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contents

VOLUME I

Archaeometry

Statistics and Classification

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A Strategic Appraisal of Information Systems for Archaeology and Architecture in England – Past, Present and Future

1 Introduction

The growth of the available literature on sites and monuments records in central and local government in England has been notable, especially in publications arising from CAA. These contributions have mainly been submitted from the perspective of one of the three major interested parties, in local government, the county sites and monuments records (SMRs) and in central government, English Heritage (EH), as the national body concerned with conservation management, and the Royal Commission on the Historical Monuments of England (RCHME) as the national body of survey, record and dissemination. While these papers have made valuable inputs to the development of information systems, and have made reference to the links between systems, a published strategic overview of their inter-relationships, both in theory and in practice, has been lacking.

In a European and international context, the heritage record systems in England can appear confusing. This paper attempts to address the current synergy between these local and national bodies. It examines advancement in the context of the current initiative of the government's organ of heritage policy, the Department of National Heritage, to coordinate certain aspects of the operation of national heritage records, particularly in relation to records of statutory protected buildings. The paper also makes reference to progress made in developing national, European and international coordination of data standards. Our discussion will be measured against the likely future potential of the technology and the future requirements for providing access to information including the needs of conservation management.

In a provocative paper delivered to the CAA conference in 1994, Booth argued that archaeology had 'missed out' on the information age (Booth 1995b). He suggested that, despite the extensive use of information technology in a wide number of application areas within the heritage community — museums, cultural resource management, excavation and survey — this has not extended to the major media of dissemination. He concluded that this lack of dissemination through digital techniques risks making archaeology and, by implication, the built heritage, more marginal than it presently is in the public consciousness, reducing the potential for public participation in the heritage, because of a general failure to embrace electronic means of presenting information, whether as text, images or sound.

Although Booth's argument was not exclusively directed towards monument records systems, these were included in some detail as part of his review. It is therefore a pertinent component of his paper and one to which we shall return. To commence, we present a model of the information relationships between the various heritage bodies and related functions in England at the levels of policy, data and function. We then look in detail at the historical inter-relationships of these systems, and finally assess progress towards an idealised model and the extent to which these heritage information systems have transcended Booth's thesis. The paper also presents a new and comprehensive bibliography of the available literature on monuments records in England.

2 Information Frameworks in England

Figure 1 provides a model of the current policy frameworks within which the three principal heritage information systems operate. This functional model reflects the policy roles of the Department of the Environment (DoE) and the Department of National Heritage (DNH) and the executive functions of EH and RCHME. The DoE is responsible for setting planning policy for both central and local government and does not itself create heritage information. It does, however, manage records at a regional level. The DNH is responsible for heritage policy. This is subsequently executed by English Heritage (EH) for conservation management, and by the RCHME through its role in surveying, recording and disseminating information. Within local government, conservation and record functions for archaeology operate mainly at the county level and for the built heritage, primarily at a more local, district level. The current review of local government in England (1994-1995) is set to create further urban, and some rural unitary (single tier) authorities, augmenting the urban unitary authorities set up in the local government review of 1985/1986. To some extent, this will erode the current two tier

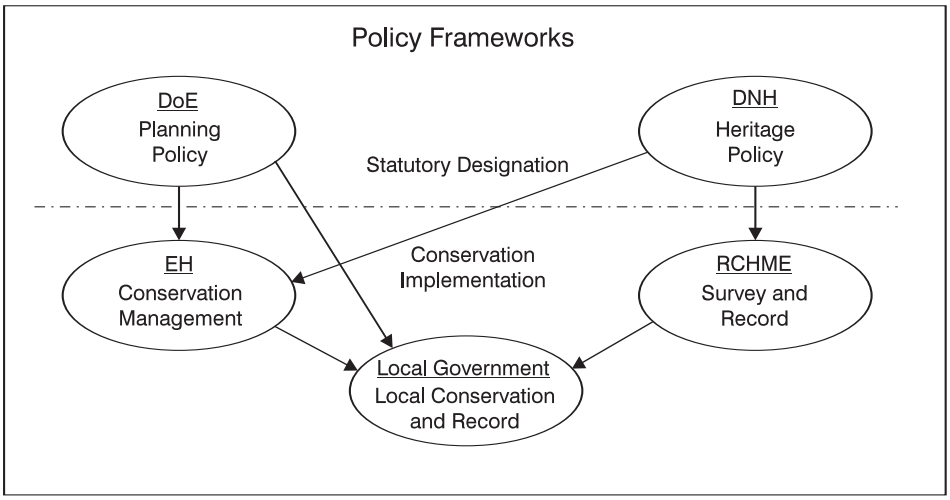

Figure 1. Policy Frameworks.

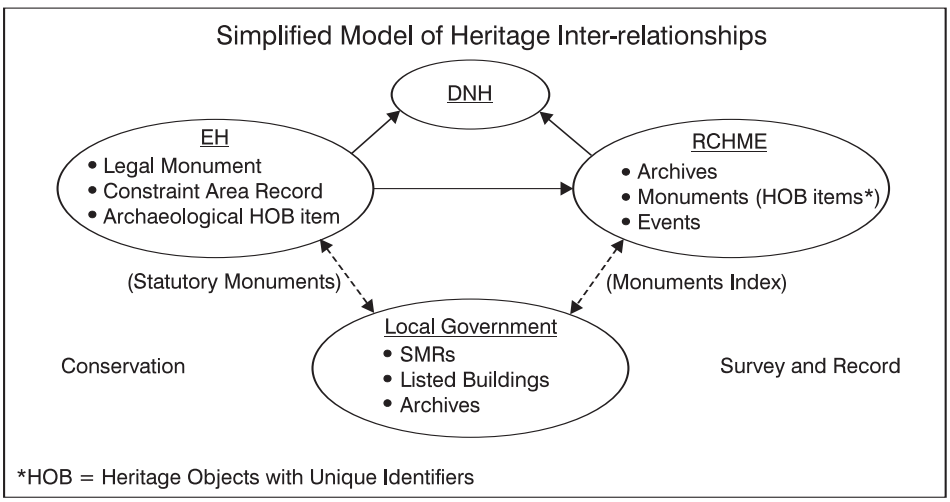

Figure 2. Simplified model of heritage inter-relationships.

system of local government comprised of counties and districts.

Figure 2 illustrates in summary form the principal data relationships between the information systems of the main holders of heritage information. EH information systems are oriented towards the automation of the conservation processes, including statutory protection and casework and RCHME systems towards the automation of recording, curation and dissemination processes. In local government are the county SMRs, complemented by records of historic buildings, largely held at district level for management purposes. In central government, EH is the government's adviser on designation for statutory protection, and RCHME the national body of survey, record and dissemination. These three records systems share several common interests in recording information on the historic environment and also have interests related to the functions of the host body.

The EH records system (mainly comprising statutory and management records) and the RCHME National Monuments Record MONARCH database (which includes both statutory and non-statutory records and associated data and archive for dissemination) have in common the concept of a 'heritage object', providing a close intellectual link between them. The National Monuments Record (NMR) of the RCHME and local SMRs are less formally connected, but a model (unpublished) agreement forged in September

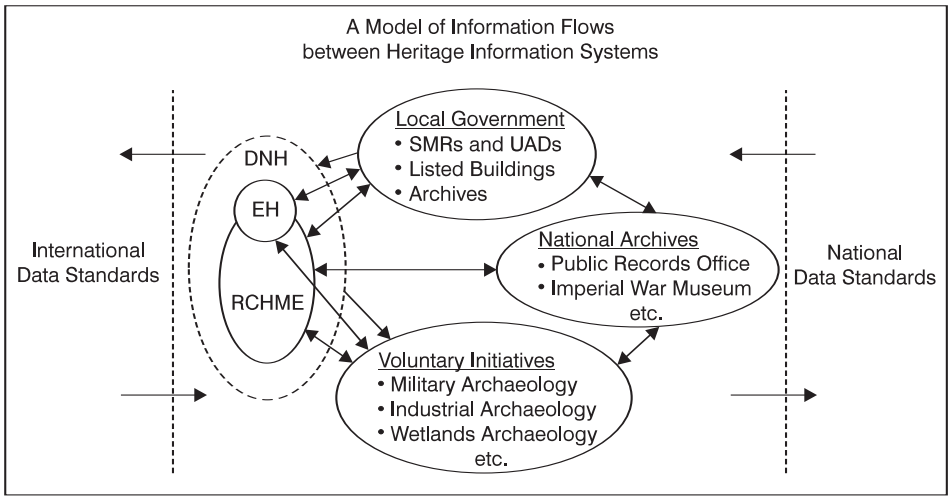

Figure 3. A model of information flows between heritage information systems.

1994 provides for the exchange of information between the two bodies at the level of a core index. This provides for information on the location, period, site type, form, condition and a basic reference for the site or monument. At a national level, it will provide the means to concord information on a thematic basis, and identify gaps in both local and national records. At a local level, it will ensure that all information on sites is registered as a constraint within the local planning process by SMRs.

A model of the information flows between the principal heritage information bodies is given in figure 3. At a national level, the combined records of RCHME (including its SMRs index), EH and DNH comprise the national heritage data set. Within local government, other, sometimes more detailed records are held primarily for the implementation of local management. Both interface with archives held locally (through County Archive Services) and nationally (for example, through the Public Record Office). Partly outside of this framework of public administration, there are also a growing number of 'voluntary' initiatives creating substantial databases concentrating on a theme, period or region. Many of these have received support in kind or through grant aid from the DNH, EH and RCHME. Each of these bodies contributes, in some respect, to the development of data standards, though contributions to international standards initiatives have tended to come almost exclusively from central government.

The next four sections of the paper look in more detail at the development of systems in local government, and RCHME and at the operation and impact of the Department of National Heritage at the policy level.

3 Sites and Monuments Records in local government

The English system of SMRs held in local government are unusual in a European context, where the norm is for unitary national records (see for example Hansen 1993). The situation has recently been further complicated by the development of SMRs at a district level, and by the creation of Urban Archaeological Databases, centred on the 30 or so most important historic urban centres in the country (EH 1992b).

While local government SMRs have benefited from a considerable degree of central government funding, they have maintained a singular independence, expressed both at the level of their national body, the Association of County Archaeological Officers (ACAO) and through the individual constitutional status of their host bodies.

Local government SMRs are a discretionary function of local government. The first were established as manual systems in the late 1960s (Benson 1974). The development of local sites and monuments records in the last 21 years has been an impressive phenomenon, in parallel with the growth of the RCHME National Monuments Record (see below). In 1973, when ACAO was first set up, there were just 5 members, and only one county had considered a programme of computerisation of its SMR records. The nearest equivalent to a national archaeological record at that time was the index records and maps held by the Archaeology Division of the Ordnance Survey, Britain's National Mapping Agency, which was then an entirely manual system. All SMRs in England have to some extent been founded on this card index, which was transferred to the RCHME in 1983.

Despite these modest origins, the importance and potential of local SMR record systems was recognised from an early date. In 1974, a working party on archaeological records was set up by the Council for British Archaeology, at the request of RCHME, which published a joint report in 1975 (CBA 1975). While this did not lead to the adoption of the common standards which many had hoped for, it did make the important distinction between the compilation of 'intensive' and 'non-intensive' records at national and local levels, and this has been influential in the development of records ever since.

The Survey of Surveys, undertaken by the RCHME in 1978 (RCHME 1978) urged the establishment of compatibility and standardisation of local records, a theme to which we shall return. It noted the extent of non-conformity, but recommended that 'County-based sites and monuments records should be the major, detailed archive for their areas'.

The significant investment in the development of computerised SMRs in the mid 1980s by EH, in part to assist its Monuments Protection Programme, built rapidly on these earlier foundations and helped to create the information base and architecture of 'cultural resource management' in English local government as we know it today.

In 1989, the RCHME was given the task of coordinating local SMRs, a responsibility confirmed in its new Royal Warrant of 1992. It has assisted developments through the production of joint data standards (RCHME 1993b), a review of SMRs (RCHME 1993a), and the development of the MONARCH for SMRs product, which is currently being piloted in four sites, and is likely to be used by at least a quarter of the SMRs in England.

4 English Heritage – the national conservation body

4.1 Background

English Heritage (EH) is sponsored by the governments Department of National Heritage (DNH) to undertake statutory responsibility for preserving England's architectural and archaeological heritage and for encouraging the enjoyment of the historic environment. It advises the government on statutory protection such as the scheduling of monuments and the listing of buildings and gives grants towards conservation generally. It manages and markets nearly 400 historic properties in the care of the state, including world-famous sites such as Stonehenge, parts of Hadrian's Wall and the Iron Bridge at Coalbrookdale. Many of the records it creates for operational purposes also form part of the permanent public national archive curated within the NMR of the RCHME.

EH was established in 1986 and most of the functions assumed at that date had been undertaken previously by the Department of the Environment. There has been a long tradition of heritage computing within the Department and EH, including applications for scientific analysis (for example see Jones *et al*. 1980) and archaeological excavation and other investigations (Hinchcliffe/Jefferies 1985; Jefferies 1977), but this paper concentrates on information systems which support monument records. The key areas are the scheduling of monuments and listing of buildings with their associated processes and spatial and graphic requirements.

4.2 Scheduling of Monuments

The history of the DoE/EH record of scheduled monuments is described in Booth 1988a. Computerisation began in 1980, using a suite of programmes originally developed for recording excavations and known subsequently as 'Version 1 Software'. By 1984, facilities for on-line data entry, editing and interrogation were required and Southdata's Superfile package was selected. From 1986, EH began to plan an enhanced programme of scheduling known as the Monuments Protection Programme (Darvill *et al*. 1987). It became evident that the record would no longer be a relatively static Inventory of monuments and that a new system would be required to manage the data and to automate much of the scheduling process (involving among other things the writing of around 50 letters for each of the monuments scheduled), and to provide a dynamic system for the management of monuments. The system, known as the Record of Scheduled Monuments (RSM) was designed during 1986-1989 and implemented for the automation of the scheduling process in 1991 (Clubb 1991a, 1991b; Clubb/Startin 1995).

Also in preparation for MPP, EH implemented in 1987 a computer mapping system providing for the management of 6,000 'raster' images of Ordnance Survey maps of England and the vectorised outlines or constraint areas of monuments (Clubb 1988). This system has fulfilled every expectation, but is now (1995) looking old-fashioned in its functionality and is reaching the end of its useful life.

4.3 Listing of historic buildings

The computerisation of listed buildings has a different history. Problems in securing funding for the computerisation of listed buildings records (Clubb 1995) led to the introduction of a partial interim solution to support the listing process within EH (Clubb/White 1990). Following a review of the cycles of activity and flows of data relating to the listing process, a Clipper compiled version of dBASE was established for the processing of listed buildings recommendations to DNH since 1990, but this holds merely a small proportion of the total number of buildings listed. The mapped representation of listed buildings at a national level has remained as a manual system.

4.4 Strategic developments

The first strategic review of information systems within EH took place in 1991-1992 (for details see Clubb/Startin 1995) and confirmed at a corporate level some of the concepts developed in the RSM, particularly the relationships between the monument and building records and their associated procedures and case-work and the requirement for flows of information from and to other bodies, including DNH, RCHME and local SMRs. It is understood that subsequent strategic analysis at EH has focused on the requirements for spatial and geographic information and on detailed data modelling and definitions.

A major achievement of EH activity on monument records has been the development of the complex model which embraces archaeological items, monuments as legally defined and areas of land (constraint areas) which do not necessarily have a one to one relationship (fig. 2 above). These have different attributes associated with them and different management implications.

5 Royal Commission on the Historical Monuments of England – the national body of Survey, Record and Dissemination

RCHME is also sponsored by DNH and was established in 1908 to investigate and report on the historical monuments of England (prior to 1992, it was sponsored by DoE). Its record and archive functions have expanded in recent years with the assumption of responsibility for the National Buildings Record (1963), the archaeological records section of the Ordnance Survey (1983) and the national library of air photographs (1984), all now managed and disseminated within the unified National Monuments Record (NMR). The NMR also provides an access point for certain records created by EH in the course of its operations. The first major computer implementation was the archaeological record from 1984, as the permanent national public database for buildings and monuments (Aberg/Leech 1992; Beagrie 1993; Grant 1985; Hart/Leech 1989; Lang 1995).

A strategic review of requirements was carried out in 1990 and this recommended the development of a unified data-base to replace the original archaeological data-base and a number of other archaeological and architectural data-bases, again using Oracle. The new system (MONARCH) was developed in 1991-1992 and implemented in 1993 (Beagrie 1993). However, its major contribution to the development of monument records is undoubtedly the analysis and implementation of the complex model which relates monument records, activities/event records, archive and bibliographic recording and the roles of individuals and institutions (fig. 2 above). Two other significant advances are the development of a sophisticated thesaurus module and a general enquiry mechanism which provides powerful retrieval facilities to individuals with little or no programming experience. Recent strategic analysis within RCHME has focused on the requirements for spatial and geographic systems, in parallel with similar EH initiatives.

In 1989, government gave RCHME a lead role for the coordination of local SMRs in England (RCHME 1990b). In 1993 RCHME published a review of local SMRs (RCHME 1993a) which seeks to establish a new partnership between local records and the national record.

It is worth considering here the degree of co-operation achieved by RCHME and EH to date. As stated above, both organisations recognise the concept of the 'heritage object', an entity which may have a one-to-many or a many-to-one relationship with physical space (such as constraint areas or land parcels) which is at the heart of their information systems. Both also agree on the concept of 'core' data, a sub-set of the record system defining type, location, status and source authority ('references') for monuments as the basis for compatibility of information at national and international levels (see section 8 below; Clubb/White 1990; Bold 1993b; Grant 1990b). They have cooperated in data standards (Booth 1988b; RCHME 1993b). EH and RCHME have produced joint publications on thesaurus terms for monument and building type (RCHME; EH 1989, 1992, 1995). There has been co-operation on relationships with local SMRs (RCHME 1993a). The decision by EH to adopt Oracle software for the RSM implemented in 1990-1991 was influenced directly by its use in RCHME and the potential for sharing expertise between staff and the requirement for flows of information between DNH, EH, RCHME and local SMRs. Most recently, there has been cooperation in the context of the DNH's proposal for a heritage management database.

6 The Department of National Heritage and the Heritage Management Database

6.1 Background

The main role of the Department of National Heritage is to help foster the ideas, creativity and skills which help generate new heritage work and which care for the inheritance of England's past. Its role is thus essentially one of policy rather than direct involvement with operational issues.

Many of the functions of DNH resided with the Department of the Environment prior to 1993. The DoE as sponsoring body for EH and RCHME and, indeed, with an interest in local SMRs through its oversight of the planning process, did not intervene significantly in heritage records matters. One exception was that it supported EH in 1988 on the choice of Oracle for the RSM system on the grounds of compatibility with RCHME. However, the DoE were

reluctant to take a proactive role between 1986 and 1993 in encouraging the computerisation of the statutory lists of historic buildings which were still a major omission from the national record (see above; Clubb 1995). Ten major studies (and several lesser studies) were produced between 1986 and 1993, but funding for the work remained elusive until 1994, given the costs of retrospective computerisation (around £ 2 million), until the present Heritage Management Database initiative was launched.

6.2 The Heritage Management Database

The various studies and initiatives carried out by RCHME and EH attempted to deal with the requirements of other bodies, including SMRs, as well as their own needs.
A significant new development coincided with the transfer of heritage sponsorship responsibilities from the DoE to the new Department in 1993. In particular, the new Department showed greater interest in coordinating certain aspects of the information strategies of its sponsored heritage bodies. The situation had changed following a report in 1992 by the Audit Office which commented on the lack of computerisation of the lists of the 500,000 or so listed historic buildings in England (National Audit Office 1992). The new Department of National Heritage decided to act on an earlier internal Information Systems Planning Framework report within the Heritage Division, then still part of the Department of the Environment, which recommended that a feasibility study was needed to determine the requirement for a National Heritage Management Database. In 1993, the Department of National Heritage commissioned consultants Ernst & Young to carry out a feasibility study into the National Heritage Management Database (Ernst & Young 1993).

The substantive project began in Autumn 1994 including the generation of indexes by RCHME to the agreed data standard. The development of the data standard for listed buildings is based on existing initiatives. The list is due to be fully computerised by 1996, with well-developed links to the RCHME MONARCH system. There is an appreciation of the requirement to link the listed building record with other data, both images of the buildings and spatial/geographical information, although these are not currently funded.

6.3 The impact of the Heritage Database on RCHME and English Heritage

The project is intended to reflect the operational roles of RCHME (recording, curation and dissemination) and EH (conservation management). As stated last year (Clubb 1995), two main issues continue to be of interest; the proposal for two main computer platforms, and the tripartite management arrangements between DNH, EH and RCHME which will govern how the proposals work out in detail, given the medium to long term problems to be solved in coordinating the information systems strategies of organisations which may have different priorities and different cycles for budgeting and planning. The Ernst & Young proposal for the computing platforms is set out in summary form in Clubb and Startin (1995). One computing platform hosted by EH is planned to support the new heritage management database and maintain the records of statutory constraints such as listed buildings and scheduled monuments. This platform is linked closely to the DNH and EH systems which support the process of listing and scheduling on the one hand and their case management systems on the other.

In parallel with the new platform is the RCHME National Monuments Record (MONARCH) system, already in place, which, under the proposals of the study, is set to contain an updated copy of the publicly-accessible sections of the heritage database (in effect, a record of statutory constraints) as a sub-set of the total national record to be disseminated. Links to the local authority sites and monuments records are provided through the 'extended' National Monuments Record (see also RCHME 1993a).

The listed buildings project represents a significant development in monument records at national level. Not only has there been a more proactive policy role on the part of the sponsoring government department, but the potential, if funding permits, that a similar approach might be adopted for future developments such as spatial/geographic systems and imaging/multi-media services means that the information system strategies of the three bodies would need to be finely tuned to each other for the foreseeable future, at least in respect of records of monuments/buildings with statutory protection and their dissemination. This would have both advantages and potential problems at an operational level.

7 Data standards and European/international cooperation

7.1 International data standards

While DNH, EH and RCHME have all taken an interest in data standards and co-operation at European and international levels, as have the equivalent bodies for the rest of the UK, RCHME has taken a lead role in these areas in England as the national body of survey and record. Data standards begin at national level and the role of RCHME in conjunction with EH and local SMRs has been described above. At European and international levels co-operation has been initiated on the basis of both architectural and archaeological documentation. The concept of a European core data standard for the documentation of the architectural heritage was first discussed at the Council of Europe Round Table in London in 1990, organised under the architectural

documentation programme of the Cultural Heritage Committee in cooperation with RCHME (Council of Europe 1990a) and developed further at a European colloquy organised by the Council of Europe and the French Directeur du Patrimoine in Nantes in 1992 (Council of Europe 1993). Proposals for the core data index are set out in Bold 1993b and approval of the representatives of the participating governments of the Council of Europe is anticipated very shortly.

The major international development on core data standards for archaeological sites has been carried out under the auspices of the International Documentation Committee (CIDOC) of the International Council of Museums (ICOM). The Archaeological Sites Working Group is chaired by Roger Leech of RCHME and is well advanced in preparing a standard due to be made available in draft at the triennial ICOM meeting at Stavanger, Norway, in June/July 1995. This standard is intended to be compatible with the European core data index for architectural documentation. It is being developed as a European initiative under the auspices of the Council of Europe for discussion at an international conference on archaeological heritage documentation to be held at Oxford in September, 1995. Both architectural and archaeological standards are compatible with the core standards recommended for use in the UK and employed by DNH, EH and RCHME.

Finally, within the context of terminology control, several multi-lingual thesaurus projects have been initiated. For architectural records, the International Terminology Working Group, sponsored by the Getty Art and Architecture Thesaurus (AAT), includes the AAT, the L'Inventaire Général, the Royal Institute of British Architects and the RCHME, and liaises with the Council of Europe. For archaeology, a pilot project under the auspices of the Council of Europe is working towards a multi-lingual glossary of monuments for the European Bronze Age (Council of Europe 1995).

7.2 Local government data standards in England

Notwithstanding the significant level of agreement at national and international levels, traditionally, local SMRs have not concerned themselves greatly with data standards. A modicum of communality has been achieved through the promotion of standards by the Department of the Environment and EH (DoE 1981), and more recently, through the jointly developed Data Standard for the extended national archaeological record between the ACAO and RCHME (1993b), although the latter is too recent to have yet made a major impact. Commonly agreed local authority standards for the recording of standing structures are, if anything, even less well established, although RCHME has provided guidance for buildings recording conventions (RCHME 1990c, 1991).

Although the original support provided by the Department of the Environment and EH for SMR development was coupled with suggested data fields, adherence to this structure was not mandatory, and was viewed as being of secondary importance compared with the political imperative to establish a local SMR network. Recording instructions, where developed, were not coordinated. Hence, between local recording bodies, many of the problems of consistency and compatibility, highlighted in previous reviews, remain (e.g. Chadburn 1989; Lang 1992; RCHME 1993c). Indeed, in some instances, local SMRs have preferred to make a fresh start on their record, using data from the RCHME National Monuments Record as the basis of their system as the most cost-effective option for achieving consistency in data compilation.

Standards work has not been prominently exploited by local government SMRs, though valuable contributions have been made both through the efforts of individual sites, and through input to national fora (for example, the ACAO and RCHME Data Standards Working Party, which led to the publication of the Data Standard for the Extended National Archaeological Record (RCHME 1993b)).

To the extent that local authority SMR staff are often fully committed to case work as opposed to records maintenance, the growth of developer funded archaeology in the last five years has meant that SMRs have become a victim of their own success. The increasing demands of development control-related duties threaten, in many Counties, to undermine the continued development of the very record providing the basis for planning decisions. The RCHME's SMR Review (RCHME 1993a) highlighted the staff shortages and growing recording backlogs in many SMRs. These shortcomings are exacerbated by the shortage of available funding to adhere to published standards, and to migrate from some of the older database management systems, which are now coming to the end of their useful lives.

Data modelling has been less prominent in the development of local government SMRs, but significant progress is being made in some counties in the development of spatial information systems. Some of these are currently in advance of developments in either of the two national bodies, predominantly, though not exclusively, because of difficulties in negotiating an affordable national mapbase.

8 An idealised model of information relationships

Following on from the above assessment of existing national and local systems in England, it is possible to describe an idealised model of information relationships

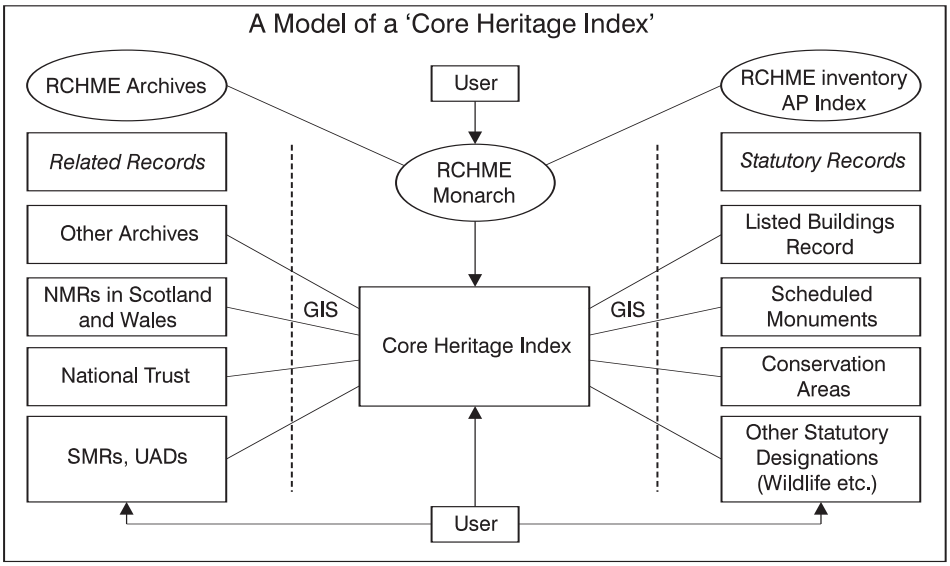

Figure 4. A model of a 'core heritage index'.

between these systems. The physical mechanisms behind this model are beyond the scope of this paper (whether through a physical network or through use of a smart meta-data set), but in either case, the underlying principles may be applied. The system we have in mind would be accessible through a national publicly accessible spatial index, which could interrogate a core heritage record common to all of the three information systems we have previously described (fig. 4).

It is suggested that the RCHME is the logical body for the management of such an index given its national role in survey, record and dissemination, its lead role for SMRs and its substantial data bases and archives which add significant value to the index concept. RCHME's archive and inventory, both retrievable through its MONARCH information system, provides a substantial base in combination with statutory records of archaeology, architecture and ecology and related non-statutory records held by other bodies for a powerful spatial database of the historic environment.

We would envisage that further information held in addition to the core index could be made available for public dissemination via the custodian body as the intensive disseminator of that information, or supplied on a more restricted basis to other custodians of information within the network (for example, where confidential management implications apply). The model would assume there will be at least some elements of a physical (or meta-physical) network between participating bodies enabling data sharing and dissemination, and that satisfactory agreements would exist covering ownership, copyright, security and standards issues. While not wishing to diminish the difficulties attendant on turning this model into reality, it may be suggested that the foundations for its deployment are in large part in place.

9 Conclusions

In the first section of this paper, we referred to Booth's hypothesis (1995b) that archaeology had missed out on the information age. In the light of the above, in relation to heritage information systems, this thesis seems to us to be one requiring further qualification.

We have attempted to demonstrate in this paper that significant steps *have* been taken towards establishing compatible information systems within archaeology and architecture. There has been progress in the development of data standards, controlled vocabulary and reference data both at national and international levels. In England, developments in geographical and spatial information systems, imaging and multi-media have often been more feasible at a local rather than a national level. Nonetheless, the data standards and models already established provide a springboard for future national development. We would therefore contend that significant progress is being made towards a coordinated approach, leading to a coherent information network embracing not merely our national interests, but with the rapid potential to expand to our European colleagues, and indeed to operate within a truly international framework.

Information systems for the historic environment in England have been developed originally without a central model guiding their deployment. In RCHME and EH,

significant progress has now been made on data modelling. Robust systems now exist in the EH RSM, governing the relationship between archaeological items, constraints and legislative processes and in the RCHME MONARCH system, governing the relationship between events, monuments and archives. Support for the processes of scheduling of ancient monuments, listing of buildings and monument recording is generally well developed and effective, underpinned by the key concepts of the 'heritage object', 'core data', data standards initiatives and the integrated archaeological and architectural thesaurus. Archival recording is perhaps less well established, but through the development of the archive module of the RCHME MONARCH system during 1995-1996 significant progress may be expected over the next year. Issues of funding, however, still dampen progress with spatial and multi-media projects associated with these models at a national level.

These, then, are some necessarily tentative thoughts on the inter-relationships of the principal archaeological and architectural information systems in England, and their current relationship to complementary systems abroad. We would welcome seeing more papers from our colleagues in other countries setting out the relationships between their respective heritage information partners. The more explicit documentation of the inter-relationships of heritage information systems in Europe may help us move perceptibly closer towards truly integrated systems.

Notwithstanding this, Booths's assertion concerning the compatibility and retrievability of data does raise significant concerns, which must be addressed through much greater investment in developing communal and compatible interfaces to information systems, or rigorous meta-data routines. Ultimately, these should enable our systems to communicate with one another, in effect, in a common language. This would seem to be a pre-requisite for the widespread digital dissemination of monument record information. There is, thus, some truth in Booth's suggestion that heritage data is still not disseminated effectively in England to the wider heritage community and beyond. Issues of protecting monuments against metal detector abuse and buildings against architectural thefts still require resolution in terms of the free supply of information (for example, see ACAO 1991, 1992; Council of Europe 1990b; Stine/Stine 1990). However, the essential models for the effective management and dissemination of heritage data are now in place. The European heritage and traditions are shared and valued by millions throughout the world, and can only gain strength and vitality through fostering an accessible, commonly understood medium of interchange.

Acknowledgements

This paper is based on existing published literature but, of course, the analysis remains our responsibility. The ideas will undoubtedly require further development and refinement in the light of further analysis of the strategic and business requirements of the local, national and international heritage community and the public. We are grateful to many colleagues in EH, RCHME and local government, and in central government in Europe and the United States for stimulating a debate over a period of some years which has made this paper possible.

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