CHAPTER 8

THE EXPERIENCE OF THE PORTUGUESE INSTITUTE OF ARCHAEOLOGY IN ARM AND GIS

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1. INTRODUCTION: ARM BACKGROUND

In Portugal, the inventory of archaeological sites has been the responsibility of the national government, as is the case with archaeological heritage resource management and research. The Portuguese Institute of Archaeology (IPA) was created in 1997, within the Ministry of Culture, to advance the promotion of these tasks. In part, the creation of IPA was a consequence of the process that led to the preservation of the World Heritage Côa Valley rock art sites, threatened by a dam project. This controversy significantly increased the awareness of politicians and the general public to the threats and dangers to the country's archaeological heritage and the need to apply proper management in the spirit of the Malta Convention.

It was during the 1980s that a first attempt to perform a comprehensive inventory was undertaken. It was a non-computerized list of archaeological sites across the country, known as the Map of Portuguese Archaeology. One of the "fields" recorded in this inventory were geographical coordinates. Complementary to this, a 1:25,000 grid was adopted for mapping the known archaeological sites at the basal administrative level, the *freguesia*. The linkage between the two variables was a numerical code, the National Site Number, still used today. These were the first steps in the geographical location of archaeological heritage in Portugal.

In 1989, there was a first attempt to computerize this information in a PC environment running Microsoft MS-DOS operating system and using Borland Dbase software. In 1990, the information was transferred to an Apple MacIntosh running Claris FileMaker. At that point, other variables were introduced, related to different areas of Archaeological Resource Management. Image archiving and geographical location facilities, though, were still missing.

It was not until 1995 that a new system for archaeological information and management was developed: the *Endovélico* system, developed by Chiron, Lda. (Figure 8.1). *Endovélico* is based on Oracle database software and uses a Borland Delphi interface. This system consisted of a series of forms with multiple internal links and allowed geographical location through an external link with Esri Arc View software. In itself, this step constituted a qualitative leap in data storage and processing.

2. GIS AND ARM. THE *ENDOVÉLICO* SYSTEM

Since its creation, IPA was defined as primarily devoted to the detection, preservation and management of archaeological heritage. To that end, it became pivotal to bring up

to date the computerized inventory of archaeological sites previously developed. This database would be made available to planning agencies and planning companies as well as other state institutions with duties in the field of archaeological research and management. In order for IPA and related state agencies to fulfill its missions in the realm of preventive archaeology, a good and as extensive as possible knowledge of the distribution and ranked importance of archaeological resources across the country's territory is required. On the other hand, the development of the database itself requires good connections between the managers, the scientific community and the public. *Endovélico* was therefore designed so as to be able to accommodate public access to the information stored therein.

The system has been upgraded and reformulated several times since 1997, with the purpose of improving its power and user-friendliness. At the same time, previously integrated information has been verified and corrected, and new data have been systematically added. At the end of 1997, we had 8,564 archaeological sites on record; today, the number is 13,500.

All the information stored in the system is of both scientific and administrative nature. *Endovélico*'s main form is the "Archaeological site form", featuring general and scientific information fields (designation, site type, chronological period, soil use, description, remains, storage of remains, administrative location, geographical location, location's level of precision (metadata) and maps) as well as administrative and legal information fields (landowner, legal protection, threats, workers, protection, conservation) (Figure 8.2). The system is complemented by forms of a more scientific (archaeological project, fieldwork, bibliography, archaeologist, images) or more administrative nature (file, inspections, organizations, individuals).

Regarding georeferencing, conversion tools have been developed, allowing the system operators to use several different reference systems (geographic coordinates, both conventional and decimal, UTM, Hayford-Gauss). For the time being, the system only admits one point per site (centroid). The possibility of drawing lines and polygons is to be developed in the future. Currently, the most significant issue relating to GIS is the reliability of the information. About a year ago, tests were carried out revealing high error levels that generated an intensive effort to correct the system's geographic reference. This proved to be quite a time consuming task, as only 20% of the coordinates have been corrected up to now. This task is based upon information gathered in administrative files from IPA's records, bibliographic references and GPS fieldwork carried out by IPA's archaeologists working in the regional offices of the Institute. Digital maps on a 1:25,000 scale are currently being purchased and there are plans to introduce the systematic use of such tools as orthophotomaps. As these steps are taken, the system shall evolve and become an advanced GIS, featuring a Web GIS module allowing for searches of territorial nature.

A feature added to the system in 1998 was Web access. Under constant updating, the amount of database contents available online thus tends to grow. This enables external use through the IPA's website[1]. The data currently available are of essentially technical and scientific nature, and mostly used by archaeologists, in the framework of research or preventive archaeology projects. The user profile is expected to become more diversified,

[1] http://www.ipa.min-cultura.pt/

and to include other agents whose activities have some sort of territorial impact (promoters of major public and private developments with important subsurface components) or are directed towards heritage management (local authorities, tour operators, etc.). At present online contents are only in Portuguese, but it is expected that in the near future they shall be made available in English as well, thereby considerably increasing the potential audience.

Recently, IPA took another major step regarding the remote online input and live use of the updated information stored in the database by archaeologists from IPA's 10 regional offices. This required the implementation of a nationwide leased-line dial-up voice and data network, which uses a structure of routers in Frame Relay (with ISDN backup) hired from a private operator (Figure 8.3). To ensure a better performance of the network, the bandwidth can be constantly adapted to the needs of the IP traffic. This network also allows voice communications and the use of Internet and Mail servers through the central node located in the IPA's Lisbon head office. Besides improving cost effectiveness and the quality of communication, the main advantages of this system are that it allows the sharing of directories and files between the head office and the regional offices, and, above all, their direct connection to the database server of the *Endovélico* system, also located in the Lisbon head office.

The actions currently under way are:

1. Development and optimization of the system and its interfaces:
   a) Progressive growth of the contents available online.
   b) Upgrading the system's GIS capabilities, through software implementation and systematic correction of the geographic references.
2. Implementing solutions related to new telecommunication concepts.
3. Transfer of information still stored in old support systems, both manual and digital.
4. Continuous insertion of new data into the database
5. Integration of field data.

The most relevant problems are:

1. The permanent need of technical upgrading, at the level of hardware, software and training.
2. The communication difficulties between archeologists and computer scientists in the development of common denominators.
3. The question of scientific ownership and authorship of the database contents.
4. The need for continuous insertion of data, needing both technical expertise and patience.
5. The permanent need for an equilibrium between fieldwork and data insertion into the system.
6. The integration/communication with other GIS systems, of foremost importance in the use of the database as a resource for planning purposes.

More than anything else, the development of such a system requires the correct understanding of the task as a permanently unfinished one.