TWENTY-FIVE YEARS OF ARCHAEOLOGICAL SITE INVENTORIES IN THE MIDDLE EAST

Challenges and Perspectives

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Figure 1. Training for Jordanian and Iraqi Antiquities staff in the framework of the joint GCI-WMF Iraqi Initiative project, Amman, 2004. (Mario Santana Quintero)

The introduction and rapid spread of personal computers in the early 1980s had an effect on the way archaeological site inventories could be managed. The pioneering work conducted by the Department of Antiquities of Jordan and the American Center of Oriental Research resulted in JADIS, a FoxPro database, and revealed the potential of using smaller and less-expensive systems to handle databases of potentially unlimited size. Similar systems with updated hardware and software were developed in Israel, Lebanon, and later in Egypt and Qatar. This paper looks at the way various countries have approached documentation and inventorying of archaeological heritage and how they have responded to the evolution of technology and the availability of tools, such as the Internet and GIS.

The widespread introduction of computers in archaeological and cultural resources management activities in the Middle East is a relatively recent phenomenon and coincides with the availability of low-cost personal computers (PCs). This late start is mainly due to two factors: the prohibitive cost of mainframe computers and the lack of skilled personnel to manage such systems within the heritage authorities of the region. Proposals to develop complex databases based on Unix or other systems can be found in the archives of various departments of antiquities, in most cases dating to the late 1970s or early 1980s. With implementation costs running in the millions of dollars and maintenance costs in the hundreds of thousands a year, it is easy to understand why such proposals failed to be adopted and implemented. A proposal made by an international assistance program to Jordan in the mid-1980s, for example, predicted maintenance costs for a mainframe-based geographic information system (GIS) running at over $200,000 a year. At that time this sum represented well over 50 percent of the total budget of the Department of Antiquities of that country. Clearly this was an unsustainable proposition.

Starting in the mid-1980s, the introduction of PCs and DOS operating systems and the adaptation of GIS software to a DOS platform opened new possibilities regarding the use of information technology in the management of cultural resources in the Middle East. In the early 1990s, Jordan and Israel were the first in the region to officially implement programs aimed at developing official computerized site inventories, later followed by Egypt and Qatar.

Jordan

JADIS, the Jordan Antiquities Database and Information System, was developed with the assistance of the American Center of Oriental Research (ACOR) with a grant from the U.S.

Agency for International Development (USAID) between 1990 and 1992. It was maintained by ACOR to assist the Department of Antiquities (DoA) of Jordan with data compilation, until mid-1994, when full responsibility for its operation was taken by the DoA. This first version of JADIS was a relational database that ran on FoxPro and DOS.[1] The database could be linked with an early version of PC ArcInfo, a GIS that ran on DOS. At the time, the Department of Antiquities lacked the resources necessary to purchase the software license and to hire a technician to maintain a GIS system. Instead it decided to adopt a simple database version, which was upgraded to Microsoft Access in Windows 3.1 a few years later at its own expense.

Early in the first decade of the twenty-first century, an American archaeologist, Stephen Savage, with a National Endowment for the Humanities grant, contributed an ArcView version of JADIS to the DoA.[2] The DoA employees, however, were not properly trained in its use and this GIS version of JADIS was never fully implemented. As a result, the department reverted to its previous inventory, the Access version of JADIS. In 2007 World Monuments Fund and the Getty Conservation Institute proposed to the DoA to migrate JADIS into a new system called the Middle Eastern Geodatabase for Antiquities (MEGA)–Jordan, developed using a variety of open source software tools with the aim of producing a Web-GIS system. In making use of technologies that do not require expensive licenses or upgrade fees, MEGA-Jordan improves the capability of the DoA to inventory archaeological sites and record their JADIS data, which was conceived since its beginning as a simple system to provide basic information on the presence of archaeological sites, while also giving the possibility of entering information on their periods, features, and general conditions. In this respect JADIS accomplished its aims, but it had some shortcomings in its concept and implementation. Sites, for example, were identified with a single set of coordinates, which did not map the extent of the site. Without the delineation of an area and actual boundaries it was difficult to depict encroaching development threats or land use changes in and around the site. Another problem was that the collection of information and coding was based only on excavation reports and published information (adding up to over 9,000 sites), and that verification and updating of this information through surveys and regular visits was not contemplated.[3] Between 1994 and 2010 when JADIS was replaced by MEGA, less than a thousand sites were entered into the system. This small number of entries indicates that JADIS had not been fully embraced by the DoA as an essential inventory and site management tool. Activities such as inventory, condition assessments, monitoring of land use and development, and providing advice to public and private organizations regarding the presence and significance of archaeological sites was conducted by the department without taking full advantage of the potential of their computerized database. Another problem was that JADIS was not made available to other governmental institutions, except by answering to precise requests concerning the presence of sites in areas slated for construction or development. This, however, is a problem that is intrinsic in the way relationships between governmental departments are established in Jordan and might also be an obstacle to the full functionalities of MEGA, if institutional agreements are not reached concerning the use of digital data across minis-

tries and public offices in the country. A GIS portal does not exist in Jordan, although two major agencies, the Royal Jordanian Geographic Center and the Lands and Survey Department, have their own national GIS systems. Only the Lands and Survey Department has a public interface and its database can be consulted online, but agreements between the DoA and the Lands and Survey Department on data exchange have not been established yet.[4]

Israel

In Israel a computerized database of archaeological sites was established at the Israel Antiquities Authority (IAA) in the mid-1990s.[5] The first GIS-based inventory of sites of the IAA was created in 1996 to improve data quality of the older database, where previously sites had been recorded only as a pair or two pairs of coordinates. This limited information failed to provide site boundaries and was therefore insufficient in offering legal protection, since property rights could not be clearly determined. After software updates and the introduction of site boundaries in the site inventory, the system was used as a legal tool and for cultural resource management functions. In its enhanced state, it was used to monitor construction activities, advise on the presence of archaeological sites, and to track archaeological excavation permits. In addition, it was integrated with an Archaeological Database Management Application (ADAMA) and used to record daily field activities. In 2001 the system was again upgraded to run on an intranet Web server, using ESRI software and an Oracle database.[6] Data are procured from published information as well as through a program of intensive archaeological surveys. The Archaeological Survey of Israel conducts intensive surveys for each of the 1:20,000 map sheets covering the state of Israel, and publishes the results of the survey in separate volumes for each map sheet. Approximately 25 percent of the maps have already been published and several are awaiting publication.

The database is not available online, although site locations can be retrieved from the published atlases. A central GIS system exists, and it is managed by the Survey of Israel, the national mapping agency.[7] The system includes all the common layers of a national GIS, including cadastral information and a layer for archaeological sites. Its online portal is only in Hebrew.[8]

Palestine

In Palestine, as early as 1994, a nongovernmental organization (NGO), Riwaq,[9] started a computerized inventory of historic buildings. This inventory can be consulted online (in Arabic);[10] it holds information about more than fifty thousand buildings in four hundred cities and villages of the West Bank and the Gaza Strip. More than that, hundreds of contemporary and historic maps have been digitized or scanned and georeferenced, and forty-five thousand contemporary and historic images can be called through the database functions, making this an invaluable tool not only as inventory of the contemporary historic building stock, but also as a research tool into Palestinian city and rural life over the past century. A corresponding system for the inventory of archaeological sites does not

exist at the Palestinian Department of Antiquities in this detail, but a GIS with several layers, partially financed by UNESCO in 1998, is under construction.[11] The Archaeological Survey of Israel had also collected information about archaeological sites in the West Bank and the Gaza Strip between 1967 and the peace accords of 1994. Israeli archaeological activity continued there beyond that date, but the database ceased to be updated in 1994. This information was eventually gathered by Raphael Greenberg and Adi Keinan for their project on compiling a complete database of archaeological sites in the West Bank and East Jerusalem.[12] This project is now complete (although the authors promise to update the database if new information is found or received) and the data for the more than 5,800 sites in the database can not only be consulted online using a Google Earth interface, but it can also be entirely downloaded as an Excel spreadsheet.[13] Although officially sponsored by a number of Israeli and U.S. institutions, including the University of Southern California (USC), which hosts the database as part of its digital library program, the public availability of detailed archaeological data with precise coordinates poses a number of ethical and security problems that will be discussed later in this paper.

A similar initiative, the Digital Archaeological Atlas of the Holy Land (DAAHL) conceived by the University of California, San Diego,[14] poses similar problems. This database runs with a Google Earth interface and displays accurate coordinates of sites (displayed as point data) in Israel, Palestine, Lebanon, Jordan, most of Syria (except the northernmost and easternmost parts of the country), the Sinai and parts of Egypt, and the northern part of Saudi Arabia. A site can be searched via the map interface, and clicking on the site name link opens a page with the site information. But while for the sites in Israel, Lebanon, Syria, Saudi Arabia, and Egypt this information consists only of the name of a site and its coordinates (derived from the U.S. Department of Defense Gazetteer of site names for those sites generically identified as "ruins"), the Palestinian sites are from the database mentioned above, compiled by Greenberg and Keinan, and the Jordanian sites are from the old JADIS database. Certainly in the case of Jordan, the data are displayed without the authorization of the Department of Antiquities, which rightly claims to have the last word on what type of data can be made public, especially as it derives from work conducted by Department of Antiquities employees over the years. This example shows that there is a difficult compromise to be reached between scholars and governmental institutions when it comes to the availability of digital records. This dilemma has been tackled by some countries by filtering the amount of information available to the public, and by others by making exact coordinates more difficult to obtain.

Egypt

In Egypt a computerized database of archaeological sites did not exist until the Finnish government proposed the Egyptian Antiquities Information System (EAIS), a GIS-based inventory, containing not only archaeological data but also data related to threat and property rights. One of the main aims of the project was to clarify cadastral and property information concerning land where archaeological sites are located. EAIS was created as a branch of the Supreme Council of Antiquities (SCA) in 2000.[15] Although not all known

sites have been plotted in the system, the availability of cadastral and property information in the area of archaeological sites adds an important layer of information and provides one more tool to the SCA to more effectively conserve and manage their sites.

The Finnish government invested more than 3 million U.S. dollars into the development of EAIS. In order to encourage the availability of local expertise, people working for this program were paid at commercial rather than governmental rates, but this solution, useful to kick start the project and ensure its continuity during the data collection, verification, and entry phases, could not be sustainable in the long run as it required the availability of expensive GIS specialists and personnel. Moreover the program was too centralized in Cairo and did not facilitate its use by SCA personnel in other regional offices. When the program was handed over to SCA it was not made an institutional priority by this organization and many seem not to have understood its usefulness, and consequently it was not integrated into the activities and requirements of the rest of the SCA. Today, EAIS survives as a much downsized project with the help of EU funding and foreign experts, concentrating right now on the Luxor area. It is early and perhaps unfair to define it as a failed project, but the reality is that after several years of operation, only a fraction of Egypt's antiquities are recorded and available in the system. A recent development is the production of atlases that are available for purchase, containing information on the archaeological sites of specific governorates. One atlas has been published so far.

The Center for Documentation of the Cultural and Natural Heritage (CULTNAT), affiliated with Bibliotheca Alexandrina and supported by the Ministry of Communication and Information Technology, is conducting a similar project, called the Archaeological Map of Egypt. This project has listed hundreds of sites in a three-level database. At the first level, sites are displayed as points on a Web-GIS map of Egypt. At the second level, once a site is selected, a satellite image shows the site as a polygon and its individual elements (monuments). At the third level, if a monument is selected and this information exists, a 3D model of the monument is displayed. This architectural 3D model can be navigated and interrogated (for example, to see its decorative elements or read its inscriptions and relative translations).[16] The project has also produced twelve volumes of an archaeological atlas of sites for a corresponding number of governorates. Data entry, however, proceeds slowly and for the quasi-totality of sites, the only information available is the national-level (point data) and extremely succinct information about their features. This database can be accessed on the Web by any user via a simple interface and the use of a single keyword. A list of keywords, however, is not available, making it a tool with very limited practical use. It is really unfortunate that two governmental institutions in Egypt decided to compete rather than cooperate, resulting in a duplication of efforts, data, and, what is worse, projects that are largely incomplete and running behind schedule.

Syria

In Syria a recent project with Italian support has joined information and two databases, one related to sites and the other to objects to create a Web-GIS that is now in its data-entry phase. The system is managed by the Directorate General of Antiquities and Muse-

ums and has a public portal where both the objects and the site databases can be interrogated.[17] The system uses open source software to display various layers of information, such as topography, roads, cities and villages, hydrology, and archaeological sites, among others. For the moment at the general level, sites are depicted as point data, however in the future, as more data are collected, they may be entered as polygons.[18] The Damascus Citadel and the ancient city of Ebla are the only two sites containing detailed GIS information including topography, individual monuments, and excavation trenches. The site database also offers the possibility to link the site information with a separate object database. The database adheres to the Dublin Core Metadata Initiative[19] in order to facilitate possible data exchange with other GIS databases in the future. This system is not only an inventory but will serve also as a management tool to monitor development projects and advise on the presence of cultural resources. It will also be a predictive and risk preparedness tool, since one of its features is a risk map built following the model of the Italian risk map of cultural heritage, where a risk factor is calculated on the basis of the presence of various risk elements, such as earthquakes, floods, and other potential disasters. No link presently exists between this system and other GIS platforms developed by other organizations in Syria, such as the General Organization of Remote Sensing.[20] This may be problematic in the future, as a link between the archaeological site GIS and other types of GIS may benefit site management and preventive conservation.

Lebanon

In Lebanon the idea of a national archaeological database of sites and monuments had an early development. As soon as the civil war ceased in early 1991, salvage excavation activities started in downtown Beirut in advance of large redevelopment projects. One of these salvage excavations, managed by English Heritage, made use of a customized GIS database called G-Sys. The system was used for a few years in an experimental way to record the location of archaeological sites and manage the growing body of electronic documentation coming from renewed research and excavations. This project, however, never became institutionalized within the Department of Antiquities. Lebanon does have a GIS portal,[21] which however, was not operational at the time of this research and it is therefore unclear whether archaeological data are available through this portal.

Gulf States

A number of Gulf States have adopted an approach where a central database gathers information from various departments and redistributes it through a public portal. The advantage of this approach is clear: data are always up to date, and duplication is avoided since the base layers are managed centrally and the specialized information remains the direct responsibility of the agencies in charge of their collection.

Qatar was one of the first countries in the world to implement a nationwide GIS reuniting the information from a large array of governmental offices and data sources.[22] The project is managed by the Centre for GIS within the Ministry of Municipality and Urban Planning. The main GIS, with many different layers of available information, can

only be accessed by registered users. A public interface exists, but does not allow complex searches and is limited to the display of the location of commercial business or public offices in Qatar. Archaeological sites are not displayed in the public interface. This information can only be accessed via an intranet portal or as a registered user on the Web.

Abu Dhabi has two geoportals. One, managed by the Environmental Agency,[23] is an ArcExplorer application that offers the possibility to select and display a large number of layers. An archaeological site layer does not show exact site location, but only the presence of sites in a 5 × 5-km square. The second geoportal is managed by the Abu Dhabi Systems and Information Centre, which is in charge of the e-government central GIS.[24] The archaeological data for both portals are provided via Excel spreadsheets by the Department of Historic Environment at the Abu Dhabi Tourism and Culture Authority (ADTCA). ADTCA is now developing an application able to manage via Web-GIS the archaeological and historic site inventory, permits, conservation activities, and museum holdings of Abu Dhabi. This application will have direct access to the GIS of the Environmental Agency and to the government geoportal in order to dynamically update the archaeological site and historic building layers of these databases.

In Bahrain the Central Informatics Organization (CIO)[25] manages the e-government program, which includes a central GIS system. The CIO develops separate GIS applications for each ministry. The Ministry of Information GIS includes data about historic buildings and archaeological sites, which is partially available to the public. The public portal of the GIS is currently under maintenance and not available for browsing.[26]

To conclude this overview, a number of GIS databases are being developed for Iraq, although most of them are for military use. Various contractors over past years have developed separate applications for environmental, planning, agricultural, and other purposes. The Getty Conservation Institute (GCI) and the World Monuments Fund (WMF) are now adapting MEGA-Jordan for use by the Iraqi State Board of Antiquities and Heritage (SBAH). United States-based researchers at the University of Chicago and at SUNY (State University of New York) Stony Brook have compiled a database of archaeological sites known through published material. This database contains information on approximately six thousand sites in the country and might provide a base of digital data on which a nationwide inventory can be developed. Since SBAH is also in charge of the protection of historic buildings, content and functionality to manage information derived from the survey of this aspect of Iraqi cultural heritage will be added to MEGA in GCI-WMF's work to develop the system for Iraq. After their work on MEGA-Iraq is completed, GCI and WMF intend to make the core MEGA system more broadly available to other heritage authorities internationally, mainly in the Middle East, although the architecture of the system can be adapted to any region.

Inventories, GIS databases, and Access to Data in the Middle East: Some Considerations

It is clear that the importance of archaeological site inventories as tools for the management and protection of these resources is now commonly understood. In one form or

another, inventories do exist, although their completeness and integration with other data sources varies from country to country. It is also clear that GIS is viewed as the most effective tool to manage the growing body of information collected into these databases. Unfortunately many governments are still blind to the fact that archaeological and historic building information is useful for planning purposes and it is not some obscure intellectual exercise. This attitude translates in Egypt to the lack of financial support for EAIS once the Finnish support ceased, and in Jordan to the absurd request of the Royal Jordanian Geographic Center (a governmental institution) to charge the Department of Antiquities (another governmental institution) hundreds of thousands of dollars for the use of their GIS layers (the department decided not to use this GIS, and utilized Google Earth imagery for its MEGA-Jordan).

Two models of data access seem to prevail in the Middle East: one is the Gulf States model, where an agency is put in charge of maintaining a central database and collects information from other specialized agencies. A geoportal is used to access the various databases, although in some cases dynamic relationships are not yet implemented and data is updated physically, providing new versions of the database to the central agency. With all the differences of approach, software, and data availability, the model that the Gulf States is applying is the most efficient: it avoids data duplication, ensures that the most updated data are always available to the user, and allows access from one single portal to data that resides in different systems. This model of integration sharply contrasts with the approach adopted by the Jordanian, Egyptian, and Syrian authorities, where each agency works in isolation and data exchange is left to the goodwill of individuals. In Jordan procedures exist for Ministry of Planning and Public Works employees to collect information on archaeological sites in areas considered for development or expansion of existing projects. The procedure, however, is cumbersome and involves a series of mail exchanges and personal visits to various offices to get listings of sites included in the project areas. A more practical arrangement would allow for direct access between development agencies and MEGA-Jordan into which the Department of Antiquities would overlay their geographic data of site locations and construction projects under consideration.

The issue of security is treated seriously by many countries, which have adopted various solutions to allow some information to be accessible, while the most sensitive information is kept out of public reach. In Abu Dhabi, for example, the public cannot see an exact site location: a large square (5 × 5 km) indicates, with shades of color, the presence of one or more sites in that area. Precise coordinate information is available, but only after password checks to authorized users. In Qatar and Bahrain, archaeological information is not shown as a layer in the public GIS portals. In Israel and Egypt the databases do not have a public portal, although site location can be found in Israel in the printed volumes of the Archaeological Survey of Israel and in Egypt in the portal of CULTNAT, the agency in charge of a second site database. But if these are decisions taken by the governments in charge of the protection of the archaeological heritage of these countries, I believe that the decision of USC to make available for download the entire database of archaeological sites in the West Bank and East Jerusalem, and of UC San Diego to display on their Web-GIS the entire Jordanian site data-

base and the one for the West Bank just mentioned, lacks sensitivity and exposes these sites to the risk of looting. The arguments that these initiatives favor data exchange among specialists and that looting is generally conducted by local villagers that already know where sites are and what to look for does not change the core of the question: Should individual researchers have the power to make the full archaeological record of a country available to everybody? In my opinion, only the designated authorities of the country have the right to determine that. The national and international scientific community is a resource for the construction of solid site inventories and they should be engaged in the process. But it should be the right of each country to decide how and in exchange for what privileges this engagement should take place.

One aspect that also requires attention is the issue of training and what can be called "project ownership." The approach that WMF and GCI are using in their MEGA project is to train the trainers, in order to avoid what has always been the main problem of such projects: the progressive disappearance of trained staff that either move to responsibilities other than maintaining the database or leave the organization for better paid jobs given their acquired skills. As for "project ownership," what is meant here is all those activities that ensure continuity between the development and training phase, which are often accompanied by external consultants and professionals, and the implementation phase, when the role of external consultants diminishes or disappears. These activities are mostly related to the integration of the project in the workflow of the organization, and include the creation of supervisory committees; the creation of procedures for data collection, entry, and verification; the establishment of a hierarchy for these functions with a precise reporting scheme; and the establishment of committees of experts to create or validate glossaries and thesauri to be used in the course of the project. Unfortunately, these aspects are either left outside the scope of the project or are conducted just before the project is handed over to the organization, which is not able to cope with the issue, mainly because it is faced with this type of problem for the first time.

Another consideration concerns the level of commitment required to launch and maintain a nationwide inventory project. Many of these projects have been initiated by foreign aid agencies or NGOs, and some have failed because there has not been sufficient local institutional commitment to implement and maintain the database. It is not just a problem related to the lack of funds or scarce availability of IT personnel interested in a poorly compensated governmental job. The problem is more with the attitude that is sometimes present in sectors of the public administration that is unfamiliar with and, as a consequence, hostile to the introduction of new technologies in the daily working routine. In this case only the introduction of these technologies in other more open sectors of the society or in the procedures of neighboring countries will change this attitude, and I am confident that as a new, more technologically savvy generation comes to power this resistance will disappear.

The conclusions of this analysis are mixed. On the positive side, there is a tremendous advance in the implementation of sophisticated systems, which are not just pretty map displays, but solid systems taking into consideration the needs and obligations of a heri-

tage agency. Also on the positive side is the perception that inventories cannot operate in isolation from other databases and especially from agencies engaged in development projects, if an effective archaeological site management policy has to be achieved.

Conversely, there is still little understanding of the benefit of this technology to facilitate site inventory and protection. As information exchange and data integration become more and more common, it is hoped that agencies deeply anchored to the idea of exclusive data ownership will understand that it is data integration and not data isolation that will contribute to more efficient heritage management policies and procedures.

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