12

The management of archaeological information — a strategy

Diana M. Murray

(Royal Commission on the Ancient and Historical Monuments of Scotland, UK)

12.1. Introduction

This paper looks at the Information Strategy being followed by Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) with particular reference to the management of archaeological information, and examines some of the issues which this has raised.

The introduction of information systems can be complex. It requires detailed analysis and considerable development time. Once implemented, Information Systems seldom remain static, for they need further development as requirements change and generate their own momentum, one development opening up opportunities for another. It is important to stand back from the issues every so often and take an overview — examining whether the developments are meeting the requirements and recommending the best way forward.

12.2. Background

The Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) is a non-departmental public body established in 1908 by Royal Warrant, the terms of which were revised in 1992; it is sponsored by Historic Scotland on behalf of the Scottish Office.

The Royal Warrant of 1992 directs RCAHMS to

> "provide a national heritage body for the survey and recording of ancient and historical monuments and constructions .."

principally by:

- compiling, maintaining and curating the National Monuments Record of Scotland (NMRS) as the basic national record of the archaeological and historical environment;
- identifying, surveying, interpreting and recording all buildings, sites and ancient monuments of archaeological, architectural and historical interest;
- establishing and maintaining national standards in surveying, recording and curating of records relating to archaeology and historic architecture;
- providing guidance on these matters to other bodies.

The curation, storage and manipulation of information is therefore central to the work of RCAHMS, and the development and implementation of information systems of fundamental importance. Work has been undertaken on the computerisation of the various activities of the Commission since 1983, the major elements being undertaken by the Scottish Office Computer Services (SOCS), but others taking place in house. By 1990 a database containing the archaeology records of NMRS had been set up using Ora-

cle software based on the Scottish Office mainframe computer. This was linked to a database containing information on Scheduled Ancient Monuments maintained by Historic Scotland (Murray 1992, Ashmore 1992).

At that date, several developments were waiting to proceed, including the computerisation of the NMRS Architecture Register, the establishment of links between field data collection and NMRS, and communication with external users such as Sites and Monuments Records (SMRs) and museums. There was also the need to explore the potential of applications such as Geographic Information Systems (GIS) and Image Systems.

It was clear that some of these applications could not be readily developed on the Scottish Office mainframe computer and that greater flexibility and speed of development was required than had been possible hitherto. This, combined with a move by Scottish Office to encourage users to take greater control of their own developments, indicated that there was a requirement for RCAHMS to become more independent and to move across to Open Systems architecture. Meanwhile, other developments had been taking place in RCAHMS, including the creation of an archaeological archive/accessions database, fieldwork monitoring databases, a database of industrial records, transcriptions of aerial photographs, and the capture of field data in digital form in addition to word-processing, CAD (Computer Aided Design) and DTP (desk-top publishing).

In 1991, RCAHMS was about to move to new premises with the potential of establishing a Local Area Network (LAN), thereby opening up opportunities for an integrated structure and more rapid development.

12.3. RCAHMS strategy study

It became clear that a more detailed strategy was required to guide and manage the future IT requirements, and in 1991, after an exhaustive competitive tendering exercise, a study was commissioned from Coopers and Lybrand Deloitte, management consultants, (Coopers and Lybrand Deloitte 1991). Their work produced a well-defined way forward on which RCAHMS could build its strategy, and it raised the profile and broadened the interest in information technology within the office (Fig. 12.1). Now there are few staff who do not use a computer for some aspect of their work.

The strategy study analysed and prioritised all the aspects of the Commission's work which could be addressed by Information Technology, setting out timescales for development and costs.
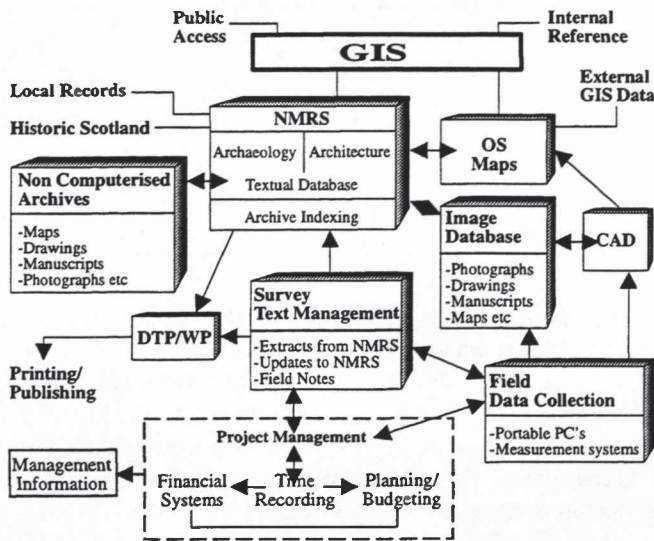
Figure 12.1: Information technology applications defined by the strategy study.

Figure 12.2. Schematic representation of RCAHMS Local Area Network.

This has provided a valuable basis with which to work, to seek support for funding, and to develop links with cognate systems elsewhere.

RCAHMS considers that it is essential that this strategy is not seen as a single statement, but as a continuously updated policy which thus maintains its currency, not only in terms of timetable and costings but also ensures that technological requirements meet future needs. The strategy is being monitored and revised, as necessary, by a strategy group representing all sections of RCAHMS, and this, in turn, is served by a series of project groups which can take forward those particular elements of the strategy that have been identified as key areas for development, e.g. the operation of the network (LAN), the computerisation of the Architectural Register and the GIS project.

Additionally, at senior management level, a Joint Strategies group has been set up to examine the interaction between the RCAHMS strategy and that currently being developed by Historic Scotland, to ensure that developments take place in harmony and that communication links are maintained.

12.4. Implementation

The first element in the strategy was to put the technological infrastructure in place (Fig. 12.2). This is well on the way to completion, and RCAHMS now operates a LAN from a network server, together with a UNIX processor designed to take the Oracle database as soon as it can be downsized from the mainframe, as well as a UNIX workstation with four X- terminals designed to run the GIS pilot project. Most importantly, an information systems manager has been appointed to oversee technological issues and to assist with the implementation of the strategy (Byrne 1993).

12.5. The management of archaeological information

The strategy regards information as a management tool and identifies distinct, but interrelated, areas of RCAHMS work
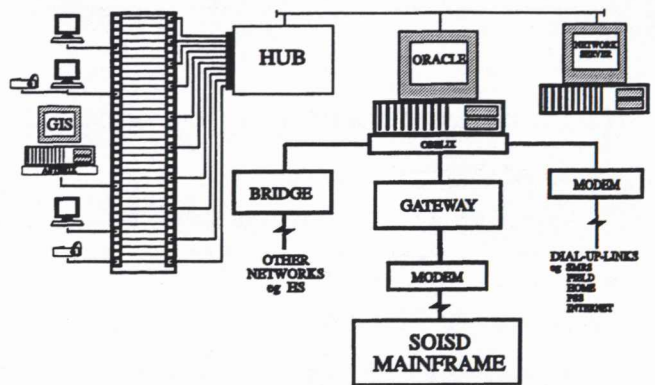
where IT can improve the use made of that information. The management of the archaeological information is an integral part of this overall strategy.

12.6. NMRS

The curation, storage and manipulation of the RCAHMS archaeological information is provided by the NMRS. The information gathered by RCAHMS field and aerial survey is transferred to the NMRS to make it publicly accessible, and the information in the NMRS provides the Inventory of monuments maintained by RCAHMS. Information is gathered from a wide range of other sources, including literature searches, news cuttings, external survey and excavation and from the deposition of archive material of all kinds. It is the starting point for many publications and provides information both internally to RCAHMS field staff and to external users.

The NMRS consists of a vast body of interrelated text, maps, photographs, plans, drawings and historical manuscripts, to which many thousands of items are added each year.

The existing Oracle archaeological database is a fully integrated site-based system which covers the whole of Scotland and contains some 72,000 site-records. It is designed primarily to assist the NMRS in the management and manipulation and retrieval of data and the information recorded for each site includes its identification and location, its major bibliographical references, archive catalogue and field reports. (For a detailed description of the database see Murray 1992, pp. 212–213.)

One of the major strengths of the Archaeology Section of NMRS is that each item of archive, whether an aerial photograph or a single plan from an excavation archive, is individually catalogued and related to its relevant site information, together with the OS report, and any recent survey report and bibliographical references. The Oracle database containing this integrated record already constitutes a major research and management tool.

The Oracle data structure will be downsized from the Scottish Office mainframe to run on the RCAHMS UNIX processor. This will enable improvements to be made to the performance of the database, make it more user-friendly

and allow developments to take place in other areas of work which require to interface to these data, such as data-transfer from field to NMRS, the development of the Architectural Register, and communication with external databases.

One of the problems of national databases is their sheer size and complexity, factors which can lead to a strong resistance to change and eventual stagnation. The strategy recognises this and encourages maximum flexibility combined with an element of stability. Priority is given to the computerisation of the Architecture Register, which is still in manual form, to complete the NMRS Oracle database. The study highlighted the need for a single central catalogue, to give the NMRS user a view of a seamless record which record the presence of the information, assisting the user to select and retrieve that information by a direct computer link or a physical filing reference. To achieve this, modifications will have to be made to the existing database, to address the needs of the architectural data.

12.7.   Field databases

Smaller databases are constructed for RCAHMS field-survey projects and for the primary logging of aerial survey reconnaissance. These are used to assemble data in advance of fieldwork, to update during and after field survey, and they may be used to analyse the data to construct commentaries on the archaeology of an area as interim or final statements of survey results or progress made. It is proposed that key information from these databases should be transferred directly to the NMRS database in a controlled fashion using validation and Quality Assurance procedures to streamline the flow of information and to reduce duplication and re-keying.

The strategy recognises, however, that while databases are a key element to RCAHMS work, they are only part of the overall picture. All systems must now be designed and adapted to support integrated text-and-image storage, including geographic data with the capacity to support spatial analysis. So much of RCAHMS data is in visual or map form that it is important to start planning systems now that will cope with this data in the future.

12.8.   Image systems

The strategy provides the opportunity to explore the potential of imaging systems for RCAHMS work. NMRS is a major repository of archaeological and architectural plans and photographs in Scotland and contains over 2 million items. The rate of accession of this material is increasing, and storage and accessibility, together with conservation considerations, are rapidly becoming major issues. The use of imaging systems will assist with information retrieval, rapid cataloguing techniques, and "stock control", and it would also assist in the preservation of original material, which would need to be handled less frequently. The technology in this field is still developing rapidly, however, and needs to reach a plateau before a major commitment can be made.

12.9.   Data integration

An increasing amount of data is becoming available in digital form, and, to maximise access to this, methods will be deployed to integrate databases with one another. This will be achieved in a number of ways — internally, by using the LAN and GIS, and externally, by using communications links.

12.10.   GIS

A project to examine the potential of GIS was a logical step forward in the development of information systems relating to RCAHMS work (Fig. 12.3). The majority of RCAHMS information is spatially referenced in some way, and the archaeological data within NMRS are indexed on a set of 1:10,000 maps, which also carry annotations and sketched detail. A new era of Ordnance Survey (OS) mapping is at hand and, within the next few years, the familiar chart paper maps with hand-drawn cartography and new "editions" will be things of the past. RCAHMS not only uses maps as a backdrop for annotations, but is also responsible for supplying OS with the information on antiquities that appears on OS maps. With GIS it will be possible to explore methods of transferring data to OS in digital form.

In February 1992 Genasys (UK) Ltd were engaged to tailor their Genamap software to RCAHMS requirements. This has now been completed and a pilot project was begun, consisting of a series of discrete tasks each relating to RCAHMS programmes and projects. The project work is based upon the areas of Fife and Edinburgh and uses data drawn from the Oracle databases relating to NMRS and Threatened Buildings (maintained by RCAHMS), and Scheduled Monuments and Listed Buildings (maintained by Historic Scotland). Work will also take place on data drawn from RCAHMS field survey, aerial survey, architectural and industrial survey programmes and there will be an examination of the relationship with CAD files and image systems, as well as data from other sources such as digital maps, boundary data, gazetteers and environmental and land-use data.

The major objectives of the project are to demonstrate how GIS can be used to benefit each RCAHMS programme or project on which it is tested and how GIS can be used as a tool for integrating spatial databases.

Much of the strategy described so far is concerned with the management of information for internal use, but there is another facet — one which looks outside to other organisations. Communication is a key issue for RCAHMS through the dissemination of information and by adopting a lead role in the development of Sites and Monuments Records in Scotland.

12.11.   External communication

The strategy encompasses the aim to establish a computerised inventory of the National cultural resource through links with other databases (and potentially other imaging systems and GIS). Site-specific, real-time links already exist between the databases of RCAHMS and Historic Scotland, and plans have been made to extend these further to encompass the Regional Sites and Monuments Records. The extended database will also include links to Scottish museum databases via the network currently being explored
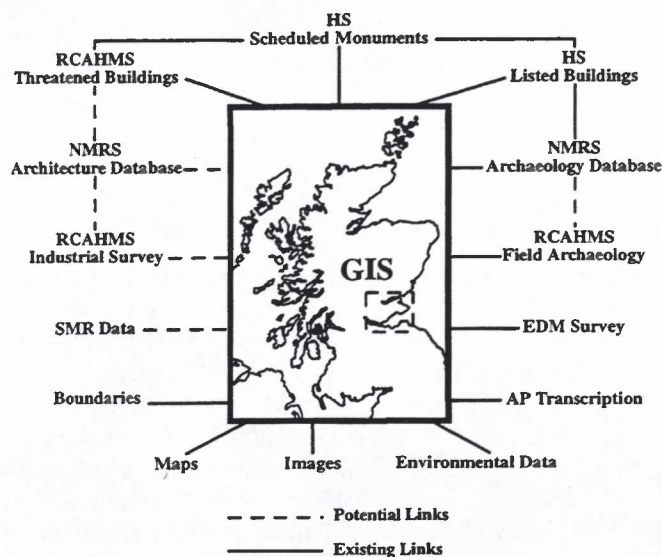
Figure 12.3: Data integration using networks and GIS.

by the National Museums of Scotland and could equally include data sets which are not exclusively of archaeological or architectural interest such as land-use or environmental data.

A skeletal database held nationally is all that is required to allow each organisation that is part of such a network to have access to an extended database. In such a framework, each participating organisation keeps as much or as little data as it requires and imposes its own structure and standards on that data; it can make as much or as little of that data available to others as appropriate. The networking of databases minimises duplication and allows maximum access to information. All of the nine Regional SMRs in Scotland have a core set of data which is similar to that maintained in the NMRS, but other databases, e.g. Scheduled Ancient Monuments, have a structure that is very different because it serves a different purpose. Attempting to impose rigorous standardisation on either the data structure or the data itself is liable merely to impose limitations on development and is not necessary in a harmonised network (Murray 1992, pp. 213–216). The NMRS will act as a catalyst for such development and will provide an organisational and administrative role in the first instance, as well as being a participating member of the network, working in partnership with other databases.

The strategy which the Commission is now implementing will help to structure the data that it already holds, speed up access to the physical archive, collect data in a more manageable way, create avenues for communication and interaction and improve the management of information for internal and external use. It allows the RCAHMS to make more efficient use of information as a management tool.

12.12. Archaeological information

Any strategy for the management of archaeological information must ensure that the archaeology retains its integrity within the technological procedures to which it may be subjected.

The implementation of sophisticated information technology raises issues concerning the quality and suitability of the data.

Information which has been collected over a long period, mostly with very different purposes in mind, is being stretched to the limit to provide distribution analyses or predictive models. Systems have been designed to pose questions for management and research purposes which could never have been contemplated before. The level of expectation has been heightened by the tasks which computers can perform, and in many cases the data is now the limiting factor in such activities.

It is important, therefore, to examine the data and establish what is required to make it suitable for such analyses to take place. This may, at best, involve separation into different fields — at most, re-collection of information from source or redesigned methods of field survey. This is a particular problem for organisations with a national interest as consistent upgrading across the breadth of such databases cannot be achieved without major commitment of time and resources. Therefore priorities must be established by analysing more closely the questions which are asked of national databases — how often those questions will be asked, and what value and priority is placed upon them; then it may be possible to construct a strategy for data-enhancement to meet these demands.

Information technology is also providing new avenues of access to the data. Methods of presentation, on screen or as print-out are generally based on selections of data — the most extreme, perhaps, being the distributions of data in the GIS, which are, at present, based on coordinate points. The separation out of data in this way provides convenient listings or displays, but places all the data on the same plane. It gives a false sense of uniformity because it removes those sections of information that provide the means of assessing quality or accuracy, i.e. reference to text and source data which users, consciously or otherwise, will generally take into account from a paper record. Improved interpretation of the data, provision of a quality assessment with each record, and better visual presentation using GIS and image technology are all being explored as methods of overcoming this problem.

A third, and related problem, is the interpretive level of the information. In future, it is likely there will be a demand for access to archaeological data without the full consultation services of a professional archaeologist. At a time when demands for information are increasing and access to digital data is becoming the norm, it is necessary to look at ways to "publish" the data in computer readable form, so that it is more intelligible both to the layman and to those concerned with land- and heritage-management without losing any of its intrinsic value.

Information systems, on their own, are not sufficient to address these problems and should not be implemented without consideration of the effect they have on the data on which they depend. Selecting and implementing an Information Systems Strategy capable of addressing such a wide range of applications is no easy task. The RCAHMS strat-

egy is to consider all these issues, to ensure that not only will there be an enhanced capability to meet user requirements, but that reliance can be placed on the character and quality of the archaeological data.

Bibliography

ASHMORE, P. J. 1992. "Coping with diversity through harmonisation", *in* Larsen, C. U. (ed.) *Sites and Monuments: National Archaeological Records*, pp. 217–219. National Museum of Denmark, DKC, Copenhagen.

BYRNE, K. F. 1993. "Information Systems at RCAHMS". In *Monuments on Record*, RCAHMS Annual Review 1992–3, pp. 14–16. RCAHMS.

COOPERS AND LYBRAND DELOITTE 1991. *Royal Commission on the Ancient and Historical Monuments of Scotland: Information Systems Strategy.*

MURRAY, D. M. 1992. "Towards harmony: A view of the Scottish Archaeological Database", *in* Larsen, C.U. (ed.) *Sites and Monuments: National Archaeological Records*, pp. 209–216. National Museum of Denmark, DKC, Copenhagen.

Mrs D. M. Murray,
RCAHMS,
John Sinclair House,
16 Bernard Terrace
GB-EH8 9NX Edinburgh