Supports many multimedia file types			
	Uses Crystal Reports XI as report writer			
	Able to 'hide' tabs in the Catalogue Module that aren't needed for specific collections			

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	Can hold an immense amount of information and media for a very large number of objects in multiple modules that link together.	Stiff learning curve. Not intuitive	If people invest the time to learn how to use the database, they say they love it.	Anthropology Museum #49
	Conservation Module that holds all sorts of specific conservation reports and treatments	Data not easily exportable		387,000
	KE has been responsive about customizing modules to our needs	Use of Crystal Reports to produce reports of data means someone has to learn Crystal Reports (which themselves are not easy)		
		Not customizable to any great degree by customer.		
	It has screens for both accession and cataloging	The links feature to other modules is clunky.	It is suited to a historical collection rather than a specific type of collection such as art as TMS is	Historical Society #50
	It allows multiple multimedia files to be associated and displayed with individual catalog records	There is no support for printing of records.	I am pleased with the EMu database design that was created by our staff with the help of KE.	2,070,000
	EMu is also built with many different 'modules' for creating records in the database	There are ways to export information to Excel, etc. but training is not offered.		
	has detailed fields for information such as shipping, insurance, date and contact information	If you want something different, you have to buy and learn another program, and there is no help from KE.		
	The loans module also has email reminders for date specific fields	The cost of the program is considerable and additional user licenses are expensive.		
	EMu as a database is able to function well as a backend database for online visitors to search via our website.	KE could do better in the training department and showing people exactly what needs to be done to transfer data from their old program to EMu.		
	it can be customized with respect to its catalog module design	Once a screen (called tabs) is set, there is no way you can modify it. It has to be done through KE possibly at some expense.		
		the learning curve involved with EMu and its many modules and data fields, and how these relate to each other.		
		Not all of the fields are intuitive as far as how to enter information, or cross reference data, especially where the Parties module and Catalog module are concerned.		
		A good deal of staff training and daily use is required, to become both timely and proficient in using EMu as a database for permanent collections information and media.		

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	Easy to administer and use	Not set up for Unicode, making different scripts impossible.	Unable to effectively manage and integrate archive and library information.	Art Museum #51
	Nice user interface	Unable to effectively manage and integrate archive and library information.	We only had EMu for a year and a half and loved it, but the lack of Unicode support, web output, and archive and library information integration was a dealbreaker for us.	11,000
	Stable			
	Beautiful database backend and design			
	Loved global find-and-replace and various keyboard shortcuts			
	Great for loan tracking			
	Really responsive and helpful staff			
	Rich and detailed set of data elements	Not geared toward materials managed as collections, rather than discrete items		Historical Society #52
	easily customizable with help from KE staff	data entry can be cumbersome, requiring creation of 3rd party templates and tools.		1,760,000
	KE staff very passionate about their products and keen on working with customers to achieve objectives			
	Elegance of design	Learning curve for non-technical users	We migrated from Argus to KE-EMu in 2006 and have been extremely pleased with our decision. It is a perfect fit for our institutional needs.	Art Museum #53
	stability of database			320,000
	excellent relationship with vendor			
	vendor open to integrating product with other systems/technologies			
	strong user community			
	robust enough to successfully manage very large collections			
	ability to customize.			
EmbARK	easy to customize	difficult to move multiple items at once	basically a smaller version of TMS	Institution #54
	easy to learn		one of my favorites	1,300
	great support		favorite is MIMSY	
	easy to link photos and documents to records		EmBark is the "junior version" of TMS	
	easy to change fields			
	easy to search			
	You don't really need an IT person on hand			
	relatively inexpensive if you have a handful of users			
	put together helpful portfolios or reports		better suited to organizing a smaller collection	Art Museum #55
		We don't utilize the database to organize exhibition loans because inputting all the information can be fairly time consuming	Planning on upgrading to TMS soon	5,000

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	excellent built-in report writing that's user-friendly	Can be hard to train users for advanced usage	I have worked with TMS, Embark, and Access and I appreciate that Embark is somewhere in between the two	Art Museum #56
	relatively easy to train people for basic usage	cost can be relatively high for smaller museums	Crystal Reports (TMS) can be hard to use for the everyday user so I thought Embark would be a better choice for our staff.	500
	great for tracking media			
	very user friendly	I sometimes find it difficult to make or modify reports in EmbARK	the system was designed for a more modest, focused collection	Art Museum #57
	easy to update	several areas of the database go unused by us since they require a lot of data input to be useful	This system is designed around images	4,500
	easy to add data	difficult to go back and make corrections in some areas	I am very happy with the company and the product.	
	easy to add images			
	volunteers, Interns and staff members all been able to jump in and use it right away.			
	easy to import and manage digital photo assets			
	Gallery Systems provides excellent user support and seem to make design changes and updates based on user input.			
	customer service	report writing isn't an intuitive skill and difficult if not practiced often, not easy to use for casual user		Art Museum #58
	flexibility			1,500
	ease in updating data (including images)			
	network of other users, industry standard (one of them)			
	Easy to use and learn.			Art Museum #59
	allows you to create customized reports directly from the database			13,000
	Gallery Systems provides excellent customer support. They respond quickly to your questions or concerns	full search feature can be somewhat arbitrary. It would be nice if there was a way to search all the records for one term that may appear in any field without have to do a search on every field.		

Database	Pros	Cons	Other Comments	Museum/ Collection Size
TMS	intuitive for the average user	relatively expensive	seems gared toward art collections	Art Museum #60
	easy to generate reports	sometimes aspects are too specific		2,500
	very sophisticated	Gallery Systems has a habit of catering to the big name museum's needs		
	tech support is helpful and friendly	cannot search on null fields		
	you can get quite creative with report writing	if you want TMS to talk with another program on a regular basis you need someone well versed in databases and programming		
	great deal of customization	all customizations have to be tracked meticulously because they can be lost when it's upgraded		
	Exporting data is flawless if you have a well scripted report	Electronic exports can sometimes be problematic		
		Difficult to import, Need to enter data manually or have Gallery Systems do it.		
		Security isn't that great		
		can be complicated to attach images and thumbnails		
		Crystal Reports is not intuitive and requires knowledge of SQL programming to be efficient		
	TMS has more features built in	data entry is cumbersome and complex.	If you aren't going to use all the features of TMS I don't think it's worth it to struggle through the data entry.	Institution #61
	Gallery Systems provides great customer service			Art Museum #62
	there are a large number of users to support one another.	TMS is also a little unwieldy for tracking locations, but the upcoming upgrade seems like it might provide some improvement in this area.	TMS is one of the most, if not THE most, widely used collections management databases	35,000
	especially good for coordinating large exhibitions with complicated loans and shipping - other systems are not quite as strong in this area	TMS was not designed to completely follow CCO (Cataloging Cultural Objects) Gallery Systems has been providing training for ways to work with CCO in TMS.		
	often able to customize their product somewhat to meet their clients' needs.			
	Able to migrate data from other databases	Non-customizable.		Anthropology Museum #63
	Can accomodate most information data	Reporting can be difficult.		3,800,000
	searchable under different terms	Difficult to attach associated documents		
		Running searches with multiple terms can be difficult and slow.		

Database	Pros	Cons	Other Comments	Museum/ Collection Size
	free text fields are useful for entering extra information	data entry in some of the pre-made fields is made difficult due to lack of flexibility in the field	Too many options for our needs(would've been fine with TMS Light)	Art Museum #64
	becoming a standard database in the museum field, will not become out-dated quickly	need to manually create categories for certain topics (i.e.. classifications)		2,400
	object module format makes all major object-related data easy to see and access	media module is confusing		
	advanced search is thorough	user-defined fields are difficult to create		
	quick search easy to use	not all dimensions for an object are viewable from the main card		
	data entry is simple	fields are not html friendly (does not take bold, italics, special characters, etc.)		
	easy to export information	crystal reports need knowledge of SQL language and crystal reports to be used easily, not for beginners		
	windows based program			
	Adaptable and flexible enough to be used for collections with contemporary art collections that may not fit into the "norm"	Shipping module is difficult to use.		Art Museum #65
	The support staff at Gallery Systems is very good			18,800
	good for storing a lot of different information in one place	omewhat convoluted way to get to related information that you seek when in an object file	in general, I really like TMS. The more you use it, the better you get at manipulating it to your benefit.	Art Museum #66
	Fairly easy to learn.			9,000