Have we Failed to Provide a Strategic Vision for Information Systems in Archaeology?

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Abstract

During the celebrations of the last twenty-five years of the Computer Applications in Archaeology (CAA) Conference in 1997, it is timely to look back over the papers presented on the innovative use of computing in many individual projects in archaeology. The concept of 'computer applications' in the conference title has, perhaps, encouraged the submission of case studies to conferences, rather than strategic and corporate analysis. It may be argued that there are omissions in the body of CAA literature concerning the potential of information systems to improve communications within the discipline and dissemination to the new mass market opened up by new technology. Elsewhere, there is a continuing concern at the contemporary state of British archaeology, including the lack of a broad intellectual and political framework and a sense of isolation and fragmentation in the discipline (for example, see Olivier 1996). It is surprising that there are few CAA papers which have attempted to review the strategic direction of the use of information systems in archaeology across its various sectors, including academics, national and local government, archaeological fieldworkers, museums and education and the voluntary sector. There does not appear to have been a serious analysis of how the discipline might use the technology to communicate its vision and knowledge to society. This will be particularly important as initiatives on access to information impact on organisations sponsored by Government (see Cabinet Office 1997) and increasing numbers of individuals develop high expectations of access to international networks. This paper attempts to:

1. revisit the key papers delivered over the last twenty-five years which surveyed and/or classified computer applications in archaeology or sought to address the management of information systems to achieve strategic objectives

2. summarise current initiatives relating to the management of heritage records in England and the UK. It suggests a significant change has occurred during 1996 and 1997, giving rise to some optimism for the future direction of information systems. It also suggests that some new frameworks may be needed to plan, develop and implement such a programme.

3. signpost the potential role of the Council for British Archaeology (CBA) as the most inclusive organisation in the UK in facilitating a strategic programme for information systems in archaeology.

1 The purpose of strategic planning for information systems

Information systems have long been required by virtually all organisations, including archaeological organisations. The initial purpose of strategic planning for information systems in the public sector was the rather prosaic, but critical objective of ensuring benefits in return for the investment in information systems for the business objective (CCTA 1989), which is often considerable. This approach assumes that the goals of the business are known and understood and may force organisations to clarify or further refine goals, if they are not sufficiently clear. Information systems should support their achievement of objectives. The administrative benefits which might be expected, therefore, are as follows:

1. Achievement of business and policy objectives

2. Development of new business opportunities

3. Communication, internally and externally

4. Effective allocation and use of resources

5. Increased efficiency and effectiveness at lower cost

6. Integrated use of systems

7. Reduced risks of abortive expenditure

Of equal, or even greater importance, corporate organisations should, and normally do, develop information systems strategies as part of the articulation of their overall business vision. This should be one of the vehicles of ensuring effective organisational management. Within the UK and elsewhere, most heritage organisations of any size, including the national public-sector heritage bodies, such as English Heritage (EH) and the Royal Commission on the Historical Monuments of England (RCHME), have developed strategies and attempted to update them to reflect their changing business environments. Without such strategies, information systems risk developing as islands of technology. Over the course of the history of archaeological computing there have been clear indications of this link (Clubb and Startin 1995). Information strategies depend on analysis and understanding of requirements, followed by the analysis of data and processes to meet those requirements. They should always be driven by the users of information systems. It follows that the compilation, curation and dissemination of information should be properly analysed and understood, with the strategy being driven by the requirements of the users and that technical solutions should be based on a business case and an appraisal of available options (for example Clubb 1989).

Information systems are also concerned with flows of information, both within an organisation and in relation to the outside world. There seems to be no intrinsic reason why

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common strategic benefits of information systems could not be provided for a whole discipline such as archaeology, covering all organisations and directly supporting the objectives of archaeology itself.

2 A retrospective on Information Systems Strategy

An information systems strategy for a heritage organisation can only be established if the objectives, activities and uses involved are fully understood. Contributors to CAA and other conferences over the years have often tried to classify the various uses of computing in archaeology. Since the papers have different aims, they may only serve as crude, although useful, indicators of changing perceptions of the relationship between information systems and archaeology over the last 25 years. Three examples have been chosen to illustrate thinking at different points in time. The papers chosen are:

1. Wilcock 1973

2. Cooper 1984

3. Ryan 1988

2.1 The Wilcock classification of 1973

In 1973, Wilcock attempted a classification of the use of information technology in archaeology as part of a wider survey of computing (Wilcock 1973), and are summarised in Figure 1.

Data banks and information retrieval
Specialist data
Museum records
Excavation records
Statistics
Seriation
Multi-dimensional scaling
Trend surface analysis
Clustering
Routine reduction of instrument survey readings
Graphics

Figure 1: Wilcock's 1973 functional grouping of archaeological computing

Wilcock's classification was a commendable start, reflecting many of the perceptions of the time. However, in retrospect, his paper illustrates that the relationships and flows between the different types of applications were not fully understood at this date and there was little analysis of the objectives of computing. Wilcock reflected the early interest in computing in higher education with areas such as museums and excavations grouped generically as 'databanks and information retrieval'. The use of information systems in Sites and Monuments Records (SMRs) was largely absent. This is, perhaps, unsurprising, since early SMRs did not, in the main, have access to computers. Many archaeologists in

local government shared a suspicion that they would be more of a hindrance than a help (see Burrow 1985b).

2.2 The Cooper classification of 1984

Over ten years later in 1984, Cooper produced one of the few papers published on the need for a national strategy for computing. It is arguably one of the most important papers on archaeological computing published in the UK (Cooper 1985). His attempt to classify computer systems in archaeology is set out in Figure 2.

Field archaeology
Excavation
Post-excavation
Research
Statistical and multi-variate analysis
Simulation and spatial analysis
Cultural resource management

Figure 2: Cooper's 1985 grouping of archaeological computing

Cooper demonstrated an understanding of the cycles and relationships between different types of computer application and of computers as part of the business infrastructure for archaeology. He recognised that the future of computers in archaeology should be based on an explicit and long-term strategy, rather than implicit and random developments. While he criticised the failure of the national archaeological organisations to take a lead, he also recognised that none of them had the full range of responsibilities necessary to make such a strategy work for the discipline. He advocated that a single national body should be given the responsibility of establishing goals for archaeological computing, both short and long term, as well as the prioritisation of those goals. He also identified the need for a policy statement and the establishment of mechanisms to bring together discordant interests. His paper reflected some of the changes in practice brought about during the 1980s, with an emphasis on the need for archaeology to become more business-like. Cooper suggested that archaeologists should become more familiar with management theory. At the time, this may have seemed quite radical to his contemporaries, but this view has now gained increased support.

The use of computing to support the management of archaeology was still new in 1984. At that time, the Department of the Environment's record of scheduled monuments was a relative pioneer of heritage management records. This was established in 1980 (Chadburn 1988), while in 1983, optical coincidence retrieval systems were still the major mechanism in the retrieval of SMR information, with limited use of machine-based retrieval (Fraser 1985).

2.3 The Ryan classification of 1988

A classification of computer applications in archaeology was made in conjunction with Nick Ryan's important

bibliography of qualitative applications and quantitative methods in archaeology (Ryan 1988). The principal findings of this classification are summarised in Figure 3.

Quantitative methods and simulation

Finds analysis

Survey and excavation recording and stratigraphical analysis

Sites and Monuments Records

Graphics

Expert systems and knowledge representation

Education

Publication

Scientific techniques

Museums

General

Figure 3: Ryan's 1988 grouping of archaeological computing

Ryan's list reflected a more detailed understanding of the cycles of activity linking different applications. By the late 1980s, management training for archaeologists was more common and within the 'General' category, papers on the specific use of computing for strategic and management purposes were starting to appear (recognising that computing has a part to play in the organisation of archaeology as a holistic discipline, not just in discrete projects). His bibliography contained a significant body of literature on both national and local organisations, (for example the papers referenced from Burrow, 1985a). Above all, Ryan's categories provided a basis for the understanding of a cycle of activity in archaeological computing from investigation to analysis, interpretation to curation, and dissemination together with the requirement for further investigation.

3 The CAA 93 session on strategic planning issues

The classifications summarised above are interesting as historical snapshots, but they do not provide any serious analysis of the ultimate aims of computing in archaeology. During the early to mid 1990s, there was a debate about the use of information systems in the management of archaeological organisations. By 1993, some archaeologists had expressed a concern that even those who had a specific interest in archaeological computing were not taking its use for the management and communication of archaeology seriously. In response, Booth organised a session on strategic planning issues at CAA 93 (Wilcock and Lockyear 1995). In his preface to the session (Booth 1995a), he suggested that the identification of the importance of information as a key resource within organisations had caused many institutions to treat information systems and information technology in a strategic manner. He argued that archaeology, as an 'information-rich' discipline, should

also adopt this pattern. He went on to suggest that if information technology were to justify its costs, it must be closely aligned to the business aims of the organisation it purported to serve.

The session on strategic planning at CAA 93 resulted in five published articles. Three of these were concerned with the development of information strategies and systems by organisations responsible for recording, protecting and managing the archaeological and built heritage, one with local government and one with a large national museum. The contributions from the larger organisations stressed that information is a key corporate resource within an organisation and, as with other resources, such as finance, staff and property, it must be managed effectively in order to help achieve the objectives of the organisation.

One paper dealt with the development of information systems strategies within English Heritage (Clubb and Startin 1995). This explored the relationship between business goals and information systems as well as the requirement to manage internal and external flows of data to serve the business. Another paper (Cooper and Dinn 1995) showed how even in a relatively small body concerned with a local administrative area (the archaeological service within Hereford and Worcester County Council), the effects and importance of information systems and technologies can be much greater than might be anticipated. The purpose of their paper was to investigate the relationship between archaeological organisations and computer technology from a management perspective. Technological change is likely to have significant influence on both archaeological organisations and their structures and also on the roles of archaeological professionals. Hence, discussions between organisations should be of great value to the discipline as a whole.

Another paper (Booth 1995b) reviewed the development of an information systems strategy for a large national museum (the National Science Museum) and showed how such an initiative had established, as a central objective, the encouragement of communications throughout the organisation. Booth identified the highest priorities which information technology can address as being improvement of the management of the museum, information resources and their use, delivery of service to the public and the generation of revenue and cost effectiveness.

The papers delivered in the session of 1993 were an important contribution, but in the main, they dealt with the role of strategy within organisations, not between them.

4 The Booth key-note address of 1994

In a provocative key-note paper delivered to the CAA conference in 1994, Booth continued his campaign, focusing on the discipline as a whole, rather than individual organisations (Booth 1995c). He identified the hallmarks of the 'Information Age' as being substantial increases in computer processing power, and the convergence of computing and telecommunications, (and latterly, with mass entertainment). Booth identified the potential for the dissemination of information via high-speed networks and easily distributed media such as CD-ROM as one of the

major benefits of these developments. The use of such techniques as multi-media, hyper-media and virtual reality have made information more accessible to its users.

Booth concluded that the performance of archaeology in terms of the 'Information Age' has been disappointing. In his review of relevant literature, he acknowledged that there have been papers discussing strategic issues for individual organisations and there has been guidance on the development of Inventory records at national and local levels. However, in terms of excavation records, he argued there have been no moves towards the adoption of a national system. Moreover, there has been little discussion of the relationship between archaeological fieldwork and museum collections. His assessment of archaeological fieldworkers who have the responsibility to recover, analyse and disseminate the results of their work was particularly harsh, suggesting that for the most part, they have not taken advantage of available technology. Overall, Booth's thesis suggested that the lack of dissemination through digital techniques would make archaeology - and, by implication, the built heritage - more marginal in the public consciousness. He considered this general failure to embrace contemporary electronic means of presenting information, whether as text, images or sound would reduce the enthusiasm for public participation in the heritage.

5 A response to Booth in 1995

At the following CAA conference in 1995, there was an attempt at a strategic appraisal of the past, present and future of information systems for archaeology and architecture in England. In part, this was aimed to provide a response to Booth's presentation of the previous year (Clubb and Lang 1996). This analysis concentrated on monument record systems, which limited its scope. It presented a model of the information relationships between the various heritage bodies and their related functions in terms of policy and data. Clubb and Lang then looked in detail at the historical inter-relationships of the systems created, assessed progress towards an idealised model and the extent to which those heritage information systems have transcended Booth's thesis. They concluded that there is some truth in Booth's suggestion that heritage data is still not being disseminated effectively to the wider heritage community and beyond. Nevertheless, they also argued that significant steps have been taken towards establishing compatible information systems within archaeology and architecture, notably in the development of data standards, controlled vocabulary and reference data, both at national and international levels. They noted that progress and developments in geographical and spatial information systems, imaging and multi-media have often only been feasible at a local rather than national level.

Clubb and Lang concluded that, at least for monument recording systems, significant progress was being made towards a co-ordinated approach which would, in time, lead to a coherent information network, embracing not only national interests, but with the rapid potential to operate within a truly national framework, although the precise nature of this framework was not described.

6 Darvill's critique of 1995

Also in 1995, a critique was presented by Tim Darvill of the difficulties for users in gaining consistent access to the various discrete information systems in England. His comments were based on his experience in using national and local records in connection with the English Heritage-funded Monuments at Risk Survey (Darvill 1995). While advocating geographical information systems (GIS) as part of the solution, he warned that "before the powerful new engine of GIS is hitched to a rickety old cart", there would be a need for more strategic thinking by the national bodies, greater co-operation between the creators, curators and users and further research and development.

Darvill has long been an advocate of the view that archaeological information must be seen as part of a much wider environmental dataset in a global context.

7 Recent developments

In spite of the development of sophisticated information systems strategies in the national organisations and a number of local authorities as well as national museums, the lack of strategic direction in computing for archaeology across the whole discipline as a whole is not very encouraging to date. However, there have been a number of initiatives during 1996-7 which give hope for a better future. These include the following:

1. a contribution to the establishment of a research framework for archaeology in England which should help set objectives for the conservation sector of the discipline

2. increased partnerships between organisations and sectors of the discipline within the UK, notably initiated by the higher-education sector, and between museums and Inventory records in Europe, including research into metadata as a mechanism for retrieval across data-sets

3. the proposed quantification of the resources required to provide the necessary infra-structure for the development of a strategic approach for records of sites and monuments records for the profession and for society at large

4. renewed interest by the Council for British Archaeology

5. improved mechanisms for the development of data standards.

These initiatives are dealt with in more detail below:

7.1 English Heritage research frameworks

In 1996, English Heritage published Frameworks for our past (Olivier 1996) as a review of research frameworks, strategies and perceptions of current concerns over a general lack of academic focus and content in areas of archaeology, especially those driven by PPG-16 on Archaeology and Planning (DoE 1990). The review suggested that there is a vacuum at the heart of conservation policies. Olivier recognised that the discipline required a general framework within which to consider curatorial concerns and make recommendations for the protection and recording of

archaeological sites. He argued for an integrated approach that combines expertise and information, academic processes and public appreciation, national and local organisations and professionals and local societies. Many of the perceived problems result from practical and structural difficulties which hinder effective communication, mainly due to a lack of technical infrastructure, especially information systems. The main elements of infrastructure required all imply computing capability. Olivier's framework is summarised in Figure 4, below.

Publication, where new mechanisms should be put in place for:
Technical reports
Developer-funded work
Access to local Sites and Monuments Records
Digital publication
Dissemination
Communication, through:
Multi-disciplinary fora
Organisational links
Digital communication
UK-wide information forum
Education and training

Figure 4: Olivier's infra-structure for research frameworks

Olivier's analysis suggests that, in order to make longer-term objectives sustainable, frameworks are needed in which all those active in curatorial decisions can participate and on which curatorial decisions can be firmly based and firmly judged. These should involve all sections of the archaeological discipline. In analysing the frameworks required, it is clear that these all need to be supported by information systems.

7.2 The establishment of the Archaeology Data Service

At a launch in London in January 1997, the Archaeology Data Service (ADS) which began operations in October 1996, became a major force in UK archaeology, originating in the higher-education sector, but building interfaces across the discipline. The ADS was established to collect, describe, preserve and provide user support for digital resources that are created as a result of archaeological research (see Richards, this volume). It has a responsibility for promoting standards and guidelines for best practice in the creation, description, preservation and use of spatial information across its host body, the Arts and Humanities Data Service. ADS is run by a consortium of eight British Universities and the Council for British Archaeology; initial funding being provided by the British Academy. Like the Aquarelle project (section 7.5. below), it has provided a research and development function for the profession in areas such as the use of metadata and the preservation of digital archives.

7.3 A networked multi-media resource for Scotland (SCRAN)

The National Museum of Scotland, the Scottish Museums Council and the Royal Commission on the Ancient and Historical Monuments of Scotland have been successful in obtaining funding from the Millennium Commission for a networked multi-media resource of the historical and material culture of Scotland (see Murray, this volume). This is a splendid example of co-operation across the Inventory and museums sectors.

7.4 The forthcoming RCHME/EH/ALGAO co-operation statement

RCHME, English Heritage and the Association of Local Government Archaeological Officers (ALGAO) have been working with representatives of users of SMRs on a new statement of co-operation designed to secure the future of local SMRs. This is due to be signed early in 1998. All three organisations place an overriding priority on establishing a network of well resourced SMRs providing an information service covering the whole of England. This statement will promulgate agreed principles governing SMRs, the national Inventory maintained by RCHME and the statutory records maintained by English Heritage, covering areas such as those set out in Figure 5.

Definition of SMRs
Content
Management
Functionality, including software
Integration and networking
Coverage
Standards
Training
Tourism, leisure, education and research

Figure 5: Agreed principles governing Sites and Monuments Records

The initiative is intended to develop and apply criteria for assessment to all existing SMRs in England to help determine the scale of the resource needed to bring them to the required standard. The statement recognises the need for a national network of SMRs to be co-ordinated at a national level, and that new capital will be required as well as adequate resources within local authorities themselves. The authors of the statement hope that as the National Heritage Lottery fund develops its policy for archaeology, there may be a place for funding the enhancement of SMRs as a phased programme.

7.5 The European Community Aquarelle project

Co-operation at national level is one encouraging sign, but it is also taking place on a European level. The European Community Aquarelle project is being funded under the Telematics, Information Market and Exploitation of

Research programme (information engineering). It aims to share cultural heritage through multimedia telematics. Several categories of users are anticipated. These include professionals, publishers, cultural mediators, museums and historical monument curators, art galleries and art traders, architects and town planners, researchers and students in art, art history, archaeology and the humanities. The programme is market and technically-driven. Of particular interest is the co-operation between Inventories of monuments, such as the RCHME National Monuments Record and similar organisations in France, Italy and Greece, as well as major museums in Europe. The participation of both RCHME and the Museums Documentation Association (MDA) as cultural resource partners should also assist with co-operation in the UK and build on the tradition of working together by the two bodies on data standards.

7.6 The establishment of an RCHME data standards unit

Progress in data standards is largely based on the key role of RCHME in close partnership with many others, including English Heritage, local government, the British Archaeology Bibliography hosted by the CBA and the MDA. Activity has been in progress since 1984 in the development of national and international standards for the recording of information about archaeology and the built heritage (for examples see RCHME 1993, RCHME/English Heritage 1993, RCHME/English Heritage 1995, Council of Europe 1995 and CIDOC 1995). In 1996, the RCHME established its own dedicated Data Standards Unit within the National Monuments Record, recognising the importance of data standards and the need to apply them vigorously internally, as well as the value of outreach and continuing involvement in national and international initiatives. Quine (this volume) sets out progress achieved by the Unit, current initiatives and concludes that the advantages of standards in terms of consistency, retrievability and compatibility, as well as in terms of facilitating access to and the sharing of heritage information, continue to outweigh any potential disadvantages, such as the additional overhead.

RCHME has also been active in sponsoring new SMR software to be provided by the private sector and incorporating agreed data standards and models to assist compatibility between national and local record systems.

8 Conclusion

The development of the concept of partnership in archaeology in recent years has lead to a recognition that one organisation is often not large enough to achieve all that is needed, but that, in a national framework, all organisations and sectors have a part to play. While the initiatives mentioned above give some hope for the future, it may be questioned whether it is sufficient for new partnerships and initiatives to develop in a relatively uncoordinated way. Perhaps, the most significant initiative yet is likely to come from the CBA, which has long recognised the problems of the lack of a strategy which unites the information systems of all elements of the discipline of archaeology. It has supported the development

of the British Archaeological Bibliography and the Defence of Britain recording project, the latter funded by the Heritage Lottery Fund, both with significant information systems components. This seems a propitious time for the launch of a new programme, due to the increasing potential of information technology in combination with:

1. the possibility of funding from the Heritage Lottery Fund for information technology projects which support archaeology

2. the current spirit of co-operation between the national bodies in England and the archaeologists in local government

3. the establishment of the Archaeology Data Service, bringing in the sector of higher education and access to research and development

4. the co-operation of monument records and museums in a UK and European context and the probable requirement for monument records and museums to co-operate in England and Wales on the recording of portable antiquities.

The CBA Research and Conservation Committee has begun investigating the requirement and feasibility of an information infra-structure covering the UK as a whole. This is a development which all members of the profession, particularly those who are users of archaeological information, should watch with interest and seek to support, particularly as its objectives become more closely defined. However, the CBA cannot act alone. All organisations, national, local, professional, academic and voluntary must pull together to assess the current situation, define the future vision and plan a migration strategy with appropriate resources sought with great creativity. Underlining this is the requirement for a research and development resource for the development of computer applications in archaeology. Areas requiring exploration include the modelling of the past, including spatial and geographical information systems, networks both for the profession and the public and the preservation of digital archives.

There are opportunities and pitfalls in the growing potential of the technology to disseminate information when there are backlogs in data capture and interpretation and badly-curated digital archives which are not readily accessible. There are, however, new sources of funding in the UK, such as the Heritage Lottery Fund which have strengthened the scope of the voluntary recording sector in areas such as the recording of historic defensive works, heritage ponds and public monuments and sculptures and there may also be an opportunity to help deal with the technical infrastructure required. A new strategic vision now seems to be possible which articulates how the several sectors in archaeology could work in partnership to develop a vision for the discipline as a whole. The potential of the technology should be harnessed to assess the archaeological resource, to inform the agenda for research, to end the relative isolation of archaeology by linking to databases serving the environment and leisure and 'cascading the fruits' of knowledge to inspire the imagination of society. This will require more proactive shaping by the archaeological profession as a whole than has

been demonstrated to date and there is an urgent need for a debate on how to achieve this.

Archaeology tends to proceed on the basis of a cycle of increasing knowledge whereby interventions are followed by the analysis and curation of data for dissemination which in turn informs further intervention. This cycle should take place in the context of agreed standards and accessible networks. It needs to embrace text, spatial information, images and scientific analysis. The stage is a large one; it transcends England to include the home countries of the UK. Beyond lie Europe and the rest of the world. The vision of information systems for archaeology is a worthy and inspiring one and if we fail to develop it then archaeology will fail all those who, increasingly, will expect direct and easy access to information.

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