A preservation system: 
Information for managing conservation 
in the Museum of London 

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Abstract of thesis

Museum collections are held in trust for all. Their preservation is a primary museum function. Adequate, timely and relevant information is essential to success in this. The application of management information techniques to the management of museum conservation in general is discussed in detail.

The background of management theory and management information is reviewed and its application to museum management is discussed. The operational context for museums is described. The operational system that the information is to serve is then analysed; only thus can information for managing be made relevant and useful. Systems analysis, and in particular soft systems methodology, has been developed as a tool for clarifying complex real world situations. The wider system, the operation of museums generally is first analysed using this technique; then, the processes of conservation itself. From this, a conceptual system and the processes it would have to include can be described. Functional information analysis is then used together with a discussion of key success factors to specify the generalised information requirements of these processes.

The means by which the data for the system are collected and analysed are then considered. Their analysis and presentation are discussed. A methodology for auditing the state of preservation of museum collections is presented. A number of techniques for assisting in decision making and prioritising action, and their relevance to the information needs of conservation, are then reviewed.

The application of the techniques described above to a real-world situation is then described in a case study of the Museum of London. The system is useful to staff at all levels from operational to top management.

Finally, this system is evaluated using management information techniques. The evaluation questions whether the techniques investigated did in fact prove useful in the real life system, and how the findings can be used to improve the care of collections in the future.
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Chapter 1

Introduction

Museum collections are held in trust for all. They are assembled by museums as the basis for providing enjoyment and enlightenment, and a record of past times or different cultures. Conservation is the means by which collections are preserved and cared for. This is a considerable task with many different components: for success, its full scope must be understood, it must be planned and organised, and progress must be monitored. The real extent of the task is only just beginning to be appreciated: the information needed to organise and accomplish it is in most museums scarcely produced at all. This research seeks to establish what constitutes it. Management and information studies are drawn on for appropriate tools. A comprehensive system of information is proposed. To illustrate and test its application, it was developed, used, and evaluated in a representative museum, the Museum of London.

1.1 THE BACKGROUND

Museums are a popular part of life in Britain today. Schools make extensive use of them as an adjunct to classroom teaching. More people are visiting museums in their leisure time (57m in 1977; 80m in 1992). Museums make a major contribution to attracting overseas tourists - one of our few remaining healthy industries. What makes a museum a museum is its collections: the basis for its existence and all its activities. Museum objects have a unique power to evoke a response in the visitor. Hebditch (1990) identifies firstly, "the power of relics and symbols contained in museums"; and secondly, "the unstructured and informal means of transmitting information and experiences by means of the exhibition". This offers the visitor the opportunity to construct their own experience from what is on offer.

Museum collections are not just assemblages of objects; they are assemblages of meaningful objects. Each object is there because of its history, its significance in technological advance, its power to describe the society of its place and day, or indeed its beauty. Each one is thus unique and irreplaceable. It may be drawn on for scholarly research or popular booklet. It may be used in many
different displays, telling part of a different story each time. Yet the object remains the same, a true testimony to its origins.

It is a primary function of museums to preserve their collections, as a permanent resource. The work of doing this, museum conservation, is an increasingly specialised and professional activity, with its own training schemes, professional bodies, and codes of conduct and ethics. Developing views of the role of collections call for a correspondingly sophisticated approach to their conservation.

In the early years of conservation as a specialised activity, the objective was to restore the object, sometimes crudely, "to its former glory", but restoration is now in museums often pejoratively defined as "to return the object to a supposed earlier state". Restoration may be all right for objects in private ownership, where a chair must still be a chair (and perhaps also a valuable investment); it may be treated in order that it can perform these functions. Once it is in a museum it becomes not a chair but an object. Its function is now not to be sat on or sold, but to be a source of information and inspiration about the context - past or present - that it represents (MacDonald and Alsford, 1991). Therefore, what the museum conservator must do now is conserve: preserve the object as far as possible as unimpeachable and original information from its context. This requires a minimalist approach to the work that is done and close cooperation with the other specialists involved - the curators, whose role it is to know what it is important to preserve.

Not everyone dismisses restoration as wrongheaded. Some museum people maintain (particularly of machines and mechanical objects) that museums should preserve the function of the object, not the object itself. But it is increasingly the view (embodied, for example, in the Museums and Galleries Commission's Standards for curation of large objects collections (forthcoming)) that objects wear out if operated, and are thus destroyed as true representatives of the past. They may still be used to demonstrate function, but not without taking account of the consequences.

The tasks involved in conservation are perhaps uniquely varied. Practical skill is still essential, and most conservators spend most of their time on actively 'treating' objects: removing dirt and damaging deposits, strengthening them using physical support or consolidation using resins, removing the chemical products or agents of decay, as in acid paper. But creating the conditions for preservation is assuming ever greater importance in the conservator's role.

The need for and difficulty of this, and the scope of the approach that needs to be adopted to ensure success, is illustrated vividly in the fate of many important
collections of ethnography. The objects are mainly of fragile organic materials, especially vulnerable to decay. Assembled by scholars and collectors, or by museums themselves, most collections when they reach museums are in good condition. But time after time, such collections are discovered in museums to be faded, dirty, crushed by overcrowding and damaged by pests and damp, lacking documentation and thus a large part of their 'meaning'.

To successfully preserve such collections takes skills and knowledge in physical treatment, in the diagnosis and treatment of chemical decay and its stabilisation, in the recreation of a preservation environment - temperature, humidity, oxygen and gaseous composition, dust exclusion, and light control. But essential though they are, those skills are useless without the high level organisational ability to create the organisation and the social system of people in it: to plan, monitor, and undertake the initial work, and to maintain these conditions indefinitely. This task in turn is impossible without planning, specification, records, and monitoring data. Those who wish to preserve collections must take the broadest possible view of the objectives and the strategies which can be used to accomplish them. They must understand whether the real world which they hope to manage is as they planned it to be, by collecting and analysing information about it, so as to identify the necessary actions.

Intellectual constructs on the meaning of museum collections and the nature of conservation have their place: they enable us to understand what happens, and thereby bring about what we wish to happen. This research has therefore been anchored in understanding the systems of museums and applying this understanding to the real world, as embodied by the country's leading social history museum - the Museum of London. As a social history museum, the Museum of London collections include most of the types of collection to be found in museums. It is quasi-national, being funded jointly by both local authority (the Corporation of London) and central government, and therefore has to respond to pressures and developments from both. It conducts a very wide range of museum operations. Though larger than most museums in the U.K. it is smaller than the major nationals. It is therefore a possible approximation to "a typical museum".

The Museum of London opened in 1976, established by Act of Parliament. It was formed by amalgamating the earlier Guildhall and London Museums. The Act set out the general purpose of its Board of Governors as being "generally to promote understanding and appreciation of historic and contemporary London and of its
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society and culture, both by means of their collections and by such other means as they consider appropriate." The Museum discharges this duty both by collecting on a very large and varied scale (its collections total over a million objects) and by drawing on these collections in a wide variety of activities.

The Museum's operations are diverse, ranging from large-scale storage of collections for study and reference, to permanent and temporary on-site displays and exhibitions, an off-site exhibition with a 'dark ride', loans of all types of objects both inwards and outwards, and the largest archaeology operation in the U.K. All of these types of activity took place during the period of the study. Staff contracts and sources of funding are also much more varied than is usual in museums. Although large, with 400-600 staff (depending on the size of the Archaeology Division), the museum is sufficiently unbureaucratic to allow management information to be developed and tested in one area of its operations. The Conservation Department had about sixteen staff during the period, divided into four specialist sections, and was involved in most of its activities. The Museum, and the organisational background during the period of study, is described in detail in the Case Study, Chapter 8.

The national context for museum operations needs to be appreciated. Various statutory and other government institutions have a hand in museum operations. National museums are established through a variety of Acts of Parliament, the most far-reaching of which is the 1983 Heritage Act. Prior to this, most of the national museums were simply Civil Service departments. The Act gave them an independent existence, with boards of trustees, as the British Museum has always had. However, since the government is still the main source of funds, the museums' independence is in practice fairly heavily qualified. Local authority museums are run as non-statutory services, meaning that local authorities may provide them, but have no statutory duty to do so. In times of severe financial constraint they are vulnerable.

The Civil Service department responsible for museums was throughout the period of study the Office of Arts and Libraries (the OAL), the fiefdom of the Minister for the Arts. Following the 1992 election the OAL was subsumed into the Department of National Heritage (the DNH). The exact organisation of civil servants responsible for museums is still developing in January 1993.

As well as the OAL, the Museums and Galleries Commission (the MGC) has a prominent role in museum affairs. The Commission is the channel of government
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funding for the Area Museum Councils, which provide various services to museums, with a 50% subsidy. The Commission itself is playing an increasingly important part in setting standards for museums. Its museums registration scheme began in 1988 (museums have to meet certain criteria in order to be registered), and it is publishing a series of *Guidelines for the curation of collections* (Museums and Galleries Commission, 1988; Paine, ed., 1992 and forthcoming). The body with general responsibility for monitoring the proper expenditure of public funds also has an effect on museums: the National Audit Office, which reports to the Public Accounts Committee of the House of Commons. The National Audit Office has produced a series of reports on museums; these continue to have an effect on their priorities and the way they allocate their resources.

1.2 MUSEUMS AND CONSERVATION

The nature of museums and of the conservation of their collections is discussed in Chapter 2. Museums play multiple roles in society. In the present economic circumstances of the UK the tourist and heritage industries are assuming real economic importance. Museums have seen managing the care and maintenance of their collections as an optional extra. It is argued that it is crucial to actively manage this, and that information is essential to success.

The purposes for which museums hold collections are analysed. They are there for three main purposes: as archives of historical evidence; for display; and to demonstrate the function of objects. But for each of these purposes, the object must be maintained in good order, and it must be "real". Therefore, every type of museum will require conservation; the field of research will be relevant to all museums. The organisation and role of conservation and conservators in museums at present is described and discussed.

1.3 MANAGEMENT AND INFORMATION

The nature of museums has been discussed: the body of knowledge and understanding of organisations and their management needs to be appreciated next, in order to set museum and conservation management in the context of the wider world.
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The development of this body of knowledge has been accelerated by the establishment of business schools and educational programmes devoted to their study. There is a wealth of literature on the subject, describing approaches that range from the highly analytical and directive (as in scientific management, where people are seen as cogs in a machine) to the inspirational and intuitive, as is much work on motivation and leadership. Management studies are explored in general in Chapter 3: some approaches offer a framework for understanding museums as organisational and social systems. The quantitative and analytical aspects of management studies, management science and operational research, discussed in Chapter 6, offer tools which can assist in developing strategies, planning, and choosing between alternative courses of action. Current management thinking stresses the importance of setting clear objectives and values ("mission statements", etc.). Management information is more easily obtained than ever before, due to the use of computers, but analysing what the information is for is shown to be as crucial as ever.

Therefore, determining what are the real aims of the organisation system must precede discussion of what information is needed to serve these aims. Writers on strategic planning (e.g. Bowman and Asch, 1987, 380) recognise that this will be particularly difficult for public sector organisations like museums, because they typically have multiple objectives, many of them measurable only qualitatively, not quantitatively. Also, the information must serve the people of the organisation. Sir John Hunt, in Managing people at work (1979, 145-46), observes that quantitative approaches imply strong central control, and reflect the elitist Anglo-American view of managers, not shared, he suggests, in other countries such as Germany or Japan. Information is useful not just to inform managers of what their subordinates are doing. Its real power is to inform the people, at all levels of the organisation, on the factors which determine whether objectives are being met and corporate values realised. If people are cut off from information on whether they are succeeding in their work they will be demotivated and uninvolved; conversely, timely feedback will have a powerful motivating effect. Providing information demonstrates, too, that what people are doing is important enough for the organisation to wish to monitor it. This will be especially important for highly-educated professionals such as conservators. The organisational culture in museums seems to be a "professional bureaucracy" (using the categories set out by Mintzberg (1983). Members of such organisations are prone to feel greater allegiance to their specialist profession than to the organisation which employs them (Bowman and Asch, p. 368-373, discussing Mintzberg, 1983). The context for management in museums is reviewed in the light of general management studies. It has been changing rapidly,
from a laissez-faire climate in which professional, curatorial objectives dominated, to one in which there are overt pressures for accountability both for the maintenance of the collections and for the use of resources. In the past, museums could be characterised as "professional bureaucracies"; it is not yet clear whether they are now in a different organisational category.

Before investigating the management information tools which can be brought to bear on a "problem situation", techniques were sought which would aid the full understanding of that situation. The choice of technique and its application is set out in Chapter 4. Many writers demonstrate the pervasiveness of systems thinking in management research. The approach in general envisages organisations as being purposeful and self-sustaining, consisting of interacting components. There are two distinct systems viewpoints: hard systems methods, which broadly speaking accept a given situation as 'the problem' and analyse it, and soft systems approaches, which focus on improving the understanding of situations. The classic soft systems analysis methodology was selected as the principle analytical tool, since it is suited to a situation where "the problem" is hard to define (Checkland, 1981).

The context for the information requirements for museum preservation is quite complex, with several purposes, and different, perhaps conflicting, priorities. From a variety of systems techniques, soft systems analysis was chosen for analysing collections preservation in terms that enable the information needs to be determined. The first analytical steps result in a description of an abstract "relevant system" for museums generally; from this is developed a "conceptual system" for museums and the processes that it would have to embody. Once the broader museum system was understood, the conservation sub-system was defined using similar techniques. Although the research is primarily focussed on information needs, analysing the system also gave the opportunity to compare the actual organisation of conservation/preservation in specific cases with the system needs shown in the conceptual system, and to diagnose deficiencies.

The analysis of information and information systems is a separate branch of the systems approach. Information systems analysis was employed to specify the information requirements.

These information techniques require data for their use. In Chapter 5, current practice in recording data on conservation is reviewed. There are no generally used standard formats. Computerised recording systems are fairly
common, but they vary greatly. Good analytical and presentation practice is discussed. Environmental monitoring is commonplace; data are much collected, but poorly analysed, and underused. Data on the processes, conservation treatment itself, can be derived from conservation records which are almost universally kept, with minimal alteration to meet the needs for management information. But again, although large quantities of data are collected, their analysis and presentation is little undertaken or considered.

The analysis showed that monitoring the condition of collections is central to the management of their preservation. Existing methods of condition surveying collect far too much data, take a great deal of time, and once again fail to analyse and present the necessary information. A framework for auditing collections condition, based on statistical sampling and a redefinition of the data required, is developed.

As well as systems analysis, a wealth of other information-based techniques has been developed in management studies and science which could be applied to the management of conservation. Management science encompasses the considerable body of work on mathematical and computerised aids to planning and decision-making generally, some of them used in Operations Research. These techniques are investigated in Chapter 6. Operations Research is derived from the concepts embodied in engineering systems: a problem is identified, and a variety of mathematical modelling techniques is then employed to "solve" it. These methods are useful for solving problems if the situation is taken as given, but many public-sector organisational situations do not lend themselves to such a convergent approach, especially at a time of change, when existing ways of doing things may need radical review. Operational research can encompass general statistical and analytical approaches, which can be applied, but many of its central techniques, such as queuing theory, are not relevant to the field of study. However, a variety of management science methods did prove useful, for instance, risk analysis, cost-benefit analysis, and strategic planning.

The concept of management and executive information systems currently receives much attention. These are usually computerised systems, designed to present essential information to senior managers. The information may be carefully targeted on the workings of the organisation, or it may relate to the outside world, the essential context in which the organisation operates. But as Lucey says in his book, Management information systems (1987), much of the literature (such as Bee, 1990) refers only to systems or data analysis, when in fact
"the means of producing the information is a secondary consideration compared to the importance of ensuring that the correct problems are addressed, and that relevant information is available when, where, and in the form required to be usable by management."

Rockart and Delong (1988) investigate the use of such systems, with interviews with many chief executives; Bush and Robbins (1991) review their current use. Information for managing museums and conservation is discussed in Chapter 7, *Using the information*.

Strategic planning is mostly discussed in the copious literature from the viewpoint of commercial firms, in which the need to make profits overrides all other objectives Bowman, 1990, p. 11). Although Handy (1988, p.126) disagrees that financial criteria are all there are, this is what the survival of commercial firms depends on, as that of public institutions does not. Ohmae (1982, p.37) suggests that what counts in business is competitive performance, measured against the competition, while in the public sector success is judged by performance against an absolute model. But, as Bowman (1990, p.11) says, many techniques can usefully be common to both types of institution. In particular, the identification of Key Success Factors is a commonly used analytical technique (Rockart, 1979; Ohmae,1982, Ch.2), which was of some importance in this research.

### 1.4 PRACTICAL APPLICATION

Information for managing conservation is needed at all levels of conservation - from individual people for managing their work, to the senior management of the museum for setting long-term directions and strategies. In Chapter 7, the present and potential use of management information in museums is described. The effects on wider and crucial management issues - particularly the motivation of staff - are also considered.

Performance measurement as applied to museums is particularly discussed. This is in general terms the means of telling whether an organisation is achieving its objectives: an essential component of management information systems. This information area, like others, suffers from inconsistent terminology. Walden (1991) and the National Audit Office distinguish between performance
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indicators, which they define as "areas of activity which can be measured", performance measures, which are the "qualitative and quantitative assessment of input and output in order to ascertain efficiency and value for money", and targets, which may be defined for indicators or for measures.

There is a strong case for developing performance measures for conservation. If the collections of museums are fundamental to their operations, then a means must be found of assessing whether they are being preserved. And, as Griffin (1987) says,

"It is not enough simply to believe that there are benefits. One must display those benefits - using words and symbols which are at least familiar, if not appealing - to those who can be persuaded to pay for them."

Peters, too, is convinced that public, timely measures have a valuable place in motivating people at work:

"I am convinced that the best strategy is that which insists on visible measures of what is going on in the trenches and on action there to achieve a high rate of improvement." (Peters, 1987, 585).

Such measures are not inappropriate for many conservation functions, particularly environmental control. The various surveys of conservation in museums do employ them; for instance, "proportion of storage space with environmental control" (United Kingdom for Conservation, 1974; Corfield et al., eds., 1989).

The real-life application of the results of the analysis in building a system of management information for the Conservation Department of the Museum of London is examined in a Case study, Chapter 8. The system was designed with and for staff at all levels from operational to top management. The various components of it are derived from existing management practice, or in some cases developed specially. Their origin and development are explained. There are two principal strands: a flow of information from the top down for planning and setting objectives, and a counter-flow upwards for monitoring the success of the operation. The planning component includes a mission statement, corporate planning, strategic planning, and operational planning. Monitoring includes work reporting, special reports, and performance indicators. Detailed components of the system include information analysis and database design, collections condition auditing, and performance measurement.
In the final chapter, the information system is evaluated, using as criteria its efficiency, its effects on staff motivation, changes assisted in the organisation, its robustness, and its usefulness to the wider profession. The lack of proper information had been both a symptom and a consequence of past management problems. These were not unique to the Museum of London. Once the Museum senior management realised that information was available it was welcomed and made use of. There were identifiable internal benefits from the information system, such as higher morale in the Conservation Department. Many elements of the system can be transferred to other museums.

As well as these, the new view of the role of museum collections which was developed through the soft systems analysis has had an effect. In general, the objectives of and reasons for conservation are clearer. There is a new understanding of the way in which the different components of the task - planning, environmental control, condition monitoring, and conservation treatment - complement each other in a unified system. It is obvious that information for managing is essential. Some practical ways are suggested in which this understanding can be applied in museum organisations.

1.5 THE RESEARCH METHOD

This research topic was largely prompted by a Cabinet Office staff inspection of the Conservation Department early in 1987, when the author had just been appointed as Head of Conservation. The management of the Conservation Department at that time was critised for lack of direction and prioritisation, poor work organisation, and lack of information about the size and nature of the task. The period of study ran from September 1987 to February 1992. As Head of the Conservation Department throughout that time, the author was well placed to develop and make use of management information.

The method employed was a scheme of action research (Checkland and Scholes, 1991). Fig. 1.1 shows the actual sequence of development. A soft systems analysis was undertaken at an early stage, and gave a framework for subsequent development. Based on the results, the management information system itself was
developed in cooperation with staff. Management information tools were chosen for their relevance to the real-life situation. Regular monthly management meetings were the main forum for discussion, with occasional special seminars, sometimes with the whole Department, to review particular matters, especially planning and strategy development. In the case of the measurement of collections condition, a particularly important area, a working party of conservators from other museums was set up to validate and finalise the method that had been developed.

The main results of each stage of the research were presented to the wider profession at conferences and in published articles. They have met with widespread interest and acceptance.

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**Fig. 1.1** How the research was conducted.
Chapter 2

Museums and collections

In this chapter, the nature and roles of museums are discussed. What functions do they fulfill, and what are the important statistics relating to them: numbers, visitors, and expenditure? The purposes of holding collections, and the roles played by different museum professionals, are reviewed. Finally, the nature of conservation in museums itself is explored.

2.1. MUSEUMS

2.1.1 Purposes

The roles of art museums are inventoried by Weil in his compilation of essays, *Beauty and the beasts* (1983 (1), 32): they are for recreation; temples of contemplation; education; connoisseurship in the sense that they portray the highest standards; symbols of power; centres of scholarship; embodiments of bureaucracy, because of the need for continuity; agents of social change; representatives of the artists whose work is displayed; patrons; and caretakers of public patrimony. These lofty roles are not, however, admired by all. Hewison in his much-quoted book *The heritage industry* (1987) claims that excessive public interest in the "heritage" promotes conservative politics and national stagnation (p. 32); encourages "a respect for privacy and private ownership, and a disinclination to question the privileges of class" (p.66). According to Merriman, the hidden agenda of museums is to legitimise affluence by promoting an appropriate lifestyle: encouraging people to acquire "cultural capital" (Merriman, 1989). Sir David Wilson, however, that strong defender of free museums as Director of the British Museum, cites the public support for the British Museum from the diversity of its visitors: from London taxi-drivers through to Inuit hunters (Wilson, 1989, 9).

Merriman (1991, 18) takes issue with the pessimistic viewpoint of Hewison, and identifies a "much more positive and potentially liberating role for museums and similar bodies". He rejects the view that they represent a Marxist "dominant ideology" which defines and confines the attitudes and social position of the
mass of society, because, he says, the majority of their visitors are in fact from the
dominant classes, not those who should potentially be dominated. Merriman calls for
"the exciting possibility that museums and other similar institutions promoting a
non-commercial representation of the past based on the positive values of
stewardship and scholarship, might have a vital role to play in providing materials
for people to creatively construct the past."

2.1.2 Numbers of museums

Rapid growth is a dominant characteristic of museums and their
operations since the late nineteenth century, and particularly in the last two decades.
As surveys and reports have established (Prince & Higgins-McLoughlin, 1987),
there are about 2,000 museums in the U.K.. The growth in museums has been
phenomenal: in 1987 a new one was opening about every two weeks, and the total
number is almost double that in 1971; in 1887 there were but 217. In the
present recession, a proportion of these newly arrived museums is closing.

2.1.3 The size of collections

The growth in museum collections has paralleled their increased
numbers. Sir David Wilson (1989, 25) points to collecting as one of the
mainsprings of a museum: "A museum which does not collect is a dead museum".
Even in the second half of the nineteenth century, one of the British Museum's
famous curators, Franks, enlarged the collections of the British and Medieval
Antiquities Department from 154 feet of cases in 1851 to 2250 cases in 1896. The
growth of collections has been especially marked in what are termed social history
museums. The Museum of London is quite typical of these. Its collections have
grown exponentially since its inception as the London Museum in the early 1900's
(Fig. 2.1). As it extended its activities by adding new curatorial departments these
began avidly to collect, either to correct imbalances in its collections (twentieth
century collections scarcely existed until the creation of the Modern Department in
the '60's) or to rescue the remains of disappearing industries and communities, as in
the case of the Docklands collections, originally assembled for a semi-independent
Museum in Docklands. The recently published survey of industrial and technological
museums in Yorkshire and Humberside (Kenyon, 1992) provides more evidence of
collections growth and its consequences.
Chapter 2: Museums and collections

Museum collections now are often very large numerically, and include a great diversity of objects. The Museum of London holds about one million objects; the British Museum about six million; even quite modest local museums often have hundreds of thousands of individual objects, especially if they include paper-based collections such as photographs (numerically, about half the Museum of London collections are paper-based objects).

Even providing storage for these large collections is a considerable function of museums. The area of storage used by the Museum of London totalled in 1992 over 17,000 sq m (Museum of London, 1992, Table 6A). Accounting for, organising, recording, storing, and preserving these assemblages requires an increasingly professional and strategic approach.

2.1.4 Museum economics and finances

Expenditure on publicly funded museums in the U.K. is quite substantial: about £406m annually in total. In 1991-92, central government funding, nearly
all for the national museums, was about £259m; local authority funding about £128m; and expenditure on other non-national museums about £42m (Museums and Galleries Commission, 1992 (1)).

Though their cost is not large in macro-economic terms, museums do have some significance economically. A large number of visits is made annually to museums and galleries: about 57m in 1977; 72m in 1989; 80m in 1991 (sources: Merriman, 1991, 10; Museums and Galleries Commission, 1992 (2)). The British Museum and the National Gallery are among the top five most visited attractions in Britain, with 5.4m and 4.2m visits respectively in 1991 (Comptroller and Auditor General, forthcoming). Merriman (1991, 10) cites figures from English Tourist Board research, and from Myerscough's survey of The economic importance of the arts in Britain (1988): in 1987 tourism was one of the most important industries in the country, and a considerable generator of income from abroad, supporting about 1.4m jobs and bringing about £14 billion into the economy. Museums are an important component of the U.K.'s attraction to tourists. Nearly a third of all museum visits, and 44 per cent. in London, were by overseas tourists (Myerscough, 1988).

2.2 WHAT ARE COLLECTIONS FOR?

The organisation of conservation and preservation in many museums today is based on a variety of assumptions and views, some overtly expressed and acknowledged, some barely recognised. Yet all the activities which these organisations undertake are based on their collections; hence, the preservation function is fundamental to all other museum activities (Weil, 1983 (1), and acknowledged for example in the Statement of Purpose and Values of the Museum of London (1990)).

2.2.1 Collections and museum missions

The greatest influence on the degree and manner in which collections are preserved is the purpose of the institution itself. The preservation, or conservation, of museum collections is undertaken for a reason. That reason must be
Chapter 2: Museums and collections

predicated on the purpose of the institution holding them. But do museums have a single purpose?

Two major functions are always cited in the statutes or other instruments establishing museums: on the one hand, to preserve and care for collections; and on the other, to display them and use them in other ways to entertain, educate, and enlighten (International Council of Museums, 1990). These functions are conflicting, since for most types of object it is almost impossible to establish optimum conditions for preservation during display or use. Every museum therefore has to strike its own balance. The point at which this balance is struck will have profound effects on the museum's preservation function. There is, too, a wide spectrum of types of museum, from art galleries where the aesthetic is all, to farm or industrial museums where the ethic is to preserve and demonstrate the function of the object as well as simply to use it as a passive source of information.

2.2.2 Paradigms for museums

An important role of the national museums in Britain is to act as centres of excellence and sources of expert advice; to show other museums what they should be aiming at. In a sense, they are paradigms which set the standards and limits of museumship. Three of them strike one as being as different as they could possibly be. These are the Science Museum, the Natural History Museum, and the National Gallery. If they are indeed paradigms, then a closer examination of their roles may shed light on some of the contradictions to be found in other less specialised museums.

The Science Museum is used as the example for museums of industry and machinery (e.g. Patrick Greene, 1990, Museums in great cities, internal Museum of London seminar), where public enlightenment through the active demonstration of how objects function is the paramount objective.

The National Gallery is the picture museum par excellence. Here, art and the aesthetic experience reign; the object must speak for itself (Wright, 1989) and it must be in such condition that nothing will interfere with the viewer's experience.

The Natural History Museum stands as an exemplar for museum collections of natural objects. In spite of its truly enormous holdings of objects, many of its displays use not objects but graphics, or three dimensional constructions
Chapter 2: Museums and collections

and interactive computer screens, along with other interactive devices to put across concepts. But it is a great research institution as well as a museum, and its activities go far beyond and have a deeper significance than its public displays (Radford, 1990).

What are the differences that make these three institutions stand out from each other, and from the other national museums? One fundamental difference is the size of their collections. The Natural History Museum holds about 65 million objects, the Science Museum 250,000, and the National Gallery some 2,200. There is naturally an inverse ratio between the size of the collections and the proportion on display, with the National Gallery having all its pictures on display, the Science Museum about 10 per cent. and the Natural History Museum less than 0.1 per cent. of its objects in its public galleries. (Information: personal knowledge or the press offices of the museums).

Does the differing nature of the collections determine their use - do the museums have to be as they are? One could envisage a museum of natural history which held and exhibited only a few key objects; an art gallery, if it had sufficient

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![Diagram](image)

**Fig. 2.2** The purposes of museum collections.
Chapter 2: Museums and collections

funds, could acquire and store an enormous archive of European painting, or set out to represent the social, technical and ideas history which produced its works of art. The differences then are not inherent in the type of collection: they must arise from differences in the reasons for holding collections, derived of course from the museums' various fundamental purposes.

Can the purposes for which these three museums hold collections be envisaged as forming the coordinates of a triangle (Fig. 2.2)? Can other museums be described in terms of this diagram? Indeed, other museums or types of collection can be envisaged in terms of this construct (Fig. 2.3). For example, archaeological collections are like natural history collections and like archives of documents: the objects are being kept as a source of scientifically valid evidence about the past. In the early days of "Rescue", the archaeological pressure group, the destruction of sites without excavation was often compared to tearing up historical manuscripts. Archaeological objects represent the last physical remnants of "manuscripts" which have been destroyed through excavation. For both natural history and archaeological objects, as for archives, their context is all-important. Just as unbroken ownership must be demonstrable for documents in an archive (BS 5454: 1989), so the connection of object and context must be unimpeachable for these collections to be

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Fig. 2.3  Types of museum vs. the purposes for which they hold collections.
Chapter 2: Museums and collections

of use as evidence. If conservation treatments or other physical intervention alter the nature of the object then its worth as evidence is severely diminished.

Similar to picture collections are, of course, other art collections: works of art on paper, and sculpture. Collections of furniture and other objects meant to be enjoyed because of their appearance share a prime purpose of display for appreciation.

Collections where demonstration is the objective include many of those in agricultural, industrial, and transport museums. One might add to these, buildings themselves, since many historic buildings are used to demonstrate a past way of life and function. Particularly good examples are those at the Welsh National Folk Museum (St. Fagans); and of course National Trust properties.

2.2.3 Consequences for museum management

The divergent uses which museums make of their collections have, of course, far-reaching consequences for the preservation of the collections and the nature of the conservation activities devoted to them. Although those who run museums are obviously aware that there are differences between them, there is little acknowledgement of the fundamental nature of the divergence. Discussions of "what are museums for" tend to view museums as being of one general type (Hebditch, 1990; Weil, 1983). Certainly the public is not aware of the differences in approach, as was well demonstrated in the Auditor General's Report, which castigated museums for not showing a greater proportion of their collections (Comptroller and Auditor General, 1988).

Most museums do not, of course, conform closely to any one of the three paradigms which have been identified. They will be somewhere in the middle of the triangle. Nothing in a museum collection was actually designed to be there (except possibly by hopeful or well-known artists). Especially in the case of local history, or social history museums, different parts of their collections will follow different models, or be expected to serve more than one purpose at once. The various curators responsible for the different collections will tend to base their approach on that of their role model, the corresponding national museum. These in turn influence specialist training courses where they exist. It is not surprising that the individuals concerned, such as art and archaeology curators, often find difficulty in sharing a

20
common approach within one institution. There is likely to be fundamental (and possibly unrecognised) disagreement on what a proper museum ought to be doing. Curators themselves sometimes of course feel torn between restoring the functionality of an object and preserving its true nature as evidence of past technology (e.g. Swade, 1990).

2.2.4 Consequences for preservation

The effects of the demonstration approach on the preservation of collections, if by "collections" is meant assemblages of real, historic, objects, has been well explored (Mann, 1989). It might be questioned whether if objects are likely to end up partly or even entirely as replicas it would not be better to resolve the dilemma by building accurate replicas in the first place. There are other possible ways of resolving it. In the Welsh National Folk Museum, the approach is said to be to retain and not use the most perfect example of the object, and to designate other similar objects specifically for use (R. Child, 1988, personal communication).

The effects of the display approach can be equally destructive. Objects can only be displayed if they are lit. The progress of fading and other damage due to light is normally not perceptible by eye, because it happens slowly, and we cannot retain accurate memories of past images against which to compare changes. There has been much intensive scientific work on the effects of light, but to many art curators the question is beside the point, because as far as they are concerned the collections are not there to be preserved for nebulous future generations; they are there to be displayed and appreciated. But the image which is the point of the display is almost certain to be drastically altered if it is exposed to sufficient light energy. Can this be irrelevant?

When the purpose of a collection is to be an archive for use in perpetuity then policies which promote its preservation are most likely to be adopted. Problems are likely to arise because such collections - natural history specimens, paper or archaeology archives - are likely to be numerically very large, and their immediate use is not obvious. They take much up-front investment to organise and inventory, are expensive in storage materials, which must all be of archival quality, and their immediate use is not obvious (why are we keeping all these bits of old pot?). Once organised, however, they require little upkeep, and because the aim is
Chapter 2: Museums and collections

to maintain them as unchanged evidence they require minimal remedial conservation treatment; the main cost will be that of suitable storage.

2.2.5 The users and their needs

So far only the attitudes of the holders of the collections, the museum professionals, have been discussed. But what about the users - the public? This broad term includes a surprising variety, from scholars to primary school children; from film producers to learned societies. Obviously, some of them will want to benefit from the collections in one way, some another. Scholars will want to use the collections-as-evidence; film producers will be after objects-for-demonstration. The question is whether the short-term wishes of one particular set of users, or indeed museum professionals, should override the needs of other future possible users. Does this matter? Museum people are fond of quoting Maynard Keynes, "in the end we are all dead"; but the point about museums is that their collections are held "in trust for the nation"; they have a life beyond that of their current employees.

The public is becoming both more and less sophisticated in its use of museums. On the one hand, the success of exhibitions such as Art in the making (National Gallery, series, 1989 and ongoing), or Fake! (British Museum, 1990) shows that substantial numbers of people want and enjoy an extremely detailed, accurate, academic and scientific treatment of objects (MacGregor, 1990). This can only be provided by preserving objects-as-evidence; in the case of Fake! real fakes! On the other hand, the growth of simulated historical experience exhibits and similar "demonstration" museums, indicates the reverse - that many people want history primarily as entertainment. Perhaps the truth is that more people are visiting museums more often, they want a wide range of education and entertainment, which is being provided by all these different museums, and they want above all something new.

Changing taste

It seems a pity, however, that policies seem to be so compartmentalised between different types of collection, and in particular that many types of museum find it difficult to defend the maintenance of collections as permanent archives. This
may be changing, as the National Audit Office and the Museums and Galleries Commission force a greater accountability for the collections as a publicly owned resource. The standards which are being developed in connection with museum registration (e.g. Paine, ed., 1992) will encourage a greater emphasis on the preservation and archive function of museums. Curators are also coming to terms with a plurality of views at the higher levels of museum management, as on the one hand exhibitions and marketing specialists and on the other conservators and collections managers increasingly demand and find a voice in policy development.

The public response to the recent report by the Comptroller and Auditor General on the collections of the English national museums (1988), and the ensuing sitting of the Committee of Public Accounts, elicited a remarkable amount of press comment, echoing with more vehemence than the average member of the public probably feels the censure expressed in the public reports (a typical headline, *Arts for oblivion* (Fletcher, 1988), gives the flavour; for others, see Keene 1991 (2)). Perhaps the debate about the natural environment - at the core of which is the need to live within the limits of a fixed resource - strikes chords when the maintenance of museum collections is discussed. The public seems to perceive museums as above all places where something at least is properly looked after: so in museums at least there should be no need to worry about using up a finite resource. Witness the surprise and sometimes dismay expressed by people visiting typical stores on museum "open days" (author's experience). In truth, museums are mostly no better at looking after their possessions than are private individuals; indeed, they are often far worse. Most museums could find examples of objects that were in excellent condition when first acquired, which have since suffered severe deterioration in overcrowded and unsuitable stores - ethnographic collections are especially vulnerable.

In America, as so often, the debate on the importance of caring for collections is far advanced, and has occasionally been pursued in the courts. It is being demonstrated there that concepts such as "due care", "fiduciary responsibility", and "standards in the industry" can be applied just as well to the responsibility of museums to preserve their collections as to the activities of many other institutions (Ulberg and Lind, 1989; Weil, 1983).

Conservation and preservation, however, like museums themselves, are not universally seen to be a good thing. Conservation is often perceived as being puritanical and restrictive, insisting on preservation at the expense of natural
Chapter 2: Museums and collections

enjoyment and use. For example, in a typical sideswipe at conservation attitudes, Hewison, referring to buildings and the built environment (1987, 98) complains that "conservation ... creates a new context, and, if only by attracting the attention of members of the public, a new use", while "preservation means the maintenance of an object or building, or such of it as remains, in a condition defined by its historic context, and in such a form that it can be studied with a view to revealing its original meaning".

Conservation or restoration?

Alongside the debate on how museum collections should be used, is that on the approach which should be adopted to their preservation and maintenance. At the two poles are those who support the minimalist approach to conservation: do as little as possible: and those who wish to restore the object to working order, looking more or less new. In the first case, only the work which is essential to the preservation of the object is undertaken, and additions are clearly distinguished from the original. Although this debate is quite vigorously pursued in museum circles, where privately funded museums, private collectors and private conservators and restorers are often identified as those in the "restoration" camp, it does not often occur publicly. A rare example was a court case held in 1989, when Edward Hubbard refused to honour a contract he had entered into to purchase a vintage Bentley because he considered the car to have been so heavily restored as no longer to be genuine (The Guardian, 1990).

The minimalist approach to conservation, necessitated by the archive function of museums, is the one which leaves the widest range of options open for other and future 'uses' of the collections. In matters of debate about conservation or restoration especially, any party should have the right of veto in favour of the option that affects the original nature of the object least, because this leaves the most options open. More thorough replacement, more extensive restoration can always be done later; but once original parts have been removed or altered then they can never be recovered. Objects which have been restored to a supposed earlier state, where someone has already decided what they looked like, will be no use in Merriman's vision in which people can draw on museum collections to creatively reconstruct the past (1991, 18).
2.3 CONSERVATION IN MUSEUMS

Conservation is defined in the statutes and instruments of government of various organisations concerned with the heritage. It can be seen from the definitions that two themes predominate in discussions of conservation in museums: firstly, the nature of the work carried out on objects: conservation versus restoration; and secondly, the role of the conservator or other agent carrying out that work.


Conservation is the means by which the true nature of an object is preserved. The true nature of an object includes evidence of its origins, its original construction, the materials of which it is composed and information as to the technology used in its manufacture. Subsequent modifications may be of such a significant nature that they should be preserved.


The activity of the conservator-restorer (conservation) consists of technical examination, preservation, and conservation/restoration of cultural property.

... 

*Preservation* is action taken to retard or prevent deterioration of or damage to cultural properties by control of their environment and/or treatment of their structure in order to maintain them as nearly as possible in an unchanging state.

*Restoration* is action taken to make a deteriorated or damaged artifact understandable, with minimal sacrifice of aesthetic and historic integrity.

Other useful definitions are contained in the *Burra Charter*, which has been drawn up by Australia ICOMOS (Australia International Committee on Sites and Monuments, undated). The Charter defines its approach to the preservation of places of cultural significance, using many terms generally applicable in conservation.
Chapter 2: Museums and collections

The Burra Charter: Definitions

1.4 Conservation means all the processes of looking after a place so as to retain its cultural significance. It includes maintenance and may according to circumstance include preservation, restoration, reconstruction and adaptation and will be commonly a combination of more than one of these.

1.5 Maintenance means the continuous protective care of the fabric, contents and setting of a place, and is to be distinguished from repair. Repair involves restoration or reconstruction and it should be treated accordingly.

1.6 Preservation means maintaining the fabric of a place in its existing state and retarding deterioration.

1.7 Restoration means returning a place as nearly as possible to a known earlier state and is distinguished by the introduction of materials (new or old) into the fabric. This is not to be confused with either re-creation or conjectural reconstruction which are outside the scope of this charter.

2.1 ... cultural significance means "aesthetic, historic, scientific or social value for past, present or future generations".

Article 2. The aim of conservation is to retain the cultural significance of a place and must include provision for its security, its maintenance and its future.

Each of these definitions draws a clear distinction between preservation and restoration.

2.3.1 Role conflict

The relationship between curators and conservators is generally considered to be a difficult one, entailing power struggles over decisions concerning objects. Can we tell what lies at the heart of this conflict, if such exists?

Basil Greenhill, as Director of the National Maritime Museum, in discussing museum management, identifies three estates in museums: the curatorial one, concerned with the past and the present of the object; the conservation one, concerned with the present and the future of the object; and the management one,
which has to coordinate and balance the functions of the other two estates. Each estate has its own functions but they overlap and interlock. However, it is management, he says, that must decide what happens and take responsibility for the whole (Greenhill, 1983). Although simplistic this is illuminating.

Looked at dispassionately, a museum simply employs people to carry out its functions. A museum is defined in the ICOM statutes as an institution which "... acquires, conserves, researches, communicates and exhibits ...". Thomson (1973) argues that, since deficiencies in all the functions except preservation are reversible, preservation of the collections is the museum administration's first duty. Indeed, for museums in the U.K. which are established by statute, these typically begin by defining the function of the museum as "... to preserve and care for ..." (e.g. Museum of London Acts, 1985 and 1986). Division of labour between individuals with differing expertise is one of the characteristics of organisation in the twentieth century, inevitable as museums grow larger and try to meet public demands for higher standards of display and service.

Curators, historically, have been in total charge of museums collections, responsible in all but the largest museums for security, handling and organisation, storage, display and conservation and restoration. But in fairly recent times, as museums have grown and their public become more demanding, other disciplines have been employed to undertake some of these tasks: designers, educationalists, administrators, conservators, and recently collections managers and registrars. Curators have at the same time lost the automatic right to the top jobs in museums. The director of the National Gallery was before that an art historian and magazine editor; of the Natural History Museum, a university academic; of the Victoria and Albert Museum, its librarian.

Perhaps because they have previously had such an all-embracing function, curators seem not yet to have defined the core of their functions and responsibilities sharply enough to make it apparent what it is that is unique and exclusive to them. The Museums and Galleries Commission, in the Hale Report, Museum professional training and career structure (Museums and Galleries Commission, 1987) stated that it is "curatorship for which training does not exist". But this begs the question, training to do what? This is still far from clear.

Conservators in museums began very much as an extension to the curator, to undertake tasks perceived as low-status, requiring craft skills or muscle. In
Chapter 2: Museums and collections

1936 the first training in conservation (at first for archaeologists) was set up, in the newly formed Institute of Archaeology of the University of London. In the '50s this became the first training course for conservation. Since then, conservators have become highly educated, well trained, more professionally organised, and more confident (Corfield et al, 1989, 60; Museums and Galleries Commission, 1987). Their status is recognised as almost, though still not quite in some museums, equivalent to that of curators. Conservators now are expected to possess a blend of scientific knowledge, manual dexterity and craft skills that must be extremely rare in employment in the late twentieth century. Since conservators are the only group in museums other than curators which has objects at the centre of its work and training it is not surprising that curators feel threatened when their power of decision is lessened, especially when their own role remains so ill-defined.

The relationship of each professional to the object is another focus of conflict. There are countless examples of conservators past and undoubtedly present doing things to objects that have damaged them or altered them in undesirable ways. These are matched by instances of curators insisting on exactly this sort of work being done. The curator adopts a role of pseudo-ownership; the conservator, that of carer, almost parent. Curators may justifiably be concerned that their proper concern and responsibilities for the object may be overlooked; and conservators, that their careful and painstaking work will be wasted due to careless handling or inappropriate storage or display. A situation needing a rare degree of trust and communication from both sides, indeed!

When a conservator works on an object it is entirely within their power, intentionally or unintentionally, whatever the specification for the work may have been, to alter it in many drastic and fundamental ways. Cannon Brooks proposed some years ago that the curator was responsible for what should be done; the conservator merely how (1976). But what must depend on a diagnosis of what is the matter, and this diagnosis depends on the skill of the conservator. Curators may wish to control the what, but in practice the only effective way to do this is through the wide promulgation of an agreed system of ethics. And practitioners too have a right to a say in what they do (Ashley Smith, 1982): they are entitled to set and maintain professional standards.

What should be the functions of the participants in this triangle? There are two separate bodies of knowledge and areas of responsibility, and they exist
because there are two distinct museum functions: to preserve; and to understand and communicate. Conservators should have expert knowledge of the diagnosis of ills and of the alternative treatments available, the effects a particular treatment will have, of its likely success, of the risks it carries, and of the ways in which it may affect the object's historic integrity and authenticity; they must communicate this knowledge. The curator must know about objects and what they mean to the collection. Both these fields of expertise should be brought to bear in deciding what should be done to the object; both participants have a duty to make sure that they acquire and maintain the necessary knowledge.

To a conservator, it is astonishing that as recently as 1988 it should be reported as obvious that

"... in general we [i.e. curators] do not really apply the concept of collections research which illuminates the objects and gives perspectives which on the one hand can guide us towards selectivity rather than random in-gathering, and on the other opens new paths of knowledge." (Fenton, 1988).

If curators do not play their expert part, then no wonder they feel threatened by those who do.

2.3.2 What is conservation?

The conservator, then, is supposed to be expert in how to retard deterioration and remedy its effects. How is this done? The Museums Training Institute undertook a functional analysis of conservation and other museum work, in developing its scheme of national vocational qualifications (NVQs). It found the following areas relating to "preserve and maintain items, collections and structures (conservation)" (Museums Training Institute, 1991, Sect.2):

- Ensure optimum work area and supplies
- Assess items in context
- Identify and agree options for preservation
- Treat items
- Maintain item condition.
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This dull little list somehow completely fails to convey either the complexity or the substance of what conservators do.

The survey of conservators and facilities carried out by UKIC in 1987 established the amounts of time spent on the following activities:

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of work time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conservation treatment and documentation</td>
<td>55</td>
</tr>
<tr>
<td>Technical and scientific examination</td>
<td>13</td>
</tr>
<tr>
<td>Teaching</td>
<td>5</td>
</tr>
<tr>
<td>Display</td>
<td>5</td>
</tr>
<tr>
<td>Conservation research</td>
<td>5</td>
</tr>
<tr>
<td>Environmental control and monitoring</td>
<td>4</td>
</tr>
<tr>
<td>Photography</td>
<td>3</td>
</tr>
<tr>
<td>Enquiries from the public</td>
<td>3</td>
</tr>
<tr>
<td>Supervising volunteers</td>
<td>2</td>
</tr>
<tr>
<td>Casting, and other methods of reproducing objects</td>
<td>1</td>
</tr>
<tr>
<td>Curatorial activities</td>
<td>1</td>
</tr>
</tbody>
</table>

The book published by the Getty Conservation Institute, *The nature of conservation: a race against time* (Ward, 1986; review by Gignac, 1988) discusses the crucial role that science plays in conservation; the rigorous training required; the nature of conservation services, and the role of the conservator and their colleagues. Gignac discovers

"... the multiple aspects of conservation, a subtle and complex process, that can be as varied and brilliantly fascinating as there are past and present cultures on earth, and yet, simultaneously, as practical and straightforward as good housekeeping".

Indeed, it is the author's experience that the processes of conservation have so many facets that it is difficult to convey the full range of knowledge and skill that is included: from the diagnosing of chemical decay or hidden physical stress; the patient, painstaking removal of dirt, soil or corrosion to reveal the soul, though not often the exact original appearance, of the object; the surveying of whole collections to find out which of their members are the most vulnerable and the weakest; the monitoring of the environment and the understanding of the subtle influence of the results; and the constant communication, diplomatic negotiation and persuasion necessary in order to represent the object's best interests. It is this great variety of activities, skills and work that must be represented in the information needed to manage conservation.
Chapter 3

Management and information

In this chapter, the development of general management thinking and the place of information in it are reviewed. Current approaches are discussed. The climate for management in museums is described: as in other areas of the public services, it has seen rapid changes through the 80's particularly. This has had deep and far-reaching effects on the ways in which museums manage their affairs and on how the different professionals involved perceive their roles.

3.1 MANAGEMENT THEORIES

Machiavelli, who wrote on the management of states in the fifteenth century, is still quoted today. Many different views to explain the complexity of organisations, and on how people can best be managed to obtain the desired results, have developed since (Clutterbrook and Crainer, 1990, Ch.1). The Open University course, The Effective Manager (Open University Course Team P670, 1983, 23-32) offers a concise review of the development of the main approaches to management. It identifies six of these: scientific management (Taylor), classical management (Fayol), operational research and management science (from the second World War), the human relations approach, the systems approach, and the contingency / situational approach. A recent movement is the quality approach. The popularity of different schools of thought, or variations on them, changes as the political climate swings from liberal and people-focussed to conservative and product- and money-focused. A variety of approaches is current at any one time.

Generally speaking, the product- and finance-based views are those which rely heavily on information. Three of the approaches listed above are strongly informational in content: from the 1890's, Taylor's "scientific management"; from the 1940's, "operational research and management science"; and the more recent development of the "systems" school. Scientific management and operations research
Chapter 3: Management and information

are essentially numbers-based; they are the product of a world-view in which people are essentially parts, although intelligent and rational ones, in a machine. The systems approaches combine information with people: information is necessary, but not sufficient, for understanding the real world, in which the organisation is a system of complex social interactions which must be taken into equal account.

3.2 INFORMATION IN MANAGEMENT

3.2.1 The role of information

Numbers and information-based techniques have not been well integrated into general management practice, although they are widely taught in business schools. In the literature on general management, it is only comparatively recently that information in organisations has been accorded specific discussion and advice in its own right. For example, Drucker's classic work, The practice of management, written in 1954, acknowledges the crucial role of information (e.g. Drucker, 1954, Chs. 8 and 9), but only implicitly. By 1976 Handy, in his comprehensive review, Understanding Organisations, has a whole chapter "On the systems of organisations", and a section specifically on information systems. In 1988 his work Understanding voluntary organisations, one of the few works which address management in the non-commercial sector, in general summarises his earlier book, but devotes a much larger proportion of it to information.

Information in management has in the recent past been more widely used in America than in Europe and the U.K. (Hunt, 1979, 145-46), probably because of the larger numbers of business schools there and the earlier and more widespread use of computers. In the U.K., at least in publicly-funded institutions, it was not until the 1980s and 1990s that the political climate and the wider introduction of computers brought about a rapid increase in the perceived importance of information to management. The emphasis is on the measurement of performance by using quantitative measures, and on accountability for the use of public money in this economically large sector, for instance the health and education services and, with less publicity, museums.
3.2.2 Excellence and quality

During this same period, the recognition that information is important in management has been paralleled, in America particularly, by a growing awareness that management by systems and numbers can create problems of its own. This has been fuelled by the publication of *In search of excellence* (Peters & Waterman, 1982, especially Ch. 2). Peters, in his sequel *Thriving on chaos* (1987), reaffirms his view that excellence lies in a focus on people: on the customers, and on the workers in the organisation. These general approaches are categorised by Bowman and Asch (1987) as "best practice". In the early '90s, many of the firms selected by Peters and Waterman as paradigms of success are experiencing problems to the point of going under (for example, IBM) but there is now such a bandwagon of courses, books, etc. hitched to the "excellence approach" that it will be some time before it goes out of fashion.

Studies of how organisations operate in the successful Japanese economy have reinforced awareness than information alone is not sufficient. For example, Ohmae (1982, 3) contrasts the then prevalent management approach in the U.S.A., strongly business school and numbers based, with that in Japan. But at the same time (pp.12, 24-34) he emphasises that "No proper business strategy can be built on fragmentary knowledge or analysis ... analytical method and mental elasticity ... are complementary". Imai (1986) expounds the concepts of "KAIZEN", an all-embracing value system devoted to total quality. Analytical information is vital, but only as a tool in its application. Perhaps ironically, it is an American, Deming, who is credited with laying the foundations of the quality approach (Clutterbuck and Crainer, 1990, 202-206; Imai, 1986, App.F); he was brought to Japan in the 1950's at a time when Japanese goods were synonymous with cheap-and-nasty. Building on these Japanese studies, and on Deming's own work, a current management movement is towards quality, 'Total Quality Management', or TQM. A British Standard (BS 5750:1991) now exists to encourage this.

3.2.3 Not-for-profit organisations

In management studies, then, despite the ever-present "bottom line", the emphasis is moving from quantities to quality. Museums, however, are not businesses, and like much of the public sector, their "products" are hard to measure quantitatively. Although much general management theory and writing is just as
applicable to what is generically known as the "not-for-profit" sector as to private firms, it is businesses which are offered overwhelmingly the most advice and exhortation. However, not-for-profits have been receiving more attention recently, as governments round the world begin to apply what they see as the forces for efficiency that exist in profit-making firms to the users of public funding. Drucker has legitimised their presence first in the Harvard Business Review (Drucker, 1989), and subsequently in his book, Managing the non-profit organisation (1990). Handy, Understanding voluntary organisations (1988) and Bowman and Asch (1987) in their invaluable review, Strategic management, address the problems of strategic management and decision-making in these organisations. Difficulties derive from the structure of the organisations, the workers in them (often professionals with greater allegiance to their profession than to their employers), their often complex and conflicting objectives, and the difficulty of objectively assessing performance. Although the U.K. government has not ignored the Excellence approach (Wright, 1991, Ch.16), it, among others, is firmly of the view that performance measures are a valuable tool, and these are being required to be produced in many sectors of public operations, including museums.

### 3.2.4 Missions and objectives

If "management-by-numbers" is not the recipe for success, should the numbers be discarded? Current thinking is that numbers, and information, are useful, if they are used in the service of what could be called "management by corporate values", as instanced by the adoption of Mission Statements, or Statements of Purpose, by many organisations. Klemm et al (1991) demonstrate their remarkably rapid spread. The communication of and focus on the over-arching objectives of organisations is identified by many writers as the single most important factor for success, and work on management information, especially at a strategic level, is increasingly directed towards serving this (e.g. Rockart, 1979; Lacey, 1987, 1). Peters and Waterman (1982, 279) note the overriding necessity to "Figure out your value system. Decide what your company stands for." A value system is not, of course, the same as a set of objectives.

Performance can only be measured if objectives have been set. In the Science Museum, the national museum which has implemented performance measurement the most thoroughly, though still not enthusiastically, a system of management by objectives accompanies it. This may be appropriate as a basis for
measuring performance, and for other reasons relating to the recent management
the barrenness and artificiality of rational objectives as a model of the real-life
social interaction that constitutes management:

"In the cabinet, in board rooms, in Trade Union branch meetings, on
committees, and in our everyday life ... the bulk of our activity is concerned
with establishing and modifying relationships through time, rather than seeking
an endless series of 'goals', each of which disappears on attainment."

3.2.5 Performance measurement

Despite the problems inherent in objectives and management-by-
numbers, government interest in the measurement of museum performance is a
reflection of current intense concern with the measurement and assessment of
performance in public service functions generally. This is most apparent in the
Citizen's Charter initiative. A recent book, How organisations measure success: the
use of performance indicators in government (Carter et al, 1992) describe the
development of this little industry. Clearly, this tool is perceived to be a lever of
power.

Performance indicators are dealt with by most writers on strategic
management as a means of monitoring whether plans are being achieved. They may
be envisaged as a component in a control loop (Lucey, 1987, Ch.13). One of Peters'
top "prescriptions" (1987, 583 ff) is "Measure what's important". Interestingly,
"what's important" is by no means necessarily financial. Handy (1988, 127) says
that organisations should have a vision, a set of specific tasks, and a set of measures
which will indicate what success means in each task.

However, the hazards of an approach based on measuring performance are
also evident. Handy (1988, 129) cited

"the hospital that decided that patient turn-round time was the criterion of
success for each ward, only to find that wards became reluctant to admit long-
stay patients no matter how ill they were".

In 1991, the Government set an objective to reducing waiting time for patients on
lists for operations to two years. The exact effect cited by Handy was the almost
Chapter 3: Management and information

There is no doubt that it is difficult to find the right measures of performance for public service functions. Bowman and Ash (1987, 382-83) only discuss performance measures in the context of the conflicting objectives and other awkward characteristics of this kind of organisation. Where outputs, "effectiveness", are not directly measurable then attention turns either to the measurement and control of inputs, "efficiency", or to "proxy measures" - some aspect of the task that can be measured. Handy observes, however, that "... the hard overrides the soft. Numbers matter. ... They had better therefore be the right numbers ...". Allden and Ellis (1991, Jan.) suggest that "a bias towards financial and numeric measures should not be encouraged in the MIS [management information system], which should be capable of communicating both numbers and text. ... provide comparative or superlative gauges ... "the best display of clay pipes in the country"". In the author's experience, producing information that is truly relevant is just as elusive (and as expensive) as when Drucker wrote optimistically that "Within a few years our knowledge of what to measure and our ability to do so should ... be greatly increased." (Drucker, 1954, 65). But perhaps finding the relevant measures is really no more difficult than it is for any organisation to truly find the answer to Peters' Prescription S1: "Measure what's important" (1987, 583).

3.2.6 Public sector parallels

Education and the health service are two comparable areas of management. In both, quality of provision is just as important as quantity; in both, it is specialist professionals, doctors and teachers, who have had command of the organisations concerned; in both, the management of their organisations has recently been greatly altered, though much more radically than has that of museums.

Secondary education

Performance measurement is currently being undertaken throughout the education system. It is particularly difficult in higher education - universities, etc. Most public interest is, however, aroused by the publication of performance measures for primary and secondary education.

The two main relevant factors in education are the changed role of education authorities that is the consequence of the introduction of local management
Table 3.1  Apparent government view of the effects of publishing school examination results, and actual effects in real life.

<table>
<thead>
<tr>
<th>Apparent government intention</th>
<th>Actual effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Publish results</td>
<td>Publish results</td>
</tr>
<tr>
<td>Parents complain about bad school</td>
<td>Bad school loses better motivated pupils</td>
</tr>
<tr>
<td>Bad school pupil numbers fall, school loses money</td>
<td>Best teachers leave</td>
</tr>
<tr>
<td>Bad school teaches better</td>
<td>School has fewer pupils, even less money</td>
</tr>
<tr>
<td>Better school: numbers rise again</td>
<td>Local children and parents stuck with school that cannot recover</td>
</tr>
</tbody>
</table>

The publication of the first results from the standard testing of pupils stimulated an intense public debate as to how the performance of a school should be measured. This debate was further fuelled by the publication of examination results for GCSE and 'A' levels in November 1992. Examination results clearly are an important measure, but what about the important functions of education to which
Chapter 3: Management and information

these figures are not relevant? They depend not only on the quality of teaching, but
on the social, ethnic and educational background of the pupils, too: and there are
other important outcomes of education, such as quality of life, and suitability for
employment. The simplistic view of the effects of publishing these measures and the
probable effects in real life are shown in Fig. 3.1.

The figures issued were widely condemned except by government
ministers and members of right-wing think-tanks, the latter not known to be
enthusiastic consumers of publicly provided education. The measure illustrates the
difficulties of applying quantitative measures to activities for which the qualitative
outcome is also important. In this, examination results are the equivalent of
museum visitor numbers, or numbers of objects conserved, and reflection on this
parallel may help illuminate the current debate on performance measures for
museums.

The health service

At the same time as the well-publicised changes to the management of the
health service, a long-drawn-out and immensely detailed study has been taking place
on information in it (the Körner working party). This is aimed at a national
management information system for the health service. McLachlan (ed., 1985)
reports the views of a group set up to contribute to the debate, with now-familiar
sentiments on the folly of a too-great reliance on performance indicators, the danger
of designing an information system in the abstract without extensive field testing,
and the cost of elaborate systems. It is interesting to observe that the government
pronouncement on the Joint Working Group's efforts, the NHS/DHSS National
strategic framework (1991) appears to concentrate heavily on inputs, at the
expense of the overwhelmingly important output - a better standard of health in the
community - as Bowman and Asch (1987, Ch. 15) expect, and cites 450 (sic!)
performance indicators which are in use.

Aside from this, a review by Long (1985) of Effectiveness: definitions
and approaches in health services discusses many familiar problems such as defining
what constitutes health; the paradox that the longer a person (object?) survives,
the more likely they are to become ill; and reviews ways of measuring effectiveness,
such as quality adjusted life years (QUALYS).
3.3 THE MANAGEMENT OF MUSEUMS

3.3.1 The operating climate

The '80s

Most sizable museums are in the public sector (Prince and Higgins-McLoughlin, eds., 1987, Fig. 6.2). They are subject to the same increasing pressures for efficiency as is the rest of that sector, through the engineering of "market", or at least business-derived, forces. Museums in the private sector are naturally much more directly exposed to financial pressures arising from the changing economic climate (currently in recession: 1991/93), but this is not to say that public sector museums are protected. Loss of local authority revenue due to revenue capping has already resulted in severe cuts to some museums, and may eventually mean closures. The interesting point is that in this, the "not-for-profit" sector, factors which might be supposed to mean operational "success" do not necessarily ensure survival. For example, the Design Museum, a privately funded museum, cut its staff severely in 1991. Although visitor numbers were rising, its business sponsorship was failing because of the economic recession (The Independent, 1991). One "key factor for success" (Ohmae, 1982, Ch.2) is, as for many small businesses, a thriving commercial economy - something completely outside its control. Again, efficient management will not protect museums from closure when local councils have to make choices between funding them or statutory duties such as education.

A review of the management context in which museums have been operating through the 1980's is given in Allden and Ellis (1990 (Nov)). Raynor Scrutinies of the V & A and the Science Museum in 1981-2, primarily concerned with reducing waste in public expenditure, were followed by the Financial Management Initiative (FMI) in the mid-80's. Important features of the FMI are delegated financial control, and the development of output indicators and performance measures. The introduction of Corporate Plans for museums, the recent investigations and reports by the Audit Commission, and the Auditor General, and the Office of Arts and Libraries's Performance Indicators initiative, are recent developments of the FMI.
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3.3.2 The national museums

The national museums are relatively better protected financially, since it would be politically difficult, if not impossible, for government to allow any of them to close. They have not been generously funded, but are still very well off compared to other types of museum, as judged by the types of activities of long-term benefit such as research that they are able to pursue. In 1983 and 1986 the legal status for some of them was altered in various Acts of Parliament (e.g. the Heritage Act, 1983; the Museum of London Act, 1986), most of them being hived off from the Civil Service and instead becoming trustee museums governed through Boards of Trustees, like the British Museum. They have experienced pressure as much to be more accountable for their use of public money and for their operations as from financial restrictions. Pressure on accountability has been exercised by the Civil Service mechanisms generally, by the Office of Arts and Libraries (now subsumed into the Department of National Heritage), which is taking a much more directive stance than in the past, and by Parliament itself through the National Audit Office and the Public Accounts Committee. (The Museum of London is a semi-national museum; see below, Section 3.6.)

In 1982, the Raynor Scrutiny of the Victoria & Albert and Science Museums was carried out, directed by Gordon Burrett (discussed by him in Burrett, 1985). These operations were designed to subject the Civil Service to an outside view under the banner of Lord Raynor, from what was seen as almost the national flagship company, Marks & Spencer. For the first time, the effect on museum operations of the traditional role of the curator, the Keeper-as-King (or as Burrett puts it, Keeper baron), the surrogate owner of his or her collections, was examined by the organisations' political masters or mistresses. The effects of some of the major changes of the early 1980's are reviewed in Cossons, ed. (1985).

From the late 1980s, the national museums were required by the Office of Arts and Libraries to submit annual corporate plans for the following five years. This discipline has forced them to be much more explicit about plans for all activities, including collections care and preservation. These corporate plans are hybrid bid and planning documents, since they include schemes for expansion, etc., which are dependent on increased funding, as well as strategic plans based on the grant-in-aid the museums can actually count on. At the same time, the annual scrum for grant-in-aid was replaced by cash-limited grant-in-aid for each museum for a
three-year period. Plans involving increased resources bids for the next three-year round have to be based both on well-argued cases, and on political priorities.

3.3.3 The National Audit Office and the Audit Commission

The Auditor General (who as head of the National Audit Office scrutinises central government affairs), the Audit Commission (for local government), and the Public Accounts Committee of the House of Commons have been taking an interest in museum accountability, with a series of reports on various national museums and their activities since 1980/81. If anything, this interest is increasing, with relevant reports in 1989, 1991, and 1992. This is giving the National Audit Office considerable influence on how museums set their priorities and allocate resources.

1988 brought a particularly relevant report by the Auditor General on the care and management of the collections of the national museums (Comptroller and Auditor General, 1988). In fact, the prime importance of collections preservation had been flagged a number of years previously, for instance Thomson (1973), Greenhill (1983 and 1984). The matter had also drawn comment from Burrett (1985, 7):

"What museum manager or Trustee would dare to dissent publicly from the view that museums should not acquire or keep objects which cannot be conserved to an acceptable standard ... But this principle is not in fact reflected even imperfectly in the actual policies of many, if any, museums."

The House of Commons Committee of Public Accounts took further evidence on this report from the Directors of the V & A and British Museums in 1989 (Committee of Public Accounts, 1989). Both report and hearing were widely reported in the press: e.g. V & A admits 'disastrous failure' (Fletcher, 1988); A case of arts for oblivion (Sewell, 1988); MPs warn of 'breakdown' in museums (Henke, 1988).

Professional concerns: raising the profile

As far back as 1974 the U.K. Institute for Conservation had been publishing concern about the state of museum collections (United Kingdom Institute for Conservation, 1974), with an update in 1989 (Corfield et al, eds., 1989). 1989 also brought specialist surveys of collections in Scotland (Ramer, 1989) and
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industrial collections (Storer, 1989), telling the same story of neglect of public assets. Recently, the Museum Council for Yorkshire and Humberside has once again identified major deficiencies in the management of collecting and collections care, in a report on industrial and social history collections in the region (Kenyon, 1992).

It is interesting to contrast the 1971 report, *The preservation of technological material*, by the Standing Commission on Museums and Galleries (as the MGC then was) with the *Storer Report* (1989) and the others cited above. The 1971 report is exclusively on the need to take such material into public ownership, with never a mention of funds for its physical maintenance. A fund (the PRISM fund) was in fact set up to aid this process. By the early 1990s the emphasis is all on how the physical conservation and housing of this material can be afforded, and in fact conservation is expected "to absorb an increasing percentage of the Fund's resources, as museums assume a more rigorous attitude towards collecting ..." (Price and Robinson, 1991).

3.3.4 Shuffling the pieces: the current climate

The Raynor scrutiny, coupled with financial and no doubt other government pressures, set in train a radical review by the national museums of their priorities. This resulted eventually in the thorough restructuring of staff and operations in most of them, during the late 1980s and '90s. This includes the Natural History Museum, the Victoria and Albert Museum, the Science Museum, the National Maritime Museum (Ormond, 1988), the national museums in Scotland, and the Museum of London. The British Museum and the National and Portrait Galleries are so far exempt. A common feature of these reorganisations is that non-curatorial museum activities have mostly been accorded equal status with those of curators. Marketing and public services functions have particularly gained, as have the central functions of managing and conserving the collections.

Concurrently, the training and professionalism of museum staff were being examined. An MGC Working Party report in 1987 (Museums & Galleries Commission, 1987) resulted in the establishment of the Museums Training Institute. This body is currently undertaking a Functional Analysis of museum operations, in preparation for setting up a system of modular training and qualifications. The first draft of their proposed Standards of Competence has been issued for comment (Museums Training Institute, 1991).
The Office of Arts and Libraries and the Audit Commission continued to require formal processes of corporate planning, performance monitoring (Ernst & Whinney, 1989; Office of Arts and Libraries, 1991), and even internal financial accounting (Ernst & Whinney, 1989). The latter, an Office of Arts and Libraries report, *Financial management survey of museums*, based on an examination of the British and Science Museums, set out in considerable detail a notional museum management information system. It is, not surprisingly, heavily biased towards financial information.

A management consultants' view of the wider operating climate for museums in the '90s is contained in Lewis (1990). Pressures are likely to be sustained for accountability, effectiveness, clarity of purpose and better discharge of fundamental museum operations.

As the 1988 Auditor General's Report fades into history, improved care and management of collections is moving down the agenda of government priorities in favour of more organised management; training and qualifications, particularly promoted through the Museums Training Institute; the introduction of performance indicators; and better access to the collections for the public. In late 1992, the Office of Arts and Libraries has been subsumed into the Department of National Heritage (DNH), along with sport and more congenial fellow organisations such as English Heritage.

There is particular interest in the measurement of performance. The Audit Commission and the government alike are pressing areas such as leisure and museums to develop suitable indicators. This is witnessed by a flow of reports on performance indicators and management issues: for leisure and libraries (Audit Commission, 1986); for museums (Audit Commission, 1991); for developing performance indicators for museums (Audit Commission, forthcoming). The latest investigation is into "quality" in museums. Compulsory competitive tendering is another recent initiative to be applied to museums: the Government has recently notified the national museums of its intention to publish a White Paper which will extend these processes to many of their activities, specifically including conservation. There are signs of a wish to exercise tighter central control with, in early 1993, a directive for multi-stage and more frequent plans and performance reviews.
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3.3.5 Current issues in museum management

Debate on management issues in museums appears to be more lively abroad than in the U.K. It is noteworthy that the Museums Journal, the main publication of the U.K. Museums Association, contains only sporadic management articles, while the journal of the American Association of Museums, Museum News, has regular contributions. Museum literature in general, and that on management in particular, is increasing, with the addition of journals and a steady flow of books.

Internal affairs

Griffin (1987, 1988, 1991) illuminates many of the major management issues in museums by reference to general management literature. In his view, museums are not very successful as institutions; they conform to Mintzberg's model of the professional bureaucracy, in which specialists work independently of each other and seek to control administrative processes which touch them. Staff are most concerned with the product, not the market. Museums appear to be at risk of being overwhelmed by the search for money and related activities; few are clear about what their business is. To remedy these ills, communication is essential. His second paper deals with conflict, choice theory and decision making, cultural revolution, staff issues, and corporate planning. His 1991 article considers the role of museum governing bodies. Kovach (1989) summarises some of the principles of strategic planning. The flow of Government publications from the Office of Arts and Libraries, the Audit Commission, and the Museums and Galleries Commission, cited above, is now a substantial body of the museums management literature in its own right.

Measuring performance

The important issue of performance indicators for museums is explored by Ames (1988); by Caton; Bud et al; Diamond; and Walden (all 1991) in a set of articles in the Museums Journal; and in reports commissioned by the Office of Arts and Libraries (Office of Arts and Libraries 1991), and by one of the Australian government departments (Scott, 1991).

Ames argues the benefits of measuring performance. He sees the process of debating what these should be as being a fruitful one, uniting and strengthening different sectors by common goals; institutions that may be adrift will have some signs to guide the way. Numerical performance indicators, particularly ratios,
may provide the best indicators. He particularly favours expenditure ratios, as "a much truer indicator of institutional priorities than any strategic plan, speech or press release". Such measures, although they certainly constitute management information, are in fact not indicators of performance; they are measures of input. Ames admits the difficulty that many important museum activities are only measurable qualitatively.

A Museums Association Working Party, chaired by Walden (1991), concluded that the use of performance indicators could be of benefit in an individual organisation, but were wary of their use to compare different museums and local authorities, due to the very different nature of museums and communities. The Office of Arts and Libraries Report (1991) identifies benefits in demonstrating value for money; assisting sponsor [government] Departments in policy formation; informing the debate about resource allocation, assisting management decision making; and motivating staff to achieve objectives. The Report recommends Group I indicators, to be used to compare institutions, and Group II indicators, to be used for the internal management of museums. However, the Group I indicators for collections management are by means of periodic reports by outside assessors (peer group review); they are not quantitative indicators. A deficiency of the Office of Arts and Libraries report is that its recommended indicators are not predicated on museum missions and objectives.

The specific models for performance measurement which are proposed by the above authors are discussed below, Chapter 7, Using the information.

Scott (1991) discusses two earlier Australian government reports. The first of these, What price heritage? from the Department of Finance (1989), is, she suggests,

"... a relatively unilateral presentation of quantitative indicators developed in isolation from museum mission statements and objectives... a commonality of aims and services among a diversity of providers was assumed".

The riposte, What value heritage?, from the Department of the Arts, Sport, the Environment, Tourism and Territories (DASET, 1990), found problems in applying the simplistic Finance model to the varying contexts and complexity of differing objectives for museum operations.
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Scott herself, in her study, identifies a further danger that accountability may be supported at the expense of appropriate response to the needs of the multiple stakeholders who should benefit from museums:

"To be truly representative of the complexity and range of services characteristic of public service providers, there is a need for performance indicators which are relevant, reflective of the aims of institutions' mission statements and objectives, and which address qualitative and quantitative outcomes."

So museums had better make the mission the point of the measures. If they do not, then the measures will inevitably come to set the mission. Museums have their full share of genuinely conflicting objectives: to raise income from sponsorship, but not at the expense of a truthful representation of the past; to raise money from charging visitors, but to attract more people from poorer social strata; to preserve and care for their collections in perpetuity, but to use them in displays and demonstrations to enlighten and entertain visitors. Only measures and indicators which relate specifically to objectives will serve a proper purpose.

Finally, a thought for the politically inclined. If the sheer presentation of numbers draws attention to the function they represent, then if a function wants to be seen as important it should be sure to present some relevant numbers.

3.3.6 The management of collections and preservation

The Office of Arts and Libraries has funded research and consultancies such as that for The cost of collecting (Lord et al., 1989) and for the collections condition audits reported below in Chapter 5, Section 5.5, Data on collections condition. However, for the U.K. these areas are mainly in the domain of the MGC. As well as operating its Museums Registration Scheme (Museums and Galleries Commission, 1988), this body is vigorously developing standards for museums, presently for the curation of particular collections and for the museum environment (Cassar and Keene, 1990; Cassar, forthcoming; Leary, 1991). Standards currently in existence or in draft include those for archaeological collections and for the museum environment (Paine, ed., 1992; Cassar, forthcoming). An early and apparently successful precursor to these were the Criteria for the grant-aided storage of excavation archives (Museums and Galleries Commission, 1986).
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In America, the Association of American Museums and the National Institute for Conservation have been active in developing the Museum Assessment Program (MAP). Rather than assessing museums against fixed standards, these questionnaires give consultants a validated structure within which to frame their advice to museums. MAP I is on general museum management; MAP II, collections management (Association of American Museums, 1985); and the Conservation Assessment, drawn up jointly by the National Institute for Conservation and Getty Conservation Institute (1991), deals more specifically with conservation and preservation.

In the U.S.A., as well as being the concern of professional museum organisations, collections care has received statutory or semi-statutory attention, being the subject of a Department of the Interior Special Directive (U.S. Department of the Interior, 1986). The more litigatious climate in the U.S.A. has also touched collections care and preservation, as in the cases cited by Weil (1983, (1) and (2)), and noted by Ulberg and Lind (1989).

In general, then, the literature on the management of collections care and preservation shows the increasing introduction and raising of standards in both America and the U.K., a consequence of museums being held more accountable for the proper discharge of this function.

3.3.7 Conservation management

The production and publication of the two surveys on the state of conservation in museums, Conservation in museums and galleries and The Survey (United Kingdom Institute for Conservation, 1974; Corfield et al (eds.), 1989) have done much to raise awareness of the management issues surrounding conservation in museums. Conservators have a reputation for clear objectives, and they often complain that conservation work is geared to production for exhibition projects. Despite this, the conservation literature has practically nothing specifically on management, or even on information management, beyond conservation treatment and condition records. There is a brief report of work by McLeod (1989); Ashley-Smith's paper on conservation ethics (Ashley-Smith, 1982); the preprints from the conference organised by the author (Keene, ed., 1990); and early summaries of part of this research (Keene, 1990 (3) and Keene, forthcoming (2)). However, there is a considerable body of work on data collection and use, particularly on environmental monitoring, discussed below in Chapters 5,
Chapter 3: Management and Information

**The data, and 8, Case study.**

Why are conservators apparently so little interested in the management of their work? Many of their posts are relatively junior, and hence they can have little influence in their organisations. Many of them entered the profession because they enjoyed the actual practical treatment of objects; they much prefer this to tackling the wider, less practical, and often less immediate issues of collections preservation. It will probably always be the exception to find equal aptitude for these very different tasks in the same person. Conservation training courses do not on the whole include management elements, beyond environmental monitoring and perhaps condition surveying.

It is obvious, however, that the tasks of improving the condition and preservation of collections which have been accumulated reactively, with little consideration of the practicalities of properly managing them, are often enormous (Kenyon, 1992). If they are to be accomplished, then information on the size and nature of what is required must be assembled, options for dealing with them weighed up, choices made and decisions implemented and monitored. There are few museums in which the collections are already well looked after. Where this is the case, their upkeep will continue to consume a substantial proportion of museum resources and this will need to be properly managed and controlled. For all these purposes accurate, timely and relevant information is essential.

**3.3.8 Management in the Museum of London**

The Museum of London is a semi-national museum, and all the above discussion applies to it. It exists by virtue of the Museum of London Act (1986). However, it has more diverse sources of funding than do other national museums, with about one-third each from the Government, as grant-in-aid from the Office of Arts and Libraries; the Corporation of London, which matches the Government’s grant; and English Heritage and donations from property developers, specifically for its archaeological operations. This gives it the flexibility to employ staff under a variety of contractual arrangements, and also greater and more direct exposure to the economic climate generally, as in the well-publicised effects on the employment of archaeologists in summer 1991. It is probably not due to chance that the departments most affected by semi-commercial operation, Archaeology, Conservation, and Production, have the most developed formal management procedures and reporting systems.
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A series of documents, the most significant of which have been agreed by the Board of Governors, sets out its policies and strategic planning. These include its Corporate Plans: annual Five Year Plans for 1989-990 onwards (Museum of London, 1989, 1990, 1991, 1992), and its Statement of Purpose and Values, first published in the Five Year Plan for 1991/2 to 1995/6. The operations of the Museum are described in detail in Chapter 8, Case study.

3.4 CONCLUSIONS

Formal management processes in museums are increasingly being adopted, largely because of government pressures for accountability, in this country and abroad, especially in the USA, through the Museums Assessments Program (MAP: Association of American Museums, 1985), and in Australia (see below, Chapter 7, Using the information). Consequently, museum managers and directors are beginning to draw on the considerable body of work that exists on general management and management information. Management information is mainly quantitative information, but it is clear that the use of this information in not-for-profit organisations presents particular problems which must be addressed. Despite this, public-sector museums are increasingly required to use quantitative measures of performance; indeed, these lie at the heart of any management information, and must be of central concern. The implications, for good or ill, of the provision and use of information on the motivation of staff are a further important dimension that must be taken into full account.
Chapter 4

Analysing the system

The operations of museums and conservation, and the roles of museum collections, have been reviewed. In what way is information necessary to these organisations, and to the preservation of the collections? In order to understand this, the situation will be viewed in systems terms, so that the processes and purposes which information would serve can be better understood. Derived from this, an information analysis including functional and entity-relationship models is presented.

4.1 THE SYSTEMS APPROACH

4.1.1 Introduction: different methodologies

Systems thinking has arisen from a recognition of the complexity of behaviour in organisations and groups of people, and in assemblages of both man-made and natural physical components. The wish to predict and control the behaviour of systems has been a stimulus to developing the analytical methodologies which are grouped under the systems umbrella (Open Systems Group, (eds.), 1972, 10).

Although systems thinking implies the study not just of information systems but of the general functioning of organisations (Handy, 1981 Ch.11; Vickers, 1981), the term 'systems analysis' has a particular place in information technology. Here, it means analysing information needs and translating them into a specification for a (normally computerised) information system. Information systems analysis embraces a variety of methods (Hawryszkiewycz, 1988, Ch. 15; Layzell and Loucopoulos 1987, 22-28; Willcocks and Mason, 1987, Ch.4). These can be grouped into two broad areas. 'Hard' methodologies are related to Operational Research. They embody a linear, logical approach from problem definition through systems design to implementation.
'Soft' approaches recognise that the needs of the organisation are not necessarily the ones which appear obvious; they focus on the need to understand the organisation, its people, and its purpose before designing its information flows (Willcocks and Mason, 1987, Ch.4). One methodology, 'Multiview', explicitly combines the two strands (Avison and Wood-Harper, 1990).

**Hard, or structured, analysis**

These methods take as their starting point a defined 'problem' or task in information handling or processing, which it is thought can be solved or eased by improving the handling of data and information, especially by using computers (Hughes 1984; Naughton 1983, 7-10). At the outset, a definition of the task and of the desired results is agreed between the organisation or individual commissioning the work, and the consultancy or employee undertaking it. A series of defined analytical steps, often using preprinted forms to assist in quality control, is followed in a prescribed order, with the object of producing a system (or choice of systems) to gather the data for and produce the defined information, or expedite the identified procedures, as efficiently as possible (Willcocks and Mason, 1987, Fig. 4.1; Layzell and Loucopoulos, 1987, 22-31).

A well-known variant on hard systems approaches, cybernetics, is expounded chiefly by Stafford Beer. His work gained such credence that he was summoned by Salvador Allende to apply his concepts to the running of a whole country - Chile. Ashby's "law of requisite variety", much cited by Beer, must be respected in any successfully operating system. His concepts are fully developed in *The heart of the enterprise* and other works (Beer, 1972, 1979, 1985).

'Hard' systems methods are by far the best established. These structured methods do go straight to the point. Where the objectives of the system are well-defined, and a limited area of operations is to be tackled, then it may be exactly the tool required, for example, for designing systems for controlling production, manufacture, bookings, or accounting.

On the other hand, despite the impression that is gained of extremely organised and predictable operation, there are many examples of failure when structured methods have been employed.

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1 This position is maintained by Cornes (1990), among others.
Chapter 4: Analysing the system

'Soft' analysis

There are a number of soft approaches (e.g. the socio-technical approach, Mumford, 1983; the soft systems approach, Checkland, 1981). In soft analysis, the initial assumption is that the situation or problem is not obvious (Checkland, 1981; Naughton 1983). Instead of focussing on 'the problem', the first step is to understand the operation of the organisation itself as a system. Checkland's Soft Systems Methodology appears to be the most widely used and published variant. The essence of this is to imagine a relevant abstract metasystem and contrast it with the real situation, thus gaining insight into what the problems really are, and how they may be addressed. The participation of those involved in the situation is essential, since the objective is to bring about real, desirable change. The methodology is inherently just as rigorous as hard analysis (Checkland and Scholes, 1990, 10), but takes a wider and more creative view.

This methodology should prove useful in public sector situations generally, where objectives are complex and where users are unsure what exactly they require from the information system. However, soft analysis was actually developed for use in management consultancy; it seems presently not to be widely used in connection with information systems. There may be problems of credibility. Information systems consultants are likely to be called in when large, expensive, complex systems are contemplated. Despite their well documented failures, hard methods, particularly "Structured Systems And Design Methodology (SSADM), have gained such a stamp of approval from their adoption as the official method of choice by government agencies that these will be the methods such consultants will normally offer. Soft systems analysis also demands a real commitment of time and enthusiasm from members of the organisation; since a primary aim is to be a stimulus and means to learning and changing perceptions, those who are to benefit must set aside the time to do so. Willcocks and Mason (1987, Ch.4) identify a further hazard: in a soft analysis, the view of the more powerful interest groups is likely to predominate. The full support and cooperation of the organisation's senior management is necessary. Otherwise, conclusions may simply be found unpalatable and recommendations not be implemented.

2 Checkland and Scholes (1991) cite only one article dealing with this application; they omit mention of 'Multiview' (Avison and Wood-Harper, 1990), in which soft systems analysis is the first stage.
Chapter 4: Analysing the system

Soft methodologies are perhaps most usefully applied to a whole system. If soft methodology is being used to understand an organisational sub-division, such as conservation, then the museum system itself must also be examined, in order that the aims, functions and objectives of the sub-system harmonise with those of the whole system. It could be argued that soft methodology will be of less benefit if applied to a sub-system, but it should throw any mismatch between system and sub-system objectives and functions into usefully sharp relief, while structured analysis is as likely as not to exacerbate it.

Methods for information systems design

"The workability of a systems design is the most important consideration for the end user. The traditional approach - getting the complete technical system design right first, making some attempt to add on 'user friendliness' then implementing it, all too often does not achieve the results desired." (Willcocks & Mason 1987, 86)

Hard and soft approaches may be regarded as complementary, rather than as straight alternatives (Naughton 1983, 14; Willcocks & Mason 1987, 88). A published method which adopts exactly this approach is 'Multiview' (Avison and Wood-Harper, 1990). The 'multiview' method begins with soft analysis as set out by Checkland, proceeds to a socio-technical analysis as developed by Mumford (1983), and thence to the hard analysis and design stages of functional, data flow, and entity relationship analysis. It goes on to place particular emphasis on the implementation stages, using prototyping to involve users in the development.

Soft analysis can generate an understanding of the organisation: of what the information component of the system is to do. Hard methods come into their own for engineering the system once specified. But the users must stay in control. Systems design is difficult enough to get right, in the author's experience, even where what is required appears to be quite straightforward.

In designing the system itself, there are two other methods, prototyping and evolutionary development, which allow users to test out the system and contribute to its development - much easier when one can actually see how one's requirements have been interpreted (Hawryszkiewycz 1986, 16; Willcocks & Mason 1987, 84-88). Generally speaking, these make use of the increasingly available software that can assist with the time-consuming and sometimes
mechanical process of turning a definition of the information one requires into a working computer system. This software is generically known as "fourth generation language", or 4GL.

Prototyping (Hawryszkiewycz 1986, 310-311; Layzell & Loucopoulos 1986, 9; Willcocks & Mason 1987, 86-88; Eason, 1982) is a sophisticated form of trial and error. The users of the system define their requirements, and a simplified system is created, with little fuss, to meet them. The system is tried out, and adapted and changed to better meet the specified requirements, which can be redefined as the users realise the possibilities of the system.

Prototyping can lead to poor control over cost and development times, if the emphasis is on 'error' rather than the 'trial' of a thought-out system component. It could also be difficult to decide when to stop developing and concentrate on using and maintaining the system. However, there is obvious sense in using prototyping as part of the system development process, as advocated by Avison and Wood-Harper (1990, Sect. 14.3).

Evolutionary development (Eason, 1982; Hawryszkiewycz 1986, 309-310; Willcocks & Mason 1987, 84-86) is similar to prototyping, in that the information system is built in close co-operation with the users. In hard systems analysis each stage is "completed" for the entire system, and the next proceeded to in a rigid sequence. In evolutionary development, a broad framework is drawn up, parts of the system are developed until they are satisfactory, and other components or modules are added subsequently. Problems to be anticipated here are that as further components are developed there must be pressure to adapt those first built - again, is there a time when the system is finished?

The advantages and disadvantages of these approaches are discussed in greater detail by Willcocks and Mason (1987, Ch. 4 particularly).

4.1.2 Choice of method

The situation-of-interest in museums is far from clear cut. Museums generally have only just begun to precisely define their roles, aims and objectives, let alone their real information needs. Information on conservation itself is mainly confined to environmental monitoring, some collections surveys, and sometimes counting productivity as defined by numbers of objects conserved over a period.
Chapter 4: Analysing the system

The systems approach in general seemed to offer a useful means of understanding and describing the museum situation in information terms. A generic problem with many scientific, engineering-derived techniques, in which cybernetics is included, is that they can miss the real problem by too narrow a focus on goals or ends (Checkland, 1981, 262). Beer's cybernetics approach was a candidate as the main analytical tool (Beer, 1972, 1979, 1985). However, this is not at all easy to understand in the depth needed to apply it usefully. While this would not necessarily rule it out, the prevailing management culture in museums, and the need to engage all workers in the process of understanding their "situation", has to be considered. It was found during workshop or feedback sessions that the systems approach was just acceptable as a means of understanding the museum "situation"; cybernetics requires many more less obviously relevant analytical steps, and it was therefore unsuitable for this application.

Thus, this particular problem, how to understand the information needed to manage conservation in museums, appeared to be one where soft analysis could appropriately be employed, and this is the method that was selected. The soft situational analysis was used as the basis for setting out objectives. These were then used in the development of the full information system, and for an information analysis of functions and entity relationships.

For the purposes of this research, the analysis is confined to publicly funded museums. In private museums, and in private conservation practice, there is a considerable difference when it comes to the ownership of the system and accountability for its operation, and this greatly affects the information needed within the system.

4.1.3 The soft methodology

Developed by Checkland (1981; Checkland and Scholes, 1990), the application of this is clearly explained and set out by Naughton (1983, 4-47). It is based on contrasting a detailed view of the existing situation (the "real world") with an abstract view of what a system to fulfil the purpose of the real one would have to do. Fig. 4.1 illustrates the stages. Steps are repeated (iterated) as much as necessary. Since the analysis described below was undertaken, Checkland has reviewed and modified the methodology (Checkland and Scholes, 1990). Although
account has been taken of these later developments, the heart of the method remains the same, and it was not felt necessary to fully revise the analysis. In fact, it is felt that, for an unpractised user, it may well be most productive to follow the seven steps of the method as first formally defined, rather than to take the more flexible approach now described by Checkland.

Fig. 4.1. Diagram of the soft methodology (after Naughton)

4.2 MUSEUMS AS SYSTEMS

4.2.1 Stage 1: The problem situation unstructured

The unstructured situation has been portrayed above, Chapters 2, Museums and collections, and Chapter 3, Section 3.3, The management of museums.
Chapter 4: Analysing the system

Table 4.1. *Description of the stages of soft systems analysis.*

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
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<tbody>
<tr>
<td>1: The problem situation unstructured</td>
<td>This is the situation as the analyst finds it. The usefulness of the methodology is not confined to information problems, as will be shown.</td>
</tr>
<tr>
<td>2: The situation expressed</td>
<td>The first stage of work is to collect information about the situation, and to represent this without analysing it, but in such a way that it expresses the issues, processes and structures inherent in the situation and its context. This is done by means of a 'rich picture', a diagrammatic representation.</td>
</tr>
<tr>
<td>3: Relevant systems and root definitions</td>
<td>In this stage, the analyst and the clients both step back and seek patterns and analogies relevant to the situation in the rich picture. These may be based on possible solutions to issues raised, or on the primary tasks identified. From these, one or more Relevant Systems are chosen, particularly germane to the situation. These will thenceforth condition the analyst's approach to the work. The Relevant System(s) are then fully but succinctly described in Root Definitions.</td>
</tr>
<tr>
<td>4: Conceptual model</td>
<td>This is an activity model, showing the essential activities which are logically implicit in the concept of the Relevant System which has been adopted.</td>
</tr>
<tr>
<td>5: Comparison of abstract model with real world</td>
<td>The abstract conceptual model, which depicts the logical detail of the Relevant System, is then compared with the rich picture of the real world. It is often necessary to iterate the stages thereafter, adding to the rich picture, adjusting or changing the Relevant System until both analyst and users are satisfied that it meets the needs of the situation.</td>
</tr>
<tr>
<td>6: Take consequent action</td>
<td>An agenda for action is drawn up towards the end of the comparison stage, 5. This is discussed extensively with the users or owners of the system. The changes implicit in the analysis will not always be politically acceptable within the organisation. The agenda may take the form of a proposed design for an information system.</td>
</tr>
</tbody>
</table>
MUSEUM
Government, National Audit Office; More collections care!
More exhibitions! Spend less!

OLD
Director
Curators
Conservators
Designers et al

NEW
Director
Head
Head
Head
Head

Management

Conservation

Curation

Exhibition

The Object

Perfect Dream Store

No dirt. No light

What I really enjoy is treating objects

Very few conservators

Conservators:
- treat
- observe
- scientifically examine
- apply standards to the care of
- prevent damage to

OBJECTS:

The Lab.

DR E A M  S T O R E

Conservator:
- treat
- observe
- scientifically examine
- apply standards to the care of
- prevent damage to

OBJECTS:

What is mine - I'll do what I want

Conservator:

Don't - I know best

Curator:

It's mine - I'll do what I want

It's not a chair, it's an object:
• Historical?
• Irreplaceable?
• Unique?
• Beautiful?
• Valuable?
• Vulnerable?
• Public property

Acquisitions
Policy ????

Always room for 1 more

A whole collection! Most important!

Fig. 4.2. The Rich Picture of the general museum situation.
4.2.2 Stage 2: The problem situation expressed: the Rich Picture (Fig. 4.2).

The Rich Picture sums up the main points, especially the issues at stake. Conservation is depicted in the context of museums in general. The first stage towards expressing the situation must be to examine the museum system which is relevant to conservation.

The relevant elements of the rich picture are:

The processes in the museum: management, conservation, curation, exhibition

The collections: consisting of objects, stored and exhibited

The people: managers, curators, conservators, designers, and very importantly, the public

Inputs and outputs within the system: inputs of objects from curators to conservation, finance to the various activities, conserved objects to exhibition and store, similar conservation outputs.

Outside pressures: the National Audit Office, the government, other local or national government influences.

Many issues, among them: that curators feel threatened by the rise of other museum professionals (Anderson, 1985; Cossons, 1990), that many conservators prefer to spend time actively treating objects rather than preventing damage, that there are many reasons why a particular object may be a candidate for conservation at any one time, conflicts of priority, difficulty deciding where to start if treating objects in store, pressure for accountability from outside bodies.

A decision has to be taken on whether the analysis is to focus on issues, structures or tasks. Since this analysis is directed towards understanding a generalised museum system and its information needs, it is most useful to examine tasks. Focusing on tasks, or functions, also makes it easier for an analyst who is herself part of one of these systems to distance herself from issues, such as the conflict over the collections and objects between one group, the conservators, who
see themselves as 'carers', and another, stronger and more numerous group, the curators, who see themselves as 'owners'. This is an element of the rich picture which is very apparent to the actors within these real-world systems (see above, Section 2.3, Conservation in museums). It is symptomatic of the dual objectives of the system (see below, Section 4.2.3, Relevant systems).

The Rich Picture does not depict structures or tasks at all clearly, although it does show conservation work going on. This does reflect the situation in 1988, when it was drawn. It is fair to say that in general museums at that time employed professionals, i.e. curators, conservators, etc., with the expectation that they would carry on and curate, conserve, etc. with little explicit objective setting or guidance. This led to much unclarity about responsibilities and roles, with consequent conflict. The task in the soft analysis was to inspect the situation as it existed in the real world and to propose a system of tasks and functions that would more effectively carry out the purpose of museums.

4.2.3 Stage 3: Relevant systems and Root Definitions

Relevant systems

The museum system that we need to imagine is one relevant to the conservation and preservation of its collections. The various definitions of museums which exist (e.g. ICOM, 1990, Statutes, Article 2) have been helpful in compiling the rich picture, but they are not descriptions of systems. More than one Relevant System needs to be developed, to aid freedom of thinking. From the Rich Picture, a variety of Relevant Systems for museums suggests itself:

A system to ...

... focus on the tasks of preserving the collection rather than on interprofessional issues

... provide management information on the preservation of the collections

... minimise the number of objects that needs to be treated (because they are all in good condition)

... set and apply standards for the care and maintenance of objects

... maintain original objects in good condition for exhibition or other "use"
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a. A production system:
A system to take in raw materials and turn them into finished products to be sold.

b. A records office:
A system to permanently preserve primary evidence, and make it available to the public.

c. A commercial exhibition (e.g. motor show):
A system to put products on show to the public in such a way as to make people want to buy them.

d. A museum:
A system to permanently maintain an irreplaceable resource and to use it to transmit ideas and concepts to the public.

Fig. 4.3 Concepts for Relevant Systems for different organisations compared

What lies at the heart of the activities and purposes of museums? What might constitute a Relevant System for other types of organisation? What about a factory making shoes, or any other commodity for sale? A record office? Commercial exhibitions? Fig. 4.3 shows diagrammatically some systems with their essential inputs and main outputs. The differences between the museum systems and the others are sharply apparent. A production system takes raw materials, turns them into something else, and passes them out of the system. A
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records office takes something which constitutes original evidence, organises and maintains it, and makes it available to the public in a form as nearly unchanged as possible; i.e., as primary evidence. In a commercial exhibition the fate of the products is irrelevant (except for their cash value): the desired output is eager customers.

Objects are not, of course, an essential input to the museum system (Fig. 4.3). Once established, records offices and museums can function without acquiring new objects, and indeed many 'closed' collections exist, such as the Wallace Collection and the Dulwich Picture Gallery. The proposed Relevant Systems for the records office and the museum both have dual outputs. This is typical of public sector and not-for-profit organisations (Bowman and Asch, 1987, Ch.15).

The Relevant System which seems to best represent the situation of interest is:

A system to permanently maintain an irreplaceable and meaningful physical resource and to use it to transmit ideas and concepts to the public.

This combines the two essential features of museums, expressed in all definitions and in most implements of governance: to maintain collections and also to transmit ideas, etc. Since they are of real objects, each unique because of its historical context or associations, collections can be seen as "an irreplaceable resource". The term "resource" implies something being used up. Nothing can prevent objects gradually deteriorating, and displaying them generally accelerates this; therefore, this term seems appropriate. Exhibitions, lectures, educational activities, actors in galleries, and all the other public service activities of museums today are essentially different ways of transmitting ideas and concepts to the public. If the resource is to be used to transmit ideas then it must also be in some way meaningful, and this must add to the uniqueness of its components.

The actual Relevant System, then, is what goes on inside the system in Fig. 4.3d: that is, the "maintenance and transmission system" which takes input resources and outputs the same "irreplaceable resource" and "ideas and concepts for the public".
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Alternative museum systems

The museum Relevant System depicted here might be called the classical system. But in Section 2.2, What are collections for?, it was shown that there is a variety of uses for museum collections: display, demonstration, and evidence. Do these various uses imply different Relevant Systems?

In this Relevant System (Fig. 4.4b), objects themselves are an essential input, because the operation of the system, if no restrictions are placed on it, entails the maintenance of the objects, by replacing parts, repainting, etc. Maintenance implies that objects will be changed, and this might be to such an extent that they are no longer the same as they originally were.

If Fig. 4.4 a and b are, respectively, the 'classical' museum system and one where collections are used for demonstration, is a third type of system required where the primary purpose is display? The prime example of this is a picture collection. In systems terms, display can be seen as a form of demonstration, or the 'use' of objects. Just as running an historic engine or maintaining an historic house will lead to original parts wearing out and either continuing to exist in a changed form, or being replaced or modified, exposing a picture to light energy in display will result in changes to colour, texture, and physical and mechanical.

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properties. The system in Fig. 4.4b appears to be generally relevant to collections for demonstration and display. Dual objectives still seem necessary, but instead of a permanent resource, historic objects are being maintained for demonstration.

Is there a sense in which the two different Relevant Systems, 4.4a and 4.4b, can be expressed as one? In both cases, historic objects are in a way both an input and an output. If they are in a museum, then objects will deteriorate, whether from display, demonstration, or natural processes, and need to be maintained. Perhaps there is a compromise system in which historic objects are maintained as nearly as possible in their original form.

Sticking to the simple Relevant System, the concept for a system that will do this is illustrated in Fig. 4.5.

Fig. 4.5. The broad concept for a museum system.
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Root definitions

The Relevant System has been defined as:

A system to build and permanently maintain an irreplaceable and meaningful physical resource and to use it to transmit ideas and concepts to the public.

The next stages in the analysis are to develop the abstract concept embodied in the Relevant System, and use it as the basis for a Root Definition. A Root Definition describes the features of the real world situation in terms of the Relevant System.

A first attempt at a Root Definition for a museum might be:

Root Definition of a museum, Version 1:

A system which uses public money to acquire and maintain an irreplaceable and meaningful physical resource and maintain it for the future, and to use and re-use it to transmit ideas, concepts and insights about culture or history to the general public.

Part of Checkland’s soft analysis process is to check the Root Definition for completeness by examining the following elements, designated by the acronym CATWOE (Naughton, 1983, 37):

Customers: The beneficiaries of the system, in this case, the public.

Actors: Those who carry out the activities in the system: they need to be specified.

Transformation: What the system does to its inputs in order to transform them into outputs. The input to the system is the irreplaceable resource, and the output, both its maintenance and the transmission of ideas and information. Inside the transformation is whatever the system does in order to maintain the resource and use it to transmit ideas.

Weltanschauung: The underlying view of the world which makes the system relevant. In this case, this is that the public desires
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museums to permanently hold objects which for a variety of reasons are irreplaceable.

Owners: Those who have sufficient power over the system to cause it to cease to exist. This is implicit in "public money" - whoever provides the resources can also withhold them.

Environmental constraints: What constraints does the system take as given? That the organisation is permanent, that objects, as a resource, are essentially non-renewable, that they must be preserved for the future.

The CATWOE process is used not so much to check that all elements are included as a tool for thinking about the relevance and completeness of the Root Definition. Working through it resulted in fairly fundamental adjustments to the Root Definition; in particular, 'actors' were inserted.

Root Definition for a museum. Version 2:

An organisation which receives public funding to permanently preserve objects which are irreplaceable and meaningful because of their historic or social significance or aesthetic qualities, in which trained people are employed to build and maintain collections in order to use them to transmit ideas and concepts to the public through display, publishing, lecturing or other means of communication.

Of particular importance is the Weltanschauung - the "Worldview". Its importance is underlined by the discussion above of alternative Relevant Systems. The world view from the demonstration museum is said to be that although objects are irreplaceable it is not important to preserve them permanently. The world view from the "classical" museum system is that the collections are to be permanently preserved in some sort of "original" state. It is obvious that the world view has profound implications for the conservation system, and that differences may account for many of the issues and conflicts identified in the Rich Picture.

The Root Definition was first drawn up in 1989. By 1991 pressures on public organisations to contract out work to the private sector had greatly increased. The Root Definition was revised to embody the principle that, while it is necessary for trained people to undertake the work, it is not essential to employ them:
Root Definition of a museum, "final" version:

An organisation which receives public funding to permanently preserve objects which are irreplaceable and meaningful because of their historic or social significance, or aesthetic qualities, in which trained people build and maintain collections in order to use them to transmit ideas and concepts to the public through display, publishing, lecturing or other means of communication.

4.2.4 Stage 4: The Conceptual Model

A conceptual model shows the activities which would be the logical consequences of picking the chosen Relevant System. It is essential to maintain an abstract view, in order eventually to gain a sharp contrast with the real-life

Fig. 4.6. Conceptual model for a museum system. Arrows indicate logical dependencies.
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system shown in the Rich Picture. To ensure that the view of the real world maintains its abstraction, we need to draw both on the Relevant System and its concept, and on the Root Definition. What would it be essential to do in order for the Relevant System to operate? The Relevant System includes two different basic, but interlocking, processes, one concerned with the physical, irreplaceable resource, and the other with the knowledge and information connected with it. Fig. 4.6 is a more formal systems view of the processes which seem to be implied in the Root Definition.

Since the collections are of original objects, and they are permanent (the resource is non-renewable), it is clearly essential to physically MAINTAIN them. Collections need to be BUILT, in which we can include adding to them, organising the objects, recording and maintaining associations between objects and information (their meaning), and if necessary refining the collections by means of disposal. If ideas and information are to be transmitted, then obviously there must also be a means to build knowledge: i.e., RESEARCH. The resource and the knowledge of it must be combined in SYNTHESISING ideas for transmission. The objects will need to be PREPARED both to ensure that their appearance does not distract from the concepts they are meant to 'transmit' (a missing leg does call into question the function of a chair) and to guard against damage, but without compromising their originality, since they will in due course be re-used to transmit other, different ideas. Since a system must operate in a purposeful way, there must also be the means to PLAN, MONITOR AND CONTROL all these activities.

For the purposes of this study, providing staff and finance and the production of the means of transmission of ideas, concepts and information to the public, are held to be outside the boundaries of the Relevant System. They are obviously critically important to the operation of an organisation, but they need not be understood in detail here as part of the Relevant System itself.

Were we undertaking a full analysis for a museum, the processes inherent in each of these front-line activities would need to be developed and detailed in accordance with the Root Definition. But the museum analysis is here only the preliminary to analysing the preservation sub-system.
4.2.5 Stage 5: Comparison of systems thinking with real world

The comparison stage is the means to the end of the soft analysis process: the identification of "meaningful, desirable change", carried out jointly with the parties within and in control of the situation. The "success" of the methodology depends on those involved responding in a rational way to the enlightenment brought by a new view of life. In this, soft analysis is no different from other reviews undertaken by management consultants, except that soft analysis, in common with other socio-technical methods, explicitly engages the actors themselves in the analysis of their situation.

The process of comparison can be more or less structured, according to the preference of the analyst. It is not proposed to go deeply into the comparison stage. The aim of this study is to uncover what information is needed within the system, not how to make it function better, and its primary concern is information for the conservation of the collections. We need to focus down on this.

The comparison

It is likely that the Root Definition would be broadly acceptable to museum 'actors'. It is not far removed from most definitions of museums. Thus, if the Conceptual System has reflected it accurately, it will be a fair basis for contrast with the real world. An examination of each of the processes in the Conceptual System is shown in Table 4.2.

A major contrast between the Rich Picture and the Conceptual System is the lack of processes in the former. The Conceptual Model focuses sharply (as was the intention) on the processes needed in order for the system to operate. The impression is gained from the Rich Picture that the system's purpose is to give meaningful roles to different professionals, who put much energy into defending their positions, power and roles. The processes themselves are hardly visible. Another feature is the conflict of priorities. Discussions of museum organisations by Burrett (1985), Griffin (1988), etc. indicate that this view is not inaccurate. It might be concluded that the main item on an Agenda for Action could usefully be to focus on processes - on what needs to happen - rather than on who does what, and controls whom.
Table 4.2. **Comparison of the real museum world with the processes of the Conceptual System.**

<table>
<thead>
<tr>
<th>Process</th>
<th>Exists in real world?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build collections</td>
<td>Much more emphasis on acquisition than on making collections and information into an integrated working resource.</td>
</tr>
<tr>
<td>Research knowledge</td>
<td>Some art historical research, but little in museum collections terms</td>
</tr>
<tr>
<td>Maintain objects</td>
<td>The physical state of many museum collections shows that this has had a low priority in planning and finance</td>
</tr>
<tr>
<td>Prepare objects</td>
<td>This is the top priority for conservation where provision for this exists.</td>
</tr>
<tr>
<td>Synthesise ideas</td>
<td>This activity has high priority in museums that have any sort of exhibition programme.</td>
</tr>
<tr>
<td>Plan, monitor, control</td>
<td>In the national museums this is assuming a higher priority - but Corporate Plans can be window dressing, with little relation to actual plans.</td>
</tr>
</tbody>
</table>

**Recent developments**

It is crude to categorise all museums in this way. In a way, the Rich Picture shows worst practice; and a lot has happened in museums since 1988, when the it was drawn. More individual museums now have some of these desirable processes in place than was the case then. Few have all of them. The accuracy of the analysis is confirmed yet again in 1992, nearly four years after the Rich Picture was drawn, in a survey of industrial and social history collections in Yorkshire and Humberside (Kenyon, 1992, i.v): "Has the stampede to interpret the past been at the expense of neglecting the collections held for the future ... Does it matter?". The report goes on to supply an amply fleshed out "yes" to these questions.

In the U.K., the large national museums are leading the movement of reform (if it can be called that), especially the National Maritime, the Victoria and Albert, and the Science Museums. This is due to pressures from government, as the
major source of funds, for measurable results, for greater accountability, and also for organisational adaptation to meet new requirements (Burrett, 1985). The new structures that are emerging fit the system depicted in the Conceptual Model much more closely than did the previous common arrangement, where the organisations and the collections were divided into fiefdoms ruled by "Keeper Barons". The British Museum, however, is so far maintaining the traditional structures, and must be judged successful by any publicly accessible measures of performance (visitor figures, new galleries and exhibitions). Less publicly accessible is its performance in preserving the collections.

4.3 THE PRESERVATION SYSTEM

The general analysis of museum operations has provided a context for the analysis of conservation itself. It has been shown that maintenance and preservation lie at the heart of the museum system (the traditional system, at least), and that this task is wider than the treatment of objects alone.

When examining the museum system, it was found helpful to consider other different or comparable systems as an aid to maintaining an abstract view of a system in which one is oneself an actor. The concept of preserving museum collections is not far removed from that of terotechnology (Checkland, 1981, 202-6). Checkland offers a Conceptual Model for terotechnology, re-drawn in Fig. 4.7.

Checkland defines terotechnology as:

"a combination of management financial, engineering and other practices applied to physical assets in pursuit of economic life-cycle costs. Its practice is concerned with the specification and design for reliability and maintainability of plant, machinery, equipment, buildings and structures, with their installation, commissioning, maintenance, modification and replacement, and with the feedback of information on design, performance and costs."

Although there are similarities, there are also important differences. Terotechnology is primarily concerned with minimising the financial costs of not caring properly for assets, while in museums the preservation of physical assets is one of the purposes of the system. Therefore, in museums there is less emphasis on acquiring, and 'replacement' is not, in the pure system, possible, since the particular state of wear and historical associations of the original could never be reproduced. The uniqueness of a museum object derives from its association with information (indeed, its embodiment as information); this is not necessary in terotechnology.
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4.3.1 Stages 1 and 2: the real world and the Rich Picture

The museum Rich Picture (Fig. 4.2) depicts the real-world conservation situation, and observations made above (Section 4.2.2) apply to it. Issues especially relevant to conservation are that actively treating objects is the preferred activity of many conservators, and that there is difficulty in prioritising tasks between the maintenance of collections and treatment, between one treatment task and another. The general impression is that this activity is seen as a service to other more important activities, rather than as a central function of museums.
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4.3.2 Stage 3: Relevant Systems and Root Definitions

Relevant systems

A Relevant System for conservation could be directly derived from the Conceptual Model for a museum. However, a number of Relevant Systems for conservation can be imagined from the Rich Picture, and it is preferable not to converge too rapidly on one solution. Issue-based systems would be those to:

... increase awareness among curators of the requirements for preservation

... make the museum's operations more purposeful

... prioritise conservation activities

... focus on the tasks of preserving the collections rather than on interprofessional issues

... make sure that the care of objects gets enough resources

It has been decided to focus on task-based systems for the present study. These could be to:

... treat and restore objects

... minimise the number of objects that need to be treated

... set and apply scientific standards for the care of objects

... maintain a non-renewable resource.

From the Museum model itself, the Relevant System that arises is:

Relevant System 1

A sub-system to permanently maintain an irreplaceable and meaningful physical resource ...

The essence of this system, the transformation, can be expressed in even more abstract terms (Fig. 4.8):

Relevant System 2

To maintain collections or objects so that the resulting condition, $C_2$, is the same or better than their past condition, $C_1$. 

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... to maintain collections or objects so that the resulting condition, $C_2$, is the same or better than their past condition, $C_1$.

Fig. 4.8. The central concept or "transform" in the conservation Relevant System.

The essence of these Relevant Systems can be combined, and this is shown in the concept illustrated in Fig. 4.9.

Fig. 4.9. A concept for a relevant preservation system
Root Definitions

A first definition for conservation could be:

A sub-system of a museum in which trained people work to preserve objects which have been collected, remedying damage and removing causes of future deterioration so that the objects when displayed can transmit appropriate concepts.

The CATWOE for this Root Definition would be:

Customers: The customers are the owners of the objects, the public now, who benefit from better appreciation of displays, and in the indefinite future.

Actors: Trained people.

Transformation: Collections (or objects) in one condition, C1, transformed into collections (or objects) in the same or better condition, C2 (see Fig. 4.8).

Weltanschauung: The same as for museums, i.e. that the public wants museums to permanently maintain collections of real, original objects, and to provide ideas, etc. for their entertainment and education.

Owners: The museum system itself can cause any preservation sub-system to cease to exist.

Environment: The collections are preserved in order to serve the purpose of museums, i.e. to transmit ideas, etc. Preservation is not in museums an end in itself, since an institution which merely stores collections is not a museum, although it could certainly employ a conservation department or service. Therefore, it must be clear that the conservation sub-system is part of a wider system.

The museum Root Definition and the comparison of the Conceptual System with the real world (Section 4.2.5) can be re-visited here. The systems of real-world museums do embody the duality of the abstract Conceptual System. How can we express the need to preserve the object in its original form while accepting that time and maintenance will alter it? The concept of "historic integrity" is put forward, because it implies not that an object will undergo no change - this is impossible - but that changes, whether intentional or unintentional, will be accurately recorded and the effects on the object will not be concealed. It also implies the crucial association of object and information.
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Root Definition for conservation: "final" version
A sub-system of a museum in which trained people preserve the historical and physical integrity of museum collections for the present and future public, by maintaining objects, preventing deterioration, controlling "use", and raising awareness of requirements for preservation. They thus contribute effectively to museum objectives.

4.3.3 Stage 4: the Conceptual Model

![Conceptual Model for the preservation sub-system]

Fig. 4.10. Conceptual Model for the preservation sub-system. Arrows indicate dependencies.

Turning now to the Conceptual Model for museum conservation (Fig. 4.10), the only source for the processes in this must be the Root Definition. Outside
the preservation system are processes from the main system: the building of the collections and the use of objects. The processes in the model for preservation are:

- **MAINTAIN**: physical condition of collections, by rectifying deterioration and removing its causes
- **PRESERVE**: historic integrity of collections, i.e. the object-as-evidence
- **PREVENT**: deterioration by providing suitable conditions, procedures, etc.
- **CONTROL**: 'use': set policies for use, demonstration, display, etc.
- **CONTRIBUTE**: to museum activities such as exhibition, publication, information, etc.
- **RAISE**: awareness of requirements for preservation and the reasons for them
- **ENSURE**: trained people - by hiring qualified people, and by maintaining their skills and knowledge
- **MANAGE**: preservation: define criteria for effective operation, plan and monitor, take control action.

**Formal systems check**

A general conceptual system must have certain elements and characteristics. A Conceptual Model can be checked against these requirements (Naughton, 1983, 44):

- **Continuous purpose?** To maintain the historic and physical integrity of museum collections
- **Measure of performance?** Is the condition $C_1$ of the collections better or worse than condition $C_2$? Is the sub-system contributing 'effectively'?
- **Means of decision-taking?** In the management sub-system
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Fig. 4.11. Detailed Conceptual Model for preservation. Arrows show dependencies.
## Table 4.3. Comparison of preservation in the real museum world with the processes of the conceptual preservation system. (see Fig. 4.11)

<table>
<thead>
<tr>
<th>Process</th>
<th>Exists in real world?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain physical condition of objects</td>
<td>Usually top of the list of preservation processes, this is well established in most museums, either as an in-house activity or by contracts with private conservators or other organisations. 'Maintenance' includes removing causes of deterioration such as acidity in paper, rectifying damage, and monitoring condition. Surveying collections condition has been considered important for some time. General method developed as part of this research (see Chapter 5).</td>
</tr>
<tr>
<td>Preserve historic integrity of objects</td>
<td>Trained conservators are mostly very aware of the need to avoid making an object 'like new', and to record what is done to it. Not all curators see this as important.</td>
</tr>
<tr>
<td>Prevent deterioration</td>
<td>This includes pest control, display design, appropriate storage conditions. Seldom thoroughly done, due to lack of awareness as identified above.</td>
</tr>
<tr>
<td>Control 'use'</td>
<td>Best developed in the form of conditions for loans, now universally set. Includes proper procedures for handling, transport, etc. Practice in the loaning institution usually falls far short of the conditions imposed on borrowers.</td>
</tr>
<tr>
<td>Contribute to other museum activities</td>
<td>Much of the work of conservation is undertaken specifically for other museum activities, particularly exhibition.</td>
</tr>
<tr>
<td>Raise awareness of preservation needs</td>
<td>'Awareness of conservation needs by curators ...' was third priority for conservators in 1987 Survey (Corfield et al, 1989). Still hard for conservators to be taken seriously in many museums.</td>
</tr>
<tr>
<td>Manage sub-system activities</td>
<td>The tendency is towards planning preservation of collections as a continuum from storage through to remedial conservation, but rarely implemented outside national museums.</td>
</tr>
<tr>
<td>Ensure 'trained people'</td>
<td>As examples of a craftsmanship approach to object maintenance show, specialist training is necessary if the causes of deterioration are to be understood and eliminated, rather than the object simply being restored to 'a supposed earlier state'.</td>
</tr>
</tbody>
</table>
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Sub-systems? Yes

Connectivity? Yes - both between sub-systems and with the wider system

Environment? The wider museum system

System boundary? These processes form a distinct and related group

Resources? It is understood that finance and people are available through the wider system.

Continuity? By virtue of the wider system itself.

4.3.4 Stage 5: Comparison of Conceptual Model with Rich Picture

As in the comparison of the museum Conceptual Model with the Rich Picture, most of the activities in the preservation model do occur in the Rich Picture, but not as a coordinated, purposeful system. Again, much of the mismatch occurs because the actors in the scene are unclear as to their role. Rather than seeing themselves as undertaking complementary tasks in pursuit of an overall goal, to preserve the collections and communicate their meaning, the actors focus on the internal politics of who has the power to set priorities and decide what happens to objects. Rather than a preservation operation or task, there is a conservator with a procession of people bring work. The accuracy of the Rich Picture was discussed above (Section 4.2.5).

The purpose of this analysis is to arrive at information needs. But the opportunity can also be taken to analyse the organisational system itself, at this general level. On the previous pages, the detailed conceptual model, Fig. 4.11, is compared with the real world in Table 4.3.
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4.4 DEFINING THE INFORMATION REQUIREMENTS

4.4.1 Introduction: Information analysis

The design of management information systems is summarised by Lucey (1987), who reviews information and systems concepts, the nature of organisations, the elements of management and their relationship to information, and finally information technology and its applicability. There is prolific literature on information analysis and database design. The general nature of systems design is described by Daniels and Yeats (1984). Stages in all design projects will normally be: investigation; specification; design; development; installation; operation.

Although reference books and manuals usually take it for granted that analysis is primarily directed towards a computerised system this is not necessarily the case. It may be considered better to continue with, or set up, paper or other records for part or all of the requirements identified, or to do nothing at all.

Investigation

The first stage in information systems analysis is often called 'problem definition'. Goals for the system are identified, and user requirements specified (Layzell and Loucopoulos, 1987, 11). And yet, Layzell and Loucopoulos in 1987 (p. 20) observe that:

"...users are more often than not dissatisfied with the delivered product. Late delivery, excessive cost, and unreliability are just some of the complaints often voiced by system users."

These authors identify the source of these problems as lack of rigorous analytical procedures: but Checkland, Land, and many others see their origin in the impossibility of developing rigid specifications before their interpretation can be seen, and in poor understanding of 'the situation', for example:

"The classic software life cycle says little about users other than that assuming that users' requirements are specified. The problem is that users often find it difficult to specify their requirements before a system is implemented. Even where they are specified, users often want to change their minds after a system is implemented." (Thomas, 1990(1)).
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Despite the now widespread use of structured analysis methods, the problems have not gone away. A number of failures of major systems in the health and other public services have been reported in 1992. Land's planning and evaluation methods (1976), Mumford's Socio-Technical analysis (1983), and Avison and Wood-Harper's Multiview approach (1990) are some techniques developed in the hope of avoiding these ubiquitous problems. There is evidence that incremental, user-driven development is more successful than are 'moon-shot' approaches (e.g. Earl, 1990; Ciborra, 1992).

Specification and design

Following the investigation stage, a number of approaches to specification and design exist within the generic methodology known as 'structured systems design'. They are described by Layzell and Loucopoulos (1987, Ch. 2) and Daniels and Yeats (1984, 1988); a general structured method is set out by Hawryszkiewycz (1988). For entity relationship analysis, Veryard (1984) is particularly useful. Common to most structured approaches are a number of related analytical techniques, such as:

- **Data flow models**
  - diagrams which show the way in which data are recorded and used in the system

- **Function models**
  - define the ways in which the data are generated, processed and used.

- **Entity relationship models**
  - diagrams which depict the entities (nouns, objects) which determine the data and their relationships to each other

- **Data dictionaries**
  - define the data entities, the flows, and their relationships

There are numerous variations in the detail of how these and other techniques are used to define information systems.

Development, implementation and operation

The three main approaches to these stages, structured systems development, prototyping, and evolutionary development have been reviewed above (Section 4.1.1). Since the objective of this work is to analyse what is required, the practical stages of development, implementation and operation have not been deeply
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explored. Experience of and lessons learned during the development of the Museum of London computerised conservation records system is described below in the Case Study (Chapter 8, Section 8.5, The conservation records database).

4.4.2 Information for managing conservation

Information systems in general tend to serve one of two main purposes: operational, which document flows of goods or services and finance in and out of the system, process orders and invoices, etc.; or management information, producing information of the sort needed by managers to plan, monitor, and control operations. Many are hybrids (Veryard, 1984, 14). Conservation information includes elements of production (pieces of work have to be completed to a standard and by a deadline), of monitoring, and also an important extra dimension: the building of and contribution to a permanent archive, or database, of information relating to the objects in the collections.

The techniques employed

The techniques employed in this work are, firstly, soft systems analysis as the investigation and problem definition stage, and secondly, business analysis followed by the structured analysis techniques of functional and entity-relationship...
## Table 4.4. Management information for preservation (see Tables 4.5 and 4.6, overleaf)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain physical condition</td>
<td>Specify appropriate condition</td>
<td>Specifications recorded</td>
<td>1 Set standards for and monitor the condition of objects and collections</td>
</tr>
<tr>
<td>Preserve historic integrity</td>
<td>Know what constitutes historic integrity for object</td>
<td>~~~</td>
<td>2 Set standards for, monitor and record the storage and display environment</td>
</tr>
<tr>
<td>Ensure preservation conditions</td>
<td>Identify causes of deterioration</td>
<td>~~~</td>
<td>3 Examine objects, record and communicate results</td>
</tr>
<tr>
<td>Control 'use' to museum activities</td>
<td>Set policies</td>
<td>Policies exist</td>
<td>4 Record diagnoses and agreement on treatment: record treatment</td>
</tr>
<tr>
<td>Contribute to museum activities</td>
<td>Prepare objects</td>
<td>All objects to be used prepared?</td>
<td>5 Plan, schedule, monitor work</td>
</tr>
<tr>
<td>Raise awareness</td>
<td>Know requirements</td>
<td>~~~</td>
<td>6 Manage resources: time, money [space]</td>
</tr>
<tr>
<td>Manage sub-system activities</td>
<td>Define criteria for 'effective'</td>
<td>Criteria defined</td>
<td>7 Acquire and use expertise</td>
</tr>
<tr>
<td>Ensure 'trained' people</td>
<td>Acquire skills</td>
<td>All people qualified</td>
<td>8 Provide management information on whether objectives are being met</td>
</tr>
<tr>
<td>Maintain skills</td>
<td>Articles read, training attended</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor skills</td>
<td>Published articles, lectures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table continues on the next page.**

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*Note: The table continues with additional rows and columns, detailing specific tasks and indicators related to each objective.*

---

*Note: The diagram illustrates the flow of information and control actions associated with each objective.*

---

*Note: The text continues with further details and explanations related to the management information for preservation.*
analysis as defined in the method set out by the software house, *Oracle™* (undated, and 1989). The information analysis was carried out during an overall analysis of information requirements for the Museum of London. *Oracle* consultants were available to coach the analysts and exercise quality control. The analysis described here is for a generalised museum system, not for the Museum of London specifically, although the system being developed for the latter maps fairly closely onto the generalised analysis.

**Investigation**

The results of using the preservation Conceptual Model (see Fig. 4.10) for this are shown in Tables 4.5 and 4.6. The investigation stage, understanding the problem, has been undertaken as a soft systems analysis. Checkland and Scholes (1990), and Avison and Wood-harper (1990) advocate using this as the basis for drawing up a data flow diagram and deriving information functions and entities from that. The *Oracle™* method employs as the basis for the detailed analysis of information requirements what is described as a 'soft' stage: a business analysis. The analytical steps in this are shown in Fig. 4.12. The soft analysis Conceptual Model can be used in a business analysis. The main processes in the model form the basis for the objectives of the system; the sub-processes are what must be done to meet them: the Key Success Factors.

**Success factors and performance indicators**

The next stage in an *Oracle™* business analysis is to identify 'Critical Success Factors': if objectives are to be achieved, what must be done? The procedure appears to be essentially that described by Rockart (1979, p.84) as the 'total study process' (first developed, he says, by IBM as its Business Systems Planning methodology) with his critical success factor method added to it. Rockart's article is widely referenced, and the success factor concept has been developed by, for example, Ohmae (1982, Ch.3). In the soft analysis, we already considered what processes would be essential to the operation of the Conceptual System as implied by the Root Definition. Table 4.4 summarises the full analytical process. Objectives have been derived from the main processes of the Conceptual System: clearly, the detailed processes are what must be done to meet them. From these can be derived the measures, the Key Performance Indicators in Oracle's term, which will show whether or not the organisation is succeeding in meeting its objectives.
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**Table 4.5.** The processes in the Conceptual Model for preservation (see Fig. 4.11).

<table>
<thead>
<tr>
<th>Main process</th>
<th>Sub-processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain physical condition</td>
<td>Specify appropriate condition for objects and collections</td>
</tr>
<tr>
<td></td>
<td>Monitor condition</td>
</tr>
<tr>
<td></td>
<td>Treat objects to remove causes of or rectify deterioration</td>
</tr>
<tr>
<td>Preserve historic integrity</td>
<td>Know what constitutes historic integrity for object</td>
</tr>
<tr>
<td></td>
<td>Agree treatments with curators</td>
</tr>
<tr>
<td></td>
<td>Record all work on objects</td>
</tr>
<tr>
<td></td>
<td>Monitor preservation of historic integrity</td>
</tr>
<tr>
<td>Prevent deterioration</td>
<td>Identify causes of deterioration</td>
</tr>
<tr>
<td></td>
<td>Specify requirements in appropriate form</td>
</tr>
<tr>
<td></td>
<td>Provide preservation conditions</td>
</tr>
<tr>
<td></td>
<td>Monitor preservation measures</td>
</tr>
<tr>
<td>Control 'use'</td>
<td>Set policies</td>
</tr>
<tr>
<td></td>
<td>Establish procedures</td>
</tr>
<tr>
<td></td>
<td>Monitor compliance</td>
</tr>
<tr>
<td>Contribute to museum activities</td>
<td>Prepare objects to 'transmit ideas and concepts'</td>
</tr>
<tr>
<td></td>
<td>Examine objects and record observations</td>
</tr>
<tr>
<td></td>
<td>Provide expert advice</td>
</tr>
<tr>
<td>Raise awareness of preservation needs</td>
<td>Know requirements</td>
</tr>
<tr>
<td></td>
<td>Communicate about requirements</td>
</tr>
<tr>
<td></td>
<td>Monitor understanding of requirements</td>
</tr>
<tr>
<td>Manage sub-system activities</td>
<td>Define criteria for 'effective'</td>
</tr>
<tr>
<td></td>
<td>Plan activities</td>
</tr>
<tr>
<td></td>
<td>Monitor efficiency (resources vs. output)</td>
</tr>
<tr>
<td></td>
<td>Monitor effectiveness (progress against objectives)</td>
</tr>
<tr>
<td></td>
<td>Provide management information</td>
</tr>
<tr>
<td></td>
<td>Take control action</td>
</tr>
<tr>
<td>Ensure 'trained people'</td>
<td>Acquire skills, through hiring policy, courses, etc.</td>
</tr>
<tr>
<td></td>
<td>Maintain skills, through reading, refresher courses, conferences</td>
</tr>
<tr>
<td></td>
<td>Monitor skills</td>
</tr>
</tbody>
</table>

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Table 4.6. Objectives for conservation.

To maintain and improve the physical condition of the collections so that standards set by the museum for their condition are met.

It may not be an effective use of resources to maintain every item in the collections in top exhibitable condition; sometimes untreated objects may constitute a better source of evidence than treated ones. It will usually be better to set a basic standard for condition below which no object should fall.

To preserve the historical integrity of objects in the collections.

Unless the objects are the 'real thing' they are not properly meaningful; they cannot play their proper part in transmitting ideas, etc. An objective needs to be set to specify the kind and degree of restoration, for example, separately from maintaining physical condition.

To prevent deterioration, by ensuring that the environmental, physical, and other conditions in which objects and collections are kept are appropriate to their preservation.

Preventing deterioration is much more efficient and effective than rectifying the consequent damage.

To control 'use': handling, exposure to light, demonstration, etc.

Museum objects are there to be used in display, etc., but this nearly always accelerates the processes of deterioration. Policies need to be set on procedures for and the extent of 'use'.

To contribute effectively to museum activities.

As well as the major museum objective, to preserve collections, the preservation sub-system can contribute to: preparing objects for display, etc., recording and passing on observations about technique, composition, etc., and providing expert advice on policies, authenticity, and the 'use' of objects.

To raise awareness of preservation needs, and of the concepts and methods of conservation, in other professionals and to the public.

As in health education, preventing damage and preserving objects starts with the education of their owners or users.

To manage activities so as to make the most effective use of resources for the care of the collections.

To acquire and maintain the necessary skills through hiring qualified people, providing in-service training, and encouraging reading, conference attendance, etc.

General objectives such as the last two might well be set for each of the operational divisions of a museum.
Chapter 4: Analysing the system

The performance indicators identified, and their use, have been analysed in detail in Chapter 7, *Using the information*, below. Performance indicators could be derived directly from the detailed processes of the Conceptual Model, without recasting the Conceptual Model into business analysis form, but organisational objectives are a cornerstone of current management methods. Moreover, the explanatory form of the objectives was found to be a good way to communicate the analysis to groups of conservators.

Functional and entity relationship analysis

The analysis of success factors and performance measures are then used to analyse the information functions required to supply the necessary information for them. Table 4.4 shows the way in which objectives, success factors, performance indicators and information functions are related. Tables 4.5 and 4.6 show the steps in the analysis, from processes in the Conceptual Model through to the objectives derived from them.

Functional and entity relationship models are standard methods of 'modelling' (depicting and specifying) information. In a functional model, the functions which give rise to or require information are verbally described, with references to elements of other functions. Functions are set out hierarchically; those in the top level may be detailed, and if necessary those in turn are further detailed. A function map, which summarises the hierarchy of information functions, is shown in Fig. 4.13. The full functional analysis is included as Paper 24.

An entity relationship model is more difficult to explain. Each 'entity' can be imagined as a card index, which could be set out as a table of data. The cards, or rows of the table, are connected by an identification item unique to each. Thus, the entity 'OBJECT' is identified by its acquisition number. The OBJECT entity contains the description of the object: name, materials, etc.. The PROCEDURE is the treatment applied to the object. It will also contain the acquisition number of the object. The top level entity relationship model is shown as Fig. 4.14; the fully detailed model as Paper 25.
Maintain the physical and historic integrity of objects and collections

1. Set, monitor standards for condition
   1.1 Record condition audit
   1.2 Maintain record of condition audits
   1.3 Maintain condition records
   1.4 Update condition grade
   1.5 Calculate condition index
   1.6 Report condition indices
   1.7 Report objects by condition grade
   1.8 Report damage factors
   1.9 Report condition records

2. Set, monitor standards for environment
   2.1 Record environmental specification
   2.2 Record environmental measurement
   2.3 Maintain environmental record
   2.4 Record 'use' of object
   2.5 Record environmental record for object vs. place

3. Analyse and examine objects
   3.1 Maintain record of observations
   3.2 Record procedure
   3.3 Record object record
   3.4 Maintain list of records
   3.5 Report list of records
   3.6 Report list of examinations
   3.7 Report list of records for object

4. Record treatments
   4.1 Record treatment proposal
   4.2 Record conservation job
   4.3 Record conservation procedure
   4.4 Update condition grade

5. Plan work
   5.1 Maintain list of projects
   5.2 Maintain object project list
   5.3 Make object project list inclusion
   5.4 Record conservation job: update object project list status
   5.5 Report conservation jobs

6. Manage resources
   6.1 Maintain list of parties connected with conservation
   6.2 Record conservator and post
   6.3 Monitor and report on use of time
   6.4 Set budget and monitor expenditure
   6.5 Maintain equipment inventory
   6.6 Report provision of conservation service

7. Maintain skills
   7.1 Maintain list of conservation events
   7.2 Record attendance at event
   7.3 Maintain record of publications
   7.4 Record lecture, etc.
   7.5 Record conservation event
   7.6 Record provision of conservation service

8. Provide management information

Fig. 4.13. Function hierarchy map
Although most of the functions describe information that could usefully be collected, it would be unlikely for all of them to be implemented in the same system. Some of them would be impractical to computerise, or would work better if left as paper records or reports; and some of them will be very low priority. Chapter 8, the Case Study, enlarges on practical experience with these information functions.

4.5 DATABASE DESIGN

Database design needs to be distinguished clearly from systems analysis. The analysis defines and specifies what are the overall information needs of the system or subsystem, while database design is the simpler process of engineering the system to meet those requirements.

At the present time, two types of database predominate: flat file, and relational (Veryard, 1984, 58-62). In a flat file database, all the data is held in one single file, as in a card index. A relational database can be envisaged as a number of card indexes. These can be linked together in use, making a much more complex, but flexible, information structure.
Chapter 4: Analysing the system

As an example, some of the basic data which might occur in conservation records can be looked at. A simple flat file might include the following data:

<table>
<thead>
<tr>
<th>Conservator section</th>
<th>Conservation identity</th>
<th>Object identity</th>
<th>Object name</th>
<th>Object description</th>
<th>Treatment date</th>
<th>Treatment Procedure</th>
</tr>
</thead>
</table>

Each of these fields would have to be filled for each record, and the data stored. In a relational database, the same information could be held in separate files, as in Fig. 4.15.

To record information about a particular treatment, all that would need to be entered would be:

- **Conservator name** - the key to the "conservator" information
- **Object number** - the key to the "object" information
- Data for the "treatment" file

The benefit of this is that much less information is duplicated when a record is entered. Information about the conservator is entered once only, into a file showing all conservators, the sections to which they belong (if relevant), the period during which they worked in the museum, and other relevant information. Information about the object is likely to be held already on another part of the system, having been input by curatorial or other finds or objects staff. This saves time and computer memory, and cuts down on possible errors.

The advantage of flat files is that they are easy to understand, set up and maintain; and they can allow for more sophisticated operations to be carried out on the data they hold. On the other hand, relational databases are presently very widely used, because they allow for greater flexibility. Flat file structures do not cope easily with the repeating information which conservation records often contain, for instance the several different materials of which an object is composed, several parts of an object which may receive different treatments, and even more difficult, treatment of the same object on several different occasions, probably by different conservators. On the other hand, the first MoL system was a flat file database, and it did meet requirements, at least in the short term.

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Fig. 4.15. The basis of a relational database of conservation records

A number of successful conservation record systems have been built using database management software, such as dBase™ (e.g. the system used by the Passmore Edwards Museum (Harris, 1987)). They tend to be for specialised types of conservation, archaeological, picture conservation, etc.. As of January 1993, there is still no single well established conservation records system which can handle a variety of collections and conservation disciplines.

4.6 CONCLUSIONS ON THE ANALYSIS AND DATABASE DESIGN

The progression from soft systems analysis through to detailed database information functions and entities has been lengthy, but follows a logical pathway. The soft analysis has been able to be incorporated at each stage. It must be borne in mind that database design has been only one part of the objective: the soft analysis will be drawn on further when the fuller system of information for managing is developed.
Chapter 5

The data

This chapter explains how the data for the system as analysed are, or might be, collected, and discusses their analysis and presentation as information for managing. The availability and use of data are discussed for each of the top-level information functions which have been set out above, Chapter 4, Fig. 4.13, and Paper 24.

General current practice is then dealt with. Are these data already collected as part of the conservation process, or will their collection eat into time that could be spent on improving the condition of objects? Are there standard formats in which data are commonly collected in the majority of institutions? Their effective presentation as management information is then reviewed.

The specification for the data required is expressed as an information systems model (Chapter 4, 4.4.2, The information analysis). This does not mean that the system must be wholly, or even partly, computerised. Data can be collected and information reported in a number of formats, including paper. The existence and importance of the informal information system must not be forgotten (Land and Kennedy-McGregor, 1987). The information model is only a way of specifying what is needed, and of showing the relationships between the data items. It also means that even if the model is implemented bit by bit, or only in part, the data and information will still fit into the general framework.

5.1 DATA ON DAMAGE PREVENTION

Information function 2: Set standards for, monitor and record conditions in the stores and display environment, and other factors affecting the condition of objects or collections.

This area, generally referred to as preventive conservation, includes light, humidity, temperature, gaseous and particulate pollution, pests, the protection of objects by individual packaging and support.
5.1.1 Environmental standards

Standards and specifications for the environment for collections are thoroughly dealt with by Thomson (1986), and in the extensive literature (see Section B1 in the AATA abstracts). These now include the curatorial standards and museums registration scheme being developed by the Museums and Galleries Commission (1988; Paine, ed., 1992) for different types of collection. They are discussed in Cassar and Keene (1990). While the above authors, and most others, advocate the use of fixed standards, another view, promulgated by Michalski (1990), is that standards are too rigid and encourage institutions to disregard the undeniable fact that some objects will deteriorate even though standards are adhered to.

The concepts embodied in these approaches differ more than do their use in the management of deterioration. In both, it will be necessary for the institution to set policies for the environment for its objects, and apply these to the spaces in which they are kept by means of specifications. If standards are to be used, then the particular ones to be adhered to will need to be stated (e.g., Papers 2, 5.2): for instance, BS 5454 for paper and archive collections; Thomson (1986, 33) Class I for sensitive objects. If standards are not to be used, then the policy must specify the procedure for setting parameters for the storage or display environment for each class of object or individual object. But either way, parameters still have to be set, and a formal record of them maintained (e.g. Paper 29.1).

While standards are commonly set for temperature, humidity and light, parameters for gaseous and particulate pollution are less often specified, because they are much more difficult to measure and expensive to control. While Thomson does give parameters for these factors, they are not included in, for example, BS 5454:1989 for libraries, other than for mechanical air handling; or in the Museums and Galleries Commission Eligibility Criteria (1986), other than excluding dust by boxing finds.

5.1.2 Environmental data recording

Temperature and humidity were found in The Survey (Corfield et al, eds., 1989) to be recorded in about half of all museums and galleries responding. In the most common method of data collection - the clockwork thermohygrograph - one
instrument must be left in each location being recorded; and each instrument produces one paper chart per week, fortnight, or month, depending on the interval selected (Fig. 5.1; Papers 28.1-2; 29.3). Instruments and systems that record digital measurements on electronic media are being used more widely (e.g. the "Squirrel" data loggers made by Grant Instruments, the Findlay Irvine monitoring system, the MEACO Museum Monitor, and a variety of Building Energy Management systems). Options are discussed in Saunders (1989). Fig. 5.2 shows an example of a chart produced from a "Squirrel" data logger; others are included as Papers 28.3 and 30.

Light is usually monitored by single measurements taken with an electronic lux meter rather than continuously. Standards are phrased in terms of maximum lux or ultraviolet levels for sensitive materials, so this is often sufficient. Continuous recording is particularly necessary where the light source cannot be strictly controlled - this is often where it is natural light (e.g. Staniforth 1990). It also makes the alternative form of standard, for kilolux-hours per year (Thomson, 1986, 30 and 268), more feasible to administer. Other simple ways of logging cumulative light exposure are described by Tennant et al (1982), and Kenjo (1986). Instruments are becoming available to continuously or cumulatively log light exposure (e.g. the Elsec and Hanwell instruments, manufactured respectively by Littlemore Scientific Engineering Co., and Exeter Environmental Services). Cumulative light exposure can also be monitored by the Blue Wool Standard test (BS 1006: 1978).

Pollution, whether gaseous or particulate, is seldom measured; The Survey (Corfield et al, eds., 1989, 81, Q.5.1) recorded only fifteen museums out of 938 as doing this. Some simple test strips for measuring some forms of pollutions are described in Kenjo (1986). The Museum of London has used passive monitoring using diffusion tubes for nitrogen dioxide. Hackney has reviewed other methods of monitoring gaseous pollution (1984). Paper 32 reports the monitoring of nitrogen dioxide levels in the Museum of London.

Pests An excellent example of pest monitoring and its use is given in Florian (1987). The variables recorded included those for time, geographical location and insect species. All were used to diagnose the problem, eradicate active infestations, set up new procedures for prevention, and design ongoing monitoring.
Chapter 5: The data

5.1.3 Presenting and using environmental data

Analysis over time

Records of temperature and humidity usually consist of a series of measurements of these parameters, either in analogue form by a recording pen on a paper chart (Fig. 5.1) or as digital measurements taken at set intervals. Although each chart contains a wealth of data (and one can quickly accumulate a filing cabinet full), it is very difficult to make much general sense of this. In management terms, we need answers to questions such as:

For what proportion of the time is the environment within/outside the set parameters?

What is the variation per hour/day/week/year?

Is there a diurnal or other regular pattern to variations? (If so, there may be a cause that can easily be corrected.)

The first and second questions can potentially be answered if measurements are recorded digitally instead of graphically. But even with digital recording instruments, the most common representation of the data is still as line graphs of humidity and temperature (e.g. Fig. 5.2). The readings are, however, taken at a series of fixed intervals, so unlike the charts produced by hair thermohygrographs, the data are not analogue. The software that is supplied by the digital instrument manufacturers facilitates graphic presentation (e.g. "Squirrelsoft", supplied by Grant Instruments), but to undertake the necessary statistical analysis necessary properly to answer the questions, the data must be downloaded into a spreadsheet and manipulated as an entirely separate operation. Few conservators have the expertise or the time to do this (although it is being done in the Victoria & Albert Museum: Boris Pretzel, pers. comm.).

However, although statistical analysis is not straightforward, graphical information can be drawn on in various simple ways to give approximate answers:

Proportion of time within set parameters: visual estimates can be made of time outside parameters and regularly recorded as figures; and a summary chart (e.g. Fig. 5.3) can be drawn to give an idea of fluctuations over a longer period.
of time. Digitally recorded output can be presented in charts with the time axis compressed (e.g. Fig. 5.2).

*Variation per hour/day/week/year:* normal paper charts are adequate for short periods; but a summary chart (see above) is needed if variation over a longer period is to be shown.

*Monitoring recurrent variation:* the same chart can be left in place: as several traces accumulate, trends become apparent.

Jonathan Brown (1992) has discussed ways in which psychrometric data can be analysed and presented. He favours a median-Dq (interquartile range) graph, which shows the median and the variation of readings around it. This, although a simple analytical technique, requires rather a lot of explanation for it to be understood by the uninitiated. The great plus point of thermohygrograph charts is that, having been so widely used for such a long time, they form a universal means of communication between curators, conservators, and air handling engineers alike. Summary hi-lo charts (Fig. 5.3; *Papers* 28.4; 29.2) are an obvious derivation of the familiar charts. The most effective forms of management information seem to be these or line graphs with the time (x) axis compressed (Fig. 5.2). The representation of data in these different formats is discussed in the Case Study.

Reports on actual environmental conditions vs. specifications can be an important component of performance assessment: see *Paper* 38.4; 38.5.

**Analysis by area**

Presentation can take other forms: for example, some building energy management systems can display the state of the environment at a point in time in the form of a plan of the building (e.g. Saunders, 1989).

In the case of pest management, it is recommended that observations are recorded not only by time of year but also on a building plan; a visual pattern quickly builds up (Florian, 1987). The same is the case in monitoring gaseous pollution: trends over time are of interest, since one would wish pollution levels to be decreasing, rather than increasing (*Paper* 32); but to understand what is happening, it is also necessary to reveal pollution gradients by comparing levels in different areas: e.g., outdoors, in the entrance hall, deep within the display galleries, inside a showcase (Hackney, 1984, and *Paper* 32).
Fig. 5.1. Example of a chart from a recording thermohygrograph.
Chapter 5: The data

Fig. 5.2. Chart produced from the output from a digital data logger.

Recorded in showcase subject to daily sunlight

Specified range

Graph expanded to show diurnal variation

Source: Squirrel data logger, readings at 15 min. intervals
Chapter 5: The data

Fig. 5.3. Summary charts showing variation in relative humidity over 5 years

Source: thermohygrograph records 1988-1992
5.1.4 Non-numerical assessments of the environment

Not all aspects of the environment can be assessed by numerical measures. There are many aspects that can only be assessed visually and reported verbally, such as the structural condition of buildings, whether procedures such as putting away objects are satisfactory, the sufficiency of space so that objects are not damaged by being crushed together, and general standards of cleanliness and housekeeping. The Museums and Galleries Commission’s Curatorial Standards (for instance, Paine, 1992) set out desirable standards for these aspects. The American Association of Museums (1985) MAP Program (Museums Assessment Program) and the associated Conservation Assessment (National Institute for Conservation and Getty Conservation Institute, 1991) both consist of questionnaires to be internally or externally administered, requiring mainly verbal replies. The U.S. Department of the Interior Directive (1986) contains another questionnaire: this format is particularly useful, in that it requires specific actions to be identified and target dates set for their accomplishment - an excellent management tool. An adaptation of this (Paper 37) was used to assess the Museum of London stores in preparing the development of the Strategy for Collections Care.

Like numerical information, this more qualitative information needs to be collected at regular intervals. The reporting format will usually be textual, but the same principles, of distilling the information that is relevant to management and presenting it in an easily understood format, must apply.

5.2 Data on the processes of conservation

Information Function 3: Analyse and examine objects; record findings; communicate results.

Information Function 4: Record agreed treatment proposals; record treatments carried out on objects.

Information Function 5: Plan, schedule and monitor conservation work, activities and projects.

Information Function 6: Manage resources of time, money, equipment and people.
Chapter 5: The data

This information area is principally concerned with data from, and planning for, the processes of conservation, the actual work that goes on in order to meet the objectives of maintaining the collections, ensuring the best possible appearance of objects on display, and adding to knowledge about them. These processes thus include scientific examination, conservation treatment, and activities such as mounting prints in acid-free board.

5.2.1 Conservation treatment and scientific examination

The object related information resulting from scientific examination, treatment procedures, etc. is not discussed, as it is well covered in the conservation literature, and has low relevance to management information.

The entity relationship model (Chapter 4, Fig. 4.14) shows how the object-centred information on treatment and scientific examination is related to the administrative data (the entity named the Conservation Job). This is expressed in Function 4.2 (Paper 24.4): Record a conservation job as undertaken on an object by a conservator / outside firm at a date, for a project / activity... Conservation treatment records usually include data, such as conservator, date, time taken, etc., which constitute extremely useful management information in their own right. Typical examples of records are given in articles in The Conservator, 7, 1983, and in Paper 18. The only addition is of the project / activity for which the job is undertaken, which is perhaps not so commonly recorded. This is how the resources that the institution is devoting to different objectives can be analysed. This information is crucial to the institution's ability to manage its activities so that priorities and targets, in terms of numbers of objects treated, or time spent on different tasks, are met.

The model also allows for agreed treatment proposals. This is a key factor for success in meeting the primary objective of "maintaining the historic integrity of the object...". In the author's experience, treatment proposals are less commonly recorded than are treatments. In some disciplines, such as picture conservation, detailed treatment proposals will be drawn up and agreed by the conservator and the curator. In the National Gallery, treatments have to be agreed by the Trustees. In others, such as archaeology or paper conservation, objects are treated by the hundred using similar or identical procedures; in this case particularly, the likely
effects of the treatment should be discussed with curators. The information model
(Paper 24.4) allows for agreement to be recorded on the treatment of classes of
objects, as well as individual objects.

Another important aspect of management data is the condition of the object
before and after treatment. If the condition of an object has previously been
recorded, then the record will need to be updated to the result of the treatment.
Although written treatment records do often include "condition before/after" (e.g.
Museum of London records, Paper 18), this is generally as free text. The
development of a standardised terminology for condition, and the definition of
condition by one of four grades (see below, Section 5.4.1) means that only the
condition grade before and after need be recorded; this then facilitates numerical
analysis. While the richer information recorded as text of course has its place,
managing collections preservation needs only the bare summary data.

Work planning

Work in museums is more and more commonly being managed by means of
projects. This is a convenient way to organise all sorts of work, not just
exhibitions: it implies that an objective is set, the means to attain it set out, and
agreement given and resources committed by some sort of central management
forum. Progress and the use of resources then need to be monitored.

To plan and coordinate the work of conservation, a broad picture of
activities necessary to meet objectives and deadlines needs to be gained. A convenient
way of communicating this picture is by means of a bar chart (Paper 7). This needs
to be backed up by a list of agreed projects and deadlines, to facilitate checking
through by senior managers responsible for coordinating work across several
Departments (Paper 8).

At a lower level, what conservators most need for a project (for instance,
an exhibition) with a deadline is a timely list of the objects which are to be included
in it. The information model allows for this - in the planned Museum of London
records system, it is to be computerised and will interface neatly with work records
(Paper 24.5: Information Functions).

Monitoring the use of resources

In the Museum of London, by far the largest proportion (85 per cent.) of
Chapter 5: The data

finance for conservation was spent on conservation time, including salaries and outside conservation. Although expenditure on equipment and materials is not trivial (about £62,000 in 1991/2), it is the use of conservation time that is in effect the most important resource to manage. Information on time can, if required, be calculated as information on the cost of different activities.

The use of conservation time is monitored in a few institutions (Ashley-Smith, 1990, figs. 4 and 5; the Science Museum monitors the proportional use of time against objectives). In the Museum of London, in 1991, staff requirements for the Curatorial Division, including the Conservation Department, were set out as post-equivalent time for a number of different projects and specific activities (Paper 19.1). Records showed that about 50 per cent. of an employee's time was needed for "core" activities (management and administration, liaison, training, research, and for conservation, environmental and preventive conservation), leaving about 50 per cent. for specific projects or activities. As time went on, the conservators in the Department were concerned, as always, that resources for the maintenance of the collections were suffering at the expense of those for display and exhibition. They were already used to recording their work in detail, and they swiftly pointed out that we could monitor the actual use of resources (time) and the numbers of objects treated against that planned. This was done by means of monthly work reports (Paper 10). The "projects" that the Department identified accommodated both those which, like exhibitions, have a fixed end point, and also ongoing work such as collections maintenance, i.e. the study collections (Papers 9-14; Figs. 5.5 and 5.6).

The administrative data recorded in a "Conservation Job" has been discussed above. The V & A Conservation Department also reports objects treated against projects (Ashley-Smith, 1990, 20).

5.2.2 Presenting and using data on conservation processes

Examples of the graphic presentation of information on conservation work in the Museum of London are shown as Figs. 5.4-5.6. Chapter 8, Section 8.4, Work monitoring and reporting, and Papers 6-17 give further details and examples, and discuss the uses of data on conservation processes.
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Fig. 5.4 Number of objects conserved each quarter, 1987 - 1991.
Chapter 5: The data

Fig. 5.5 Management information on conservation work in 1991.

Where did the conservation time go?

Collections

Loans +
off-site
displays

Galleries

Exhibitions

Did we use time as we planned
(within 5%)?

Why did we conserve these objects?

Note: there are more archaeology conservators, due to separate funding

Which activities carry the highest time overheads?

Source: work monitoring data, MoL, 1991
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Fig. 5.6 Number of objects conserved for different projects, 1989 - 1991.

a. Total objects treated for each project

- Loans
- Non-mus. obj
- Priority cons.
- Beatr. Potter
- What is it?
- Showcases
- Gardens
- Pageant
- Blitz
- Suffragettes
- Off-site displays
- Jewellery
- Study collect.
- Refurbishment
- Arch. publicn.
- Current arch

Number of objects treated

b. Proportions of objects treated by each Section, by projects

- Beatr. Potter
- What is it?
- Showcases
- Gardens
- Pageant
- Blitz
- Suffragettes
- Jewellery
- Study collect.
- Off-site displays
- Refurbishment

Note to (b): Conservation for archaeology publications and current sites omitted; data for some projects have been combined.
Chapter 5: The data

5.3 DATA ON SKILLS AND QUALITY

Function 7: Acquire, maintain and use skills and expertise

This is the main information function supporting the objective "Ensure trained people". Although this is a qualitative objective, success in certain critical areas can be measured. Skills and expertise must be maintained by attending suitable courses and conferences. Expertise is tested by peers if articles on technical matters or conservation treatment are submitted for publication. The outside view of the quality of work can be gauged if numbers of enquiries from fellow professionals and requests to take students are logged, although for real information these statistics would need to be compared to those for other institutions. In the Museum of London scheme, these data are collected as part of the monthly work reports (e.g., Paper 10), and are reported in quarterly Board of Governors reports and in annual reports.

5.4 DATA ON COLLECTIONS CONDITION

Information function 1: Set standards for and monitor the condition of objects and collections

An important component of management information for conservation relates to what is arguably the fundamental function of museums: to ensure the physical care and preservation of the collections, on which all other museum activities are based. The most direct way of ascertaining whether this is being achieved is to examine the objects in the collections themselves. Because of its importance, a substantial proportion of work on this thesis was directed towards developing the information on this.

A standard method of surveying offers a common measure of success in preserving collections, and a means of comparing the condition of one collection with another within an institution, or in a different one. Successive comparable surveys over time are the only obvious way to establish whether collections are deteriorating

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Chapter 5: The data

A framework for this type of survey, more aptly termed an audit of collections condition, has been developed. It consists of carefully specified terms for defining the condition of objects, a method for designing how to select a sample only of the objects in the collections to examine, and the analyses which are necessary to derive understandable information from the data.

5.4.1 The organisation of the research

In 1990/91, after the Auditor General's Report (Comptroller and Auditor General, 1988) gave an impetus to auditing the care of collections, a project was established in the Museum of London to develop this information framework. Its successful use on the extremely varied Museum of London collections was reported (Keene, 1990 (1), Keene and Orton, 1992). Subsequently, a working party of six people from museums known to have an interest in surveying was assembled, who in four meetings reviewed and improved the terminology and data definitions, bringing their own institutions' experience of condition surveying and information on other such exercises elsewhere. In summary, the sampling method was developed by the author with Clive Orton: the former developed overall strategy, definitions, the detailed procedures, initial analysis and information presentation; the latter, the survey design, sampling methods and more complex statistical analysis. The data definitions were developed first by the author, and then validated and somewhat improved by the Working Party. The initial work has been very fully reported, in Keene and Orton (1992), in a succession of internal Museum of London research reports (Keene, 1990 (1,2); Keene, 1991 (1), Keene, 1992 (1)), and in conference preprints (Keene, 1991 (2),1992 (2)).

5.4.2 Existing and related work on collections surveys

Information on existing work was found in the literature (a search of the Getty Conservation Information Network bibliographic database). Most published work on surveys concentrates either on detailed condition reports on individual objects or on every-object surveys of collections in order to prioritise which objects should be conserved (e.g. Craft & Jones 1981; Quandt 1986; Raphael 1987). These methods are very time-consuming, and collect far more data than is necessary to measure collections condition. There have been a few general surveys of
regions or collections types (e.g. Ramer 1989; Storer 1989; Kenyon, 1992),
some of which which have employed sampling methods to the selection of museums.
There is no reference to such methods being used to assess the condition of collections
themselves, apart from some work on statistical selection for libraries and
are much less variable than are museum collections. The first report of a condition
survey aimed at assessing an entire and diverse collection is to be found in Walker
and Bacon (1987); this was an every-object survey for the Horniman museum.

Some U.K. institutions known to have been involved in surveying were
contacted for further information. Although this has resulted in a bias towards
national museums, for this purpose what is needed is not a fully representative
sample, but a selection of those institutions with the most experience of undertaking
surveys on a variety of different types of collections, and of using the results. With
the help of the Working Party, information was found for the U.K. on well over
twenty surveys past or present in six museums, two libraries, some museum
"umbrella" bodies, and the National Trust. This represents quite a considerable
investment in the time of highly skilled conservators, and the present study should
help to ensure that this is used in the most effective way. Information from these
institutions is summarised in Appendix 5.1.

Procedures

Most surveys have been object-by-object. Where a sample of objects has
been inspected, this has not been statistically designed but informal: e.g. every tenth
object. The exception is the Library of Congress survey, where the condition of
twenty million books was estimated from a sample of about 1,000 (Wiederkehr,
1984).

Data

The surveys referred to here are detailed in Appendix 5.1. Nearly all
surveys used many-object forms, with columns for entering a code or a tick. All
surveys recorded brief object information: number, simple name, location. Most
collected information on the damage suffered by the object, as well as a general
rating of condition or of conservation priority. Within the sample, there is very
wide variation on the number of items of information collected, from 21 on condition and treatment in one of the V & A library surveys to two headings only (with a choice of about 11 categories for damage, and 4 for priority) in the Public Records Office pilot survey.

Most forms had about eight categories of damage and four for overall condition or priority, but there was wide variation among the others.

**Analysis and reporting**

The number of information items collected, when coupled with large numbers of records in object-by-object surveys, means that, even though in summary form, very large volumes of data are being assembled. Typical examples are nearly 200,000 items of data from a survey of 7,900 objects (Victoria and Albert Museum, National Art Library survey, 1985); and over 200,000 items of data from a survey of 14,600 objects (National Maritime Museum). Most reports cite only an analysis of objects by type and conservation condition grade; not, for instance, condition by damage. This is because it is scarcely feasible to cross-tabulate two or more data variables by hand.

Many extant surveys have not yet had their data analysed at all. This does not mean that they are useless: the Horniman information is found extremely useful by curators, as a complete collections inventory, a basis for future condition monitoring, and as an immediate source of information about environmental problems (Louise Bacon, pers. comm.). In most cases the information collected informally by observing storage conditions and obvious causes of damage has been drawn on and used, both in survey reports and in taking action, at least as much as the survey data itself (various conservators, pers. comm.).

**Conclusions on existing work**

A lot of time and effort is being put into surveys at present - time which could be spent on treating and caring for collections. Very large amounts of data are being collected, and too little use is being made of them. Major reasons are that surveyors launch into form design and data collection - surveying itself - without evaluating sufficiently carefully what it is they want to discover, and without undertaking a trial, or pilot, survey to try out the process from start right through
Chapter 5: The data

to analysis and report stage. Without an overview, information at individual object level assumes more importance to the surveyor than information about collections.

5.4.3 Different types of survey

At least three types of survey are needed to provide a truly comprehensive view of collections preservation:

*Preventive Conservation Assessments* In order to diagnose and eliminate the causes of deterioration, the preservation environment needs to be assessed in the broadest sense, covering institutional policies, procedures, available staff and skills, the history of the collections and space and physical resources for their preservation. Work on this has been completed in America. The Getty Conservation Institute together with the National Institute for the Preservation of Cultural Property have developed a standard Conservation Assessment, to be used for "planning, implementing and fundraising" (National Institute for Conservation and Getty Conservation Institute, 1991). In this country, *Guidelines* on good practice are being developed by the Museums and Galleries Commission (Cassar, May, forthcoming). Other examples are the Stores Assessments used in this study (*Paper* **) and the scheme used in the survey of Yorkshire and Humberside museum collections (Kenyon, 1992).

*Collections condition audits* Data on the condition of objects and collections themselves - the subject of this report. These are the exact complement to Preventive Conservation Assessments.

*Curatorial assessments* Curatorial assessments of the importance of the object as part of the collection. This sort of assessment is clearly essential for prioritising action to be taken as a result of Condition Surveys, and for allocating resources. Despite current concerns with the refinement of collections through disposals, the only published work so far found on this emanates from the Dutch government, on the Delta Plan, a national initiative to address the backlog of collections management work in Holland (Anon., 1992, Annexes 3 and 5).

As well as these general audits, object-by-object surveys will still of course be required for other purposes. For example, a Collections Condition Audit will form the basis for deciding which *collections* are the highest priority; to plan
### Table 5.1. Survey objectives, relevant factors, and data needed.

<table>
<thead>
<tr>
<th>Survey objective</th>
<th>Relevant factors</th>
<th>Data needed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Audit condition</strong></td>
<td>Condition of individual objects</td>
<td>Condition audit</td>
</tr>
<tr>
<td></td>
<td>Statistics on collections condition</td>
<td>Damage types &amp; severity</td>
</tr>
<tr>
<td><strong>Identify causes of deterioration</strong></td>
<td>Environment: space, enclosures, supports-mounts, growth of collection, humidity, temperature, light, contaminants, pests, provenance</td>
<td>Observations</td>
</tr>
<tr>
<td></td>
<td>Use: display, handling, repairs/conservation, examination, running/demonstration of objects</td>
<td>Environmental records - past, present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Damage types &amp; severity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Records of use</td>
</tr>
<tr>
<td><strong>Diagnose trend</strong></td>
<td>Condition: past vs. present, Likelihood and rate of future change i.e. vulnerability and stability Factors which have caused / likely to cause change</td>
<td>Condition past (?inferred)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Condition present</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cond. predicted future (= stability)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Present and likely future environment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Present and likely future use</td>
</tr>
<tr>
<td><strong>Affect trend</strong></td>
<td>Change environment (see above) Modify use (see above) - display conditions, handling/use procedures, conservation procedures, running or demonstration Modify object - treat or restore</td>
<td>Most potent causes of deterioration</td>
</tr>
<tr>
<td><strong>Assess resources needed</strong></td>
<td>Space, buildings, plan (HVAC etc.), Equipment (racks, cupboards, etc.), Materials (for mounts, etc.) Time, skills Finance</td>
<td>Size of task (e.g. number of objects, volume, storage area, etc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nature of task (e.g. mounting, treatments)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refit store, new store</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amount/cost of resource (e.g. conservator/years, sq.ft. of storage)</td>
</tr>
<tr>
<td><strong>Assess benefits</strong></td>
<td>Present use of objects, potential use, information potential, relevance to institution's purpose, monetary value, uniqueness, quality of workmanship, physical quality (e.g. wholeness), aesthetic quality</td>
<td>Present use (e.g. objects displayable, books readable, drawings accessible)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Curatorial assessments of worth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Numbers of objects being successfully preserved (i.e. in condition defined acceptable)</td>
</tr>
<tr>
<td><strong>Recommend priorities</strong></td>
<td>Institutional objectives Resources vs. benefits Consequences of &quot;do nothing&quot;</td>
<td>Conservation/preservation policies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost/benefit calculations using above data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vulnerability of objects/collections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Judgements re will deteriorate or not</td>
</tr>
</tbody>
</table>
work, one will need to know which objects are the highest priority, and for this an object-by-object survey is essential.

At a more detailed level still, instrumental or microscopic examination and recording of individual objects or parts of objects is required to investigate exact mechanisms of deterioration, and this may in time influence the form of surveys. See for example Pretzel (1990), and the Library of Congress survey, in which the selected sample was tested for pH and fold strength (Wiederkehr, 1984; Appendix 5.1, Library of Congress survey).

5.4.4 Defining the data

Museum collections are extremely diverse, ranging from beetles to traction engines; flints to oil paintings; costumes to spacecraft. At first sight, it seems impossible that the condition of such a variety of objects could be described by a common set of terms. But on studying surveys from different institutions (see Appendix 5.1), it was found that the terminology to describe "condition" in different types of object was in fact quite similar.

Table 5.1 sets out the objectives of collections condition auditing, and relevant factors to be investigated. Audit data quickly amount to large quantities, which are difficult to handle and to understand. It is recommended that only essential data are collected. There are five main aspects of objects which relate to condition for which data can be collected: administrative data, descriptive data, damage, condition, and work required.

Administrative data

These are the main terms used in analysing data and reporting results. Because museum collections are so diverse, even these seemingly obvious terms need to be defined to take account of collections which are often only partly inventoried, disorganised in store, with no factual estimate of collections size.

Collection An administrative unit within the overall collection of the institution. There can be collections and sub-collections within collections.

Store A self-contained room in which collections are kept.
**Store location**

An important concept, on which the survey design rests. The smallest identifiable grouping of objects within a store, e.g. a shelf, a box on a shelf, a group of objects on the floor, each drawer within a cabinet of drawers, etc.. If a shelf has some freestanding objects, and others contained in a box, then each group counts as a separate store location, and so on.

**Object**

The concept of objects-within-objects is a familiar problem in museum data definition: for example, is the object the tea set, or the individual cups and saucers? For audit purposes, the auditors decide what is most appropriate and record the rule they establish. Normally, an object made up of component parts is taken to be as a single object.

**Object identification**

The inventory or acquisition number. Though desirable, particularly for repeat surveying over time, for a collections condition audit it is not essential that objects have individual numbers.

**Descriptive of object**

How much data are collected on this is optional, and may vary according to individual institutions' or collections' needs. It may include:

- Simple name
- Materials
- Manufacturing processes
- Type (e.g. photographic process)

Data which might relate to, but do not describe, condition may optionally be included here: fragility (the object may be fragile but in perfectly good condition); completeness; working or not. These terms do not necessarily reflect deterioration.

**Damage**

The selection of existing survey forms which had been collected contained altogether 77 different terms to describe damage and deterioration. Many of these were synonyms.
## Table 5.2. Classification of types of damage by broad heading and object type.

<table>
<thead>
<tr>
<th>Structural damage</th>
<th>Surface damage</th>
<th>Disfigurement</th>
<th>Chemical/ internal</th>
<th>Biological</th>
<th>Accretions</th>
<th>Bad old repair</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General:</strong></td>
<td></td>
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</tr>
<tr>
<td>Separate pieces/part; Loose crack; Large tear likely to spread; Large holes; Major splits; Parts missing; Mechanical disorder;</td>
<td>Crack; Small tear; Puncture; Small holes; Small splits; Obviously weak; Loose attachment; Bent; Warped; Creased; Distorted elements e.g. feathers</td>
<td>Flaking/lifted paint, etc; Peeling; Paint/surface losses; Bruised; Cupped; Delaminated; Crazed; Dented;</td>
<td>Scratched; Stained; Abraded; Discoloured; Faded; Tarnished; Colours bled;</td>
<td>Crumbling; Friable; Desiccated; Exudations; Grease; Salts;</td>
<td>Insect attack; Moth; Woodworm; Foxed; Rodent damage; Greasy; Mould; Mildew</td>
<td>Adhesive; Dirty; Encrusted; Surface salts; Deposits; Staples; Sellotape; Patches;</td>
</tr>
<tr>
<td><strong>Furniture:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very loose joint; Separated attachment;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifted veneer;</td>
<td></td>
<td></td>
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<tr>
<td><strong>Paper:</strong></td>
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<tr>
<td>Very badly crumpled with split; Very badly creased with split; Very badly distorted/ rolled;</td>
<td>Cockled; Crumpled; Folded;</td>
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<td></td>
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<tr>
<td>Acid; Yellowed; Chemically changed edges; Matt burn; Redox spots; Metal impurity;</td>
<td>Tape; Sellotape;</td>
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<td></td>
<td></td>
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<tr>
<td><strong>Books:</strong></td>
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<tr>
<td>Separated or nearly separated spine/ cover;</td>
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<tr>
<td>Acid paper; Red rot;</td>
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<tr>
<td><strong>Textiles, fibre</strong></td>
<td></td>
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<tr>
<td>Split seam; Badly creased with split; Seriously crumpled; Crushed;</td>
<td>Shrunken; Detached fibres;</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Deteriorated silk; Acid dyes;</td>
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<tr>
<td></td>
<td>Clumsy stitching; Alterations;</td>
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<tr>
<td><strong>Pictures:</strong></td>
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<tr>
<td>Cupped paint; Losses; Flaking paint; Lifted paint;</td>
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<tr>
<td>Blanched; Deteriorated canvas;</td>
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<tr>
<td><strong>Ceramics, glass:</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Chipped; Small crack;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt damage; Encrustations; Crizzled;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Metals:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corroded; Rusted;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Solder;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The eight general terms originally selected in the Museum of London are themselves sufficient to describe damage to objects in an informative way, and the many other terms found can be grouped within these, as in a thesaurus (Table 5.2). These eight broad terms are:

- Major structural damage
- Chemical deterioration
- Minor structural damage
- Biological attack
- Surface damage
- Bad old repairs
- Disfigurement
- Accretions

A survey in the V & A, designed after the publicising of the framework described here, elaborated on its approach, both defining the broad terms by listing the detailed ones they included, and actually recording the more detailed damage terms (relating to the condition of books) as sub-codes within the codes for the main headings (Shenton, 1991). For example, "major structural damage" included:
- boards off;
- boards missing;
- spine off;
- spine missing;
- spine split;
- sewing broken;
- leaves detached;
- corners broken;
- boards severely missshapen;
- boards broken.

**Condition**

All the surveys found included a variable which summarised the "condition" of an object.

The Museum of London phase of the research had defined "condition" in terms of the priority of the object's need for conservation, using definitions similar to those used in the British Museum and the Horniman:

- URGENT: Object actively deteriorating.
- HIGH: Object needs remedial treatment to prevent further deterioration.
- LOW: Object is seriously disfigured but not deteriorating: treat before display.
- LITTLE: No conservation needed, other than superficial cleaning.

The Working Party discussed the definition of "condition" intensively, and agreed on four grades, defined in Table 5.3.
Chapter 5: The data

Table 5.3. The terms used to describe "Condition", and their definitions.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOOD (C1)</td>
<td>Object in the context of its collection is in good conservation condition, or is stable.</td>
</tr>
<tr>
<td>FAIR (C2)</td>
<td>Fair condition, disfigured or damaged but stable, needs no immediate action*.</td>
</tr>
<tr>
<td>POOR (C3)</td>
<td>Poor condition, and/or restricted use, and/or probably unstable, action desirable.</td>
</tr>
<tr>
<td>UNACCEPTABLE (C4)</td>
<td>Completely unacceptable condition, and/or severely weakened, and/or highly unstable and actively deteriorating, and/or affecting other objects: immediate action should be taken.</td>
</tr>
</tbody>
</table>

* "Action" means something done to the object itself, rather than to its surroundings or environment.

A summary grading of each object's condition is essential, as the main analytical tool for assessing and quantifying preservation. However, there are a number of different aspects to "condition", and all of these have been used in different (or even in the same) surveys (Buck, in 1971; Walker and Bacon, in 1987; Keene 1990 (1) and other survey reports). The aspects of condition were identified as below:

- **Insecurity** (Buck, 1971, and V & A): mechanical stresses, stability or vulnerability
- **Disfigurement** (Buck, 1971, and V & A): appearance of object
- **Conservation priority** (Horniman, Museum of London, British Museum, and others): how urgently is conservation needed?
- **Condition rating** (National Maritime, Public Records Office): e.g. good, fair, poor
Chapter 5: The data

<table>
<thead>
<tr>
<th>Condition</th>
<th>Stability/vulnerability</th>
<th>Usability</th>
<th>Action the object needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>Stable, strong</td>
<td>&quot;usable&quot; for foreseeable future</td>
<td>Needs no action</td>
</tr>
<tr>
<td>Appalling</td>
<td>Weak, highly unstable</td>
<td>Unusable</td>
<td>Immediate treatment</td>
</tr>
</tbody>
</table>

Fig. 5.7. Aspects of the "condition" of an object.

All the factors detailed above are of course valid aspects of "condition". They fall into four areas, shown in Fig. 5.7. They can be combined in the definitions of broad summarising terms, as in those the Working Party decided on. The worse the condition of the object, the more terms descriptive of deterioration are likely to be applicable (Fig. 5.8).

Fig. 5.8. The amount of data needed to describe condition. The worse the condition of the object, the more description is needed.
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Since the objective of these audits is to measure the condition of collections, it was decided that "condition" was more relevant than "need for conservation". What conservators were really doing when they described "condition", it was felt, was predicting the rate at which an object was likely to change, assuming that change in a museum object implies deterioration. The concept of "stability", then, is central to the definition of "condition". Even when an object, although otherwise stable, is graded "highly unstable" (or its equivalent) because of a detached fragment, which would be common practice, this is a prediction that the object will suffer serious change due to the fragment's permanent loss.

It was also noted that the condition of an object needed to be defined in the context of its particular collection. For example, a pot which is in separate sherds may be in GOOD condition as part of an archaeological archive, while the definition for an applied arts ceramic collection may place it in the UNACCEPTABLE category.

Data on damage will give information on why the object has been assigned its condition grade. For example, "Biological deterioration" combined with Condition Grade 4 implies pest infestation or active mould growth; Grade 4 coupled with "Major physical damage" implies an insecure break or a detached part.

There was debate about the number of grades: between three and five. Four grades have been used in many institutions (British Museum, Horniman, Museum of London, National Museum of Wales). Allowing a fifth grade means that the majority of objects are assigned the middle, indeterminate grade, which does not give very useful information. Three grades do not allow sufficient discrimination between different grades of condition, and again have the disadvantage of an indeterminate grade.

Data on work required

A major use of surveys is to estimate the amount of work, and resources, required to properly care for collections. Therefore, it may be useful also to define the category of work required. General categories of work include, in ascending order of elaboration:

None
Clean
Treat / conserve
Mount, box or support
Further categories tailored to individual collections can of course be defined: rebinding books, for libraries, for example.

5.4.5 The audit method

The basis of the sampling design arrived at is statistical method, by which we can learn what we want to know about the population (the whole collection) from statistics gathered about a sample (Rowntree, 1981, 83). If the sample is selected randomly from the population, then it is possible to predict the accuracy of the estimate about the population, and how sure we can be that the results from the audit can be applied to the whole collection (the confidence level).

There are several advantages in using a statistical sampling method. Audits take less time, which is important, because conservators are in short supply, and auditing itself does nothing to directly improve the condition of the collection. Fewer objects, examined more carefully, will give more reliable results than many objects examined only cursorily. If huge quantities of data are collected, it is very difficult to make sense of them, whether they are analysed by hand or by computer.

Audit procedures and sampling

There are five distinct stages in an audit:

• Specify the objectives and scope of the audit;
• Undertake a pilot audit, to establish the variability of the collection and quantify the task;
• Analyse the pilot audit results design the sampling procedure;
• Collect the data (conduct the audit itself);
• Analyse the data
• Report the results.

Audit specification

If the results of the audit are to be adopted and used ("owned") by the institution generally, it is most important that both curators and conservators
cooperate in as many stages as possible. Some obviously suitable tasks for cooperation are: to establish the objectives and scope of the audit, describe the nature of the collection, and note particular aspects of it which are of interest and which should be covered by the audit; to agree the administrative data which will be used in analysing the audit; to define the audit variables (what is "an object" in the context of this collection? Does Condition Grade C4: UNACCEPTABLE need more precise definition?). The time to be spent on the audit must be decided in advance.

Quantification of task, and pilot audit

A pilot audit collects together the necessary information to design the sample and tests out the audit procedures. Necessary information will include information about the collection(s), information about how they are organised in store, quantifications of the size of the task (typically, how many store locations, and how many objects can be examined per day), and data on the statistical "variability" of the collection (see below, 5.4.5, Audit sampling design). It gives an opportunity to test out the means of data collection - whether paper forms or computer. It enables the data definitions to be tested in the context of the particular collection, and rules on their application to be agreed. For example, inexperienced auditors can find themselves having set the criteria for C4: UNACCEPTABLE condition too low, so that they add "even more urgent" classifications as the audit proceeds! (Victoria and Albert Museum, National Art Library Survey, 1985: see Appendix 5.1). A pilot audit will iron out this problem.

The pilot audit can be expected to take up to 20% of the total time available for auditing (see Section 8.7.1, Collections condition audits, and Paper 34.1). It needs to be carefully thought out, so that all parts of the collection are covered evenly. Its procedure can be changed if necessary during the course of it (in the main audit the procedure that has been designed should be rigidly adhered to unless it becomes clear that the design is seriously faulty). The information required from pilot audits is set out in Table 5.4.

Audit sampling design

The method adopted is a two-stage systematic sampling procedure, with storage location as the first stage and individual objects the second. This allows samples to be designed to allow for different levels of between- and within-location variability. This is comparable to selecting every nth street, and within that street, every xth
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The data house to survey. The notation and formulae used are set out in Appendix 5.2; sampling design is discussed in detail in Keene and Orton (1992). Paper 34.3 is an example of a survey design.

Sample size

The sample size required depends on several interrelated factors (Rowntree, 1971, 100; Cochran, 1963): the amount of time allowed for the audit, the confidence limits required and the standard deviation (range) in which the results are to be expressed; the variability of the collection. Time allowed and confidence level (95%, applying to objects in Condition Grade C4, or C3 + C4

Table 5.4. Information to be derived from pilot audits.

Quantification:

1. Time spent on pilot survey (pre-determined):
2. Number of storage locations surveyed in the time:
3. Number of objects surveyed in the time:
4. Total number of storage locations (as counted in pilot survey):
5. Mean number of objects per location:
   (total of col. (b) from table below, / number of locations surveyed)
6. Approximate total number of objects in collection:
   (mean number per location x total number of locations)
7. Number of objects that could be surveyed in the time allocated for the survey:
   (number of objects surveyed per person/day x person/days for survey)

   * Add at least 3 person-days for analysis and report writing.

Variability: For each of the locations surveyed:

<table>
<thead>
<tr>
<th>Location code</th>
<th>Total number of objects</th>
<th>Number of objects surveyed</th>
<th>Number and per cent. of objects in each condition grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>C1</td>
</tr>
</tbody>
</table>

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combined) will normally be fixed: the variability of the collection must be established from a prior pilot survey. Should the size or variability of the collection mean that too great a standard deviation would result from the analysis, then the time allowed may have to be increased.

Collections size

It seems paradoxical, but is not the size of the collection that determines the size of the sample needed, but its variability. "Variability" in audit terms means the number of objects per location, and the proportion of objects in the different grades of condition within different locations.

Designing the sample

The objective of the sampling design can thus be expressed as:

"To design the most effective way of selecting a sample of objects to inspect, given that \( x \) objects can be examined in the time available (figure from the Pilot Survey), in order to calculate the proportion of objects in condition C4 (or C3 + C4), to 95% confidence limits".

The task of sampling design is then to achieve a balance between the sampling fractions \( f_1 \) (the proportion of the locations sampled) and \( f_2 \) (the proportion of objects sampled within each selected location) (Keene and Orton (1992). For example, for the Museum of London Social History collections every 4th location was sampled, and within those, every 8th object, both counts starting from a random selection (see Paper 34.3, the survey design for the Applied Arts collections).

However, these statistical techniques are accessible to few, if any, conservators as yet, since few are trained in statistical method. It is hoped in due course to design a computerised package to do this task\(^1\). If the collection is of a manageable size, an informal sample design can be used. In this, the results of the pilot audit are taken and a reasonable strategy worked out - for instance, every 5th or 10th object. As a general rule, the majority of surveys are based on a sample of around 1,000.

\(^1\) Completed by Keith May, as part of an MSc degree at Queen Mary College.
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It will still be very important to select objects at random; only if they are can statistics about the sample be used to calculate parameters for the collection. In an informal sample (say every 10th object) the first object must be selected randomly by drawing a ticket, etc., and subsequent objects must be chosen according to a predetermined systematic procedure.

Using an informal method with only one stage of sampling has the advantage that it is very simple to extrapolate the results from the sample to the collection as a whole. Statistical techniques can still be used, if wished, to calculate the range and the confidence limit for the whole collection. The disadvantages are that considerably more objects may have been audited than necessary; scarce specialist time may not have been put to the best use; and unnecessary quantities of data may have to be analysed.

Data collection and basic analysis: paper vs. computers

There is a choice between recording audit data on paper or on computer. Paper records are permanent, accessible, and some analysis is easily done by hand (see for example Paper 33, a Museum of London survey form). Their disadvantages are the bulk which quickly accumulates, and that statistical analysis beyond simple counts and percentages is in practice impossible.

The widely available program "Microsoft Works™" was used to prototype an application for simple data input and initial analysis. "Works™" was selected because it is cheap, commonly used, readily available, has a good user interface, and will run on any standard PC computer, even ones without hard disks. The prototype provides a form for entering audit records, which can then be listed and counted, and simple analyses such as percentages performed, using pre-designed report formats. The results can then be printed out (see Appendix 5.4).

Any database program can probably be set up to give a similar output, although there may be snags - "dBase™", for example, cannot perform calculations on fields which include items for which no data are available (null values), which is not uncommon. An alternative would be a spreadsheet such as "Excel™", which also has database facilities. These more sophisticated applications are, however, quite expensive, require fairly large amounts of computer memory, and offer many features which are not needed for collections condition audits. Purpose-built software is likely to be a better solution.
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5.4.6 Monitoring condition over time

If a new random sample of the collection were to be taken for each re-auditing exercise, few if any objects would be common to both audits. Any real change in the overall state of the collection might be masked by the variability introduced by the sampling procedure. The best way around this may be for subsequent audits to include a subset of the original sample in the new sample, perhaps around a third of the original. More detailed logging of data on the subset may be required in order to spot differences more easily. The subset would provide a bench-mark against which the other parts of the audit can be measured. The subset itself would have to be randomly selected.

There is some work based on this, and on using particular types of object as tell-tales on condition (Robert Waller, Canadian Museum of Nature, pers. comm.; SPNHCC-CC Assessment Sub-Committee, 1990). Development of the statistical procedures is continues to be researched, by Clive Orton and Louise Bacon, for the Horniman Museum (Clive Orton, pers. comm., 1991).

5.4.7 Data analysis and presentation

The data from the Museum of London audits has been analysed in considerable detail, using three methods: non-computerised methods, the computer software Microsoft Works™, and the statistical analysis program, SYSTAT™ (see Case Study, and Keene, 1992 (1)). This helped in deciding which analyses are most useful, and on the best formats for presentation.

The sort of information that can be derived from audit data is:

**Descriptive:** different collections, sub-collections, object types; analysis of other descriptive information collected (fragility, broken, etc.)

**Quantitative:** Total numbers of objects in collections, sub-collections, of different types, with different condition grades, etc.
Use of these parameters to calculate conservator or other person/years (months, etc.) needed to undertake necessary work; resources required.
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Comparative: using as a measure the proportional distribution of the sample to compare size of collection, object type, condition of collections/sub-collections, types of damage suffered.

Correlational: The correlation between type of damage and condition grade; correlation between store and condition grade or damage type; correlation of these and other factors such as type of object.

Descriptive information

These variables can by analysed in as much detail as required, depending on the data that has been collected. For example, photographic collections might be analysed by type of object: negative, print, etc., and by photographic process. These sorts of data would be held in an inventory of the collection, but an inventory may not exist.

Information on fragility, completeness, whether in working order, etc. can be analysed if the need for this has been anticipated in audit data design and data coding. Though not directly relevant to condition, this information is invaluable for collections care and management generally.

Analysis: Simple lists.

Output: Lists of object types, stores, collections, etc.. Because a sample only is collected, "object type" has to be fairly broad; for instance, if "object name" was analysed many kinds of object would not have been included in the sample. Even so, this is a very quick way of producing an outline description of a collection. See Appendix 5.3.1.

Quantitative information

Sample audits are designed to enable quantitative information about whole "populations" to be calculated from data about smaller samples. Quantitative information can be derived about the collections, including numbers of:

- Objects in collections, sub-collections, object types
- Objects in stores
- Objects in different condition grades (therefore needing or not needing conservation)
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Objects which have suffered different types of damage
Objects needing mounting or other particular types of work
and as a spinoff ...
Objects lacking a valid inventory number.

The results of this quantitative analysis can be combined with additional data on resources, i.e. work rates - numbers of objects conserved/ mounted/cleaned, etc., in a year; materials, such as amount of mount board required to cut n mounts; prices of boxes, to quantify the resources needed to improve the condition of collections to some predesignated state.

**Analysis:** Counts of cases (object records) by different groups; statistics - standard deviation, maximum number, minimum number; cross-tabulations; application of the statistical formulae designed for survey analysis (Appendix 5.2).

**Output:** Quantified lists, tables, histograms, bar charts. Information on resource requirements: price of required packaging, conservator/ years to treat all objects in Condition Grade 4, etc.. See Appendix 5.3.2-5.3.6.

**Comparative information**

Both numbers and proportions of objects analysed by different variables can be used to make comparisons, of collections size, collections condition, etc. The proportion of objects graded C3 and C4 combined may be used as a simple index of condition. Comparing proportions of damage types may assist in understanding the causes of deterioration.

**Analysis:** Cross-tabulations of object type (or other grouping: e.g. store) by condition grade, with percentages. Log-linear or contingency analysis to compare the condition of different object groupings. The chi-squared test of significance (if required). Percentages of objects with different types of damage.

**Output:** Tables and figures, as above. Percentage and other bar charts; pie charts. See Appendix 5.3.6-5.3.9.

**Correlational information**

Information on how statistics relating to Condition Grade correlate with those for damage factors will undoubtedly be of interest. It can be expected that the relationship will be indicative of the causes of deterioration.
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Analysis: scatter diagrams, correlation coefficient (if necessary).

Output: principally charts.

Conclusions on audit data analysis

All this is very simple information, invaluable for collections care and management, and planning conservation. However, it is characteristic of collections audit data and information that it can be analysed in the same way at many different hierarchical levels (Fig. 5.9, and Papers 35, 36). This means that many separate, though similar, analyses need to be performed. These in turn result in numerous tables, diagrams, etc.. It takes very considerable work and thought to make full use of the information, to draw conclusions, and to quantify and plan work. It is also quite a task to extract a general view. The complexity of actually making use of the information from audits is the main reason for urging that only really essential data be collected.

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**Fig. 5.9.** The hierarchical nature of museum collections data. Large or complex institutions will have more organisational tiers in their collections.
### Table 5.5. Checklist of headings for survey reports

<table>
<thead>
<tr>
<th>The context of the collection</th>
<th>Possible action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of object</td>
<td>Collections management</td>
</tr>
<tr>
<td>Main materials</td>
<td>Summary: Improve store or building</td>
</tr>
<tr>
<td></td>
<td>Improve equipment</td>
</tr>
<tr>
<td></td>
<td>Eliminate pests</td>
</tr>
<tr>
<td></td>
<td>Improve racking</td>
</tr>
<tr>
<td></td>
<td>Control or alter use</td>
</tr>
<tr>
<td>Provenance</td>
<td>Conservation or care</td>
</tr>
<tr>
<td>Age and rate of growth</td>
<td>Support or mount or protect</td>
</tr>
<tr>
<td>Past conservation provision</td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>Treat</td>
</tr>
<tr>
<td></td>
<td>Assess risk if no action</td>
</tr>
<tr>
<td>The environment</td>
<td>Resources available and needed</td>
</tr>
<tr>
<td>Summary:</td>
<td>Finance</td>
</tr>
<tr>
<td></td>
<td>Staff - numbers, skills</td>
</tr>
<tr>
<td></td>
<td>Policies and procedures</td>
</tr>
<tr>
<td></td>
<td>Recommendations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Uses and procedures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary as relevant:</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>Handling</td>
<td></td>
</tr>
<tr>
<td>Working or demonstration</td>
<td></td>
</tr>
<tr>
<td>Public access or use for study</td>
<td></td>
</tr>
<tr>
<td>Archive function</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information on condition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage</td>
<td></td>
</tr>
<tr>
<td>Nature of damage</td>
<td></td>
</tr>
<tr>
<td>Analysis of data</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td></td>
</tr>
<tr>
<td>Analysis of data</td>
<td></td>
</tr>
<tr>
<td>Comparisons</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>Inferences</td>
<td></td>
</tr>
<tr>
<td>Causes of deterioration</td>
<td></td>
</tr>
<tr>
<td>Quantification</td>
<td></td>
</tr>
<tr>
<td>Numbers of objects</td>
<td></td>
</tr>
<tr>
<td>Resources required</td>
<td></td>
</tr>
</tbody>
</table>
5.4.8 AUDIT REPORTS

The presentation of data and information from audits should follow the rules of good practice set out by Chapman (1986).

Table 5.5 gives a checklist of the areas that a report might cover. This is potentially a lot of information, but much of it can be brief. Report headings should therefore include those below. Areas which would be explored in depth through a complementary Preventive Conservation Survey would need to be touched on in a Collections Condition Audit report. See also Table 5.1, above.

Different collections often need separate, mini-reports of their own. This was illustrated in the Museum of London audit reports, where the objective was to audit the collections of the institution as a whole. Here, there are no less than fifteen separate reports on sub-collections; these are drawn together into a report discussing the results under four main object types, reflecting the conservation specialities in the Museum (Keene, 1990 (2)) (Paper 35). Finally, a brief summary dealing with the collections as a whole was presented to the Board of Governors (Paper 36). The digestion and summarising of many separate reports, even if they follow a common format, is (like understanding the data) a considerable task.

5.4.9 TESTING THE METHOD

Work on validating the methodology is outside the scope of this research. It is currently about to proceed in the Conservation Unit of the Museums and Galleries Commission. Four factors need to be tested:

Auditor bias: Different auditors need to audit the same collections (probably even the same objects) to see if the definitions of damage factors and condition rating enable them to arrive at comparable results.

Differences between collections: The same auditors need to inspect similar collections in different institutions, to see how much genuine variation there is.

Blind testing: A few institutions which have not been involved in the development should be persuaded to try out the method.
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Testing over time: Audits of the same collections, using the same methodology, need to be conducted over time. Such audits would probably need to be a number of years apart to record any significant changes, especially if storage conditions have improved.

5.5 CURRENT PRACTICE IN DATA COLLECTION, AND SOURCES OF INFORMATION

There are numerous articles in journals and conference proceedings on record keeping and data management. Relevant sections in the AATA Abstracts include A4: Data and record handling and computation; B1: Environmental control, conservation surveys, pest control. A few books or conference proceedings are devoted to these matters: especially, of course, The Museum Environment (Thomson, 1986). Others are cited in the text. The ICOM Conservation Committee Working Group on Lighting and Climate Control contributes much useful work, reported in the ICOM Preprints. It is shown below that there is a huge variety of formats for documentation and recording; it was therefore found to be more useful to use published examples than to study the approaches of a selection of institutions.

5.5.1 The data archive

The primary function of many of the conservation records discussed above is to add to the permanent archive of information about each object, to record changes and alterations which may affect its integrity as evidence of its historic use or manufacture. Such records include above all those of treatment, but also of condition and use: i.e., most of the processes which constitute the work of conservators. Most of the raw data from which management information derives are therefore being assembled anyway; they need not be specially collected, although their form may be influenced by the need to use them also for this other purpose. Data for the information archive are of less concern in this research; they are adequately dealt with in the literature.
5.5.2 Data normally collected

A useful (though limited, because not designed for this purpose) insight into what conservation data are commonly collected is offered in UKIC's survey of conservation in museums in England and Wales (Corfield et al., eds., 1989). 87 per cent. of conservators responding spent 50 per cent. or more of their time on treatments and documentation. 72 per cent. spent at least some time on scientific examination; 58 per cent. on environmental control and monitoring (Corfield et al., eds., 1989, 42 and 84). 83 per cent. of private conservators provided written reports on treatments and scientific examination. In 67 per cent. of institutions, there had been a survey to assess the condition of the collections.

It is part of a conservator's job to keep conservation records (Corfield et al., eds., 1989, 42). Considerable amounts of data quickly build up (e.g. Bradley, 1983; Corfield, 1983; and author's experience). Some types of record are collected or recorded by most conservators; other data are not routinely or widely collected.

The UKIC survey of conservation practice in museums (Corfield et al., eds., 1989, 23) showed 24 per cent. of museums monitoring and recording temperature and humidity. When institutions do this, large volumes of records again quickly accumulate (Staniforth, 1990). Other types of preventive conservation data are less commonly kept - such as records of pest occurrences (personal experience of the author), although these can be highly revealing, and are indeed essential to a proper integrated pest management system (Story, 1985, Part II, Sect. 12).

There are no reports in the literature (AATA Abstracts) on compiling data on the "use" of objects, other than logging cumulative exposure to light. In the museum context, "use" can also include demonstration, as in rural life or technology museums or the running of clocks, or actual use by the public as in library and archive collections.

Standard formats

A great deal of national and international effort is going into documentation (cf. Brown, 1990; McDonnell, 1990), and it might be imagined that standard systems had been adopted for conservation recording. This is by no means the case, due to the variety of formats taught in training courses, the inclinations of different
conservators, and to a degree the recording requirements for different types of object. For example, in the U.K. the Museums Documentation Association promotes the standardisation of records, but its systems are far from universally adopted (as the enquiries cited below demonstrate). The diversity of systems in use is testified to by a continuing trickle of publications of individual systems or formats (e.g. articles in *The Conservator*, 7 (1983), and recent AATA Abstracts 28-89, 28-90, 28-92). Enquiries are quite often received in the Museum of London Conservation Department from conservators in other museums which are developing their own recording systems. These include within the last two years the British Museum, Birmingham City Museum, Museums and Galleries on Merseyside, the Victoria and Albert Museum, the Horniman Museum.

Collections condition surveying is widespread: 142 out of 211 respondents to *The Survey* (Corfield et al, eds., 1989, 87, Q. 9.4) said all or part of the collections had been assessed. But as we have seen above the lack of standard terminology and procedure has led to unnecessary amounts of time being spent on collecting excessive quantities of data. Attempts to systematically log the deterioration of individual objects themselves, as opposed to using experimental samples to predict effects on objects, are few (for example, Pretzel, 1990). New approaches to limiting damage from exposure to light (Michalski, 1990) would require a much more systematic approach to this: they are dependent on the detailed assessment and monitoring of the sensitivity and "use" of individual objects.

It is increasingly common for records systems to be computerised, but again this is as likely to be as part of an individually tailored whole-institution system as to be one of the commercially, or semi-commercially available, computerised conservation records systems, such as REFORMATION (marketed by Abel Seddon Associates), or the CONSERVATION DATABASE (developed with the Tate Gallery and marketed by William Mackinnon), or STIPPLE (Cannon-Brookes 1987; marketed by STIPPLE DATABASE SERVICES LTD). It is possible that the LASSI initiative (Larger Scale Systems Initiative, a Museums Documentation Association project) will give a further impetus to the standardisation, or at least compatibility, of computerised records systems.

### 5.5.3 Data into information

Conservators are markedly good at keeping records on these various aspects of conservation (e.g. AATA Abstracts, 1985-92), to the point where the
quantity of data becomes embarrassing. Reedy and Reedy (1988) review the use (and briefly the presentation) of statistical analysis in published conservation papers: most published work falls short of good standards both in the statistical techniques used and in presentation. Only one report has been found (Brown, 1992) on how environmental data can be analysed and presented in forms that will be effective for managing the preservation function as an overall, coordinated, long-term strategy: reports on using data are otherwise of particular, individual situations, where the form and presentation of the information is incidental to the description of the problem and its solution.

To be effective as management information, data must be presented in forms that address the relevant questions, either to inform decision making or else to help to assess progress against objectives, and that are easily and quickly understood. In Plain Figures, Chapman (1986) gives a view of how this can best be done. There is a choice, she points out, to be made between words, charts or tables for presenting information; for numerical information, charts, or tables are usually necessary. The design of tables will depend on whether the data is presented to demonstrate a point, or for reference. Charts are always for demonstration. Both charts and tables must always be explained by a verbal (written) summary. It is good practice first to analyse the data; then to write the verbal summary; then to design the tables or charts to clearly illustrate the points being made. Chapman gives detailed instructions on good design. Further advice on the design of charts and graphs is given by Tufte, The visual display of quantitative information (1983).

Some useful observations to bear in mind for conservation are:

It is often the exceptions that are relevant rather than the normal state of affairs (e.g. time outside the set parameters for relative humidity);

Data always needs to be in a context - either over a period of time or for several different locations - to be useful for management;

Though carefully chosen numbers and tables have their place, graphical presentation can be as useful for management as numerical data.
Appendix 5.1

EXISTING WORK ON SURVEYS TO 1990

Information is by personal knowledge or communication unless a reference is given.

U.K. SURVEYS

British Museum

Surveys of different collections have been ongoing for several years. Condition ratings (four grades) common to all types of collection are used, and there is a standard reporting format. Surveys are so far mostly object-by-object.

Horniman Museum (Walker and Bacon, 1987)

Main purpose: Assess what is in the collections; develop strategies for care and conservation.


Time/resources: Two conservators x 1 day each week (c. 380 person/days), augmented by conservation interns and students.

Numbers of objects: Around 100,000 objects in collection. All surveyed.

Survey design: Every object

Data collection: Object-per-line forms: headings slightly adjusted for different types of collection. e.g., for musical instruments, it is important to know if parts are missing, and if the object is in working order.

Type of data: 11 headings, including "priority". Tick or blank.

Data analysis: Paper lists only; numerical analysis. Some computerised data from lists mainly for natural history collections.

Museum of London (Keene, 1990 (2))

Smaller surveys preceded the main survey: of the Ceramics & Glass collections, Posters and Wallpaper in the Printed Ephemera, and the Archaeology Study Collections. Standard data collection began to be developed, but the surveys were object-by-object, and it was not until the need to assess the whole collections arose that sampling was considered.

National Maritime Museum

Condition of some collections assessed as part of compilation of museum wide management record of collections. A condition survey of ships' figureheads was found to take a very long time - e.g. 200 objects took many months. Here, a detailed condition record was made of each object.
Chapter 5: The data

Main purpose: Management record of collections - condition is part of complete record.


Time/resources:

Numbers of objects: 120,000 records to date.

Survey design: Every object

Data collection: Object-per-line forms, uniform scheme of headings tailored to the particular collection.

Type of data: Headings: condition, vulnerability, urgency, each with a score of 1-3.

Data analysis: Records computerised. Data sorting available. Analysis at later date.

National Museum of Wales

Most collections now surveyed.

Main purpose: Develop strategy for conservation and care of collections

Surveys commenced: 1990, ongoing

Time/resources:

Numbers of objects: c. 420,000 in collections surveyed; 5,000 in sample.

Survey design: Every object in some collections (e.g. musical instruments, by outside specialist); others systematically sampled, between 1 and 25% depending on time available and collection and object size.

Data collection: Object-per-line forms; headings adapted for different collections: especially for fossils, where particular types of damage were distinguished.

Type of data: Complex data, with score of 1-5 under each of 9 headings.

Data analysis: Full written report on musical instrument collection. For others, numerical analysis, with hand counts followed by spreadsheet analysis and graphing.

Science Museum: Large Objects collection at Wroughton

Main purpose: Gain information on the condition of collections so as to plan conservation work.

Survey commenced: 1990; completed 1992

Time/resources: 4 conservation technicians, c. 50% of year

Numbers of objects: c. 5,000

Survey design: Every object.

Data collection: One form per object. Paper forms.

Type of data: Three levels of condition report: full, during conservation; partial, a thorough examination including some dismantling; survey, can still take a day for a complex object, e.g. an aircraft.

Data analysis: None to date

Victoria and Albert Museum
Chapter 5: The data. Appendix 5.1

As well as surveys, the V & A uses condition report forms for different types of object.

A large number of surveys has been or are being undertaken of different parts of the collections. For the early ones, their aim was to broadly quantify the conservation resources needed, and the results were those cited in the National Audit Office report. Two key objectives in the Museum’s Strategic Plan for 1990-1995 are:

1. To provide suitable conditions for the well-being of all objects both on display and in study collections;
2. To develop a strategic plan for the conservation of the whole Collection and to implement a programme for the elimination of backlogs.

The latest and current surveys are in support of these objectives, and are intended to estimate present condition of objects; present environment; risk; workload; and to set priorities.

1980 Conservation needs across the Museum
1984 Museum-wide survey of conservation needs
1985 Book-by-book survey of parts of National Art Library
1987 Survey of 18th century costume
1988 on Survey of bound works in Dept. of Design Prints & Drawings
1989a Textile/Prints & Drawings survey of Thang-ka collection
1989b Survey of glass for glass disease
1990a Survey of photographic material throughout museum
1990b Survey of photographic material in Archive of Art & Design
1990c Survey of photographs collection.
1990d Boxed objects in Design Prints & Drawings (paper)
1990e Survey of Chinese textiles
1990f Survey for carpet beetle infestation
1990g (planned) Survey of plastics materials in Textiles Collection

The following are those of the type we are interested in, for which information is available:

1985: National Art Library
Main purpose: planned approach to conservation
Time/resources: 3 months (?)
Numbers of objects: total: over 1,000,000. Surveyed: 7,935
Survey design: Sample (details not available); object-by-object for some collections
Data collection: Object-per-line forms
Data type: Number, date; Tick/blank for: description (6 items); exterior condition (9 items); text block condition (4 items); action (2 items); conservation priority (A-E, with A2 and A3 added)
Data analysis: hand

1988 on: Bound books in Dept. of Design Prints & Drawings
Time/resources:
Numbers of objects:
Survey design:
Data collection: Object-per-line forms
Data type: Tick/blank for: Description & condition of binding (20 headings), same for text block (17 headings), object type, mount, enclosure (14 headings), recommended treatment (4 choices), conservation priority, and additional note.

Data analysis:

1990a: *All photographic material*
Main purpose: see above
Survey commenced: 1990
Time/resources:
Numbers of objects: Every object
Data collection: Forms, then spreadsheet
Data type: Spreadsheet

1990b: *Photographic material in Archive of Art & Design*
Main purpose: see above
Survey commenced: 1990
Time/resources: 16 person/days (2 days per month)
Numbers of objects: Total - c. 1,200,000. Surveyed - 308,000
Survey design: Every object
Data collection: Object-per-line forms.
Data type: For each object, object information: artist, title, object type, process. Location. Tick/blank for: Damage: about 8 headings. Action: 5 headings. Also copy negatives for some objects, to monitor changes over time.

Data analysis:

1990c: *Photographs Collection*
Main purpose: see above
Survey commenced: 1990
Time/resources:
Numbers of objects: 2,000,000 approx.
Survey design: Object-by-object
Data collection: About 8 information items for each object.
Data analysis:

1990d: *Objects (paper) in Design Prints & Drawings*
Main purpose: Know collection; set conservation priorities; plan storage & accessibility improvements
Survey commenced: 1990
Time/resources:
Numbers of objects: 32,000 since Sept.'90.
Survey design: 
Data collection: 
Data type: 
Data analysis: 

142
General surveys of collections

Main purpose: Assess condition of collections; quantify preservation resources needed; develop preservation strategy

Survey commenced: 1987 and 1988 (small surveys); 1989/90 (general survey)

Time/resources: General survey: 6 person/months

Numbers of objects: Whole collections, c. 1,000,000 objects; surveyed collections, c.250,000 objects; c. 32,000 objects surveyed.

Survey design: using statistical calculations based on pilot survey results.

Data collection: Object-per-line forms

Data type: Object name, material; location; 8 items of damage (tick/blank) and conservation priority

Data analysis: Initially by hand, then computerised using statistics package.

Area Museum Service for South-Eastern England

Natural History Unit: surveying collections using form: 6 damage headings, conservation needed, recommended action (retain, relegate to "loan collection", unusable - consider discarding).

Public Record Office

The PRO is planning a condition survey of its holdings. Resources available dictate a sampling approach. A pilot project has been undertaken:

Main purpose: Collect information for planning fuller survey in summer 1991

Survey commenced: 7-17 November 1989

Time/resources: 11 staff + 12 students for 8 days (184 person/days)

Numbers of objects: 2,000 surveyed

Survey design: sample

Data collection: Object-per-line forms

Data type: 11 codes for condition (damage); 4 codes for priority (immediate, height, medium, low)

Data analysis: broad per cent. of priorities for parchment, paper and bindings

Oxford Joint Libraries Committee

A project to raise awareness of conservation needs, and to assess the condition of all the Oxford college and university libraries, is just beginning.

Museums Documentation Association

There is some work on condition recording, but at object rather than collection level.

Natural history collections

Manchester Museum: North Western Collections Research Unit: is preparing a survey of natural history collections. Aim: to identify general requirements.

Federation of Natural Science Collections Research (FENSCORE)
Assessing information on scientific collections, taking the broadest categories of information first. May possibly include inspection of samples of specimens.

**WORK IN OTHER COUNTRIES**

**USA:** Main published focus is on "Conservation assessments" - of storage, procedures, etc.

Earlier work on terminology for describing condition published by Richard Buck (1971). Also work in the National Inventory Program on terminology.

**Library of Congress:** (Wiederkehr, 1984)

Main purpose: To establish "what percentage of the books in the Library of Congress’s General and Law Collections would benefit from deacidification treatment".


Time/resources:
- Numbers of objects: Total 12 m. books; 1,200 surveyed.
- Survey design: 2-stage systematic sample: book stack then object. 3 volumes from each of 400 stacks.
- Data collection: 1 form per object: observation, fold test, lignin test, pH measurement.
- Data type: Date of object, condition of binding - 4 codes each broken/intact; condition of paper - results of tests
- Data analysis: Computerised

**Canada:** Some work on natural history collections surveys, as part of SPNACH.


## Chapter 5: The data. Appendix 5.2.

### FORMULAE FOR SURVEY CALCULATIONS

by Clive Orton

1. **Notation**

<table>
<thead>
<tr>
<th>Population</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of locations</td>
<td>N</td>
</tr>
<tr>
<td>Number of items at ith location</td>
<td>M_i</td>
</tr>
<tr>
<td>Total number of items</td>
<td>M</td>
</tr>
<tr>
<td>Proportion of items at ith location which fall into chosen category</td>
<td>P_i</td>
</tr>
<tr>
<td>Number of such items</td>
<td>Y_i</td>
</tr>
<tr>
<td>Proportion of such items overall</td>
<td>P</td>
</tr>
<tr>
<td>Number of such items overall</td>
<td>Y</td>
</tr>
</tbody>
</table>

Sampling fractions are:
- (locations): \( f_i = n/N \)
- (objects within locations): \( f_x = m_i/M_i \) (chosen to be the same for all locations)

Other notation:
- Sum of all such items: \( \Sigma \)
- Estimate: \( \hat{\Sigma} \)
- Mean: \( \bar{m} \)
- \( q \) is calculated as: \( 1-p \)

2. **Estimating the number of items**

If the survey does not cover all locations, \( n < N \) and we do not know \( M \):

Then we estimate \( M \) by: \( \hat{M} = N(\Sigma m_i/n) = N\bar{m} \)

The standard deviation of \( \hat{M} \) is given as the square root of its variance, which is

\[
\text{var}(\hat{M}) = \frac{(1-f_i)N^2\text{var}(\bar{m})}{n(n-1)} = \frac{N(N-n)\Sigma(m_i-m)^2}{n(n-1)^2}
\]

Note: the quantity \( \text{var}(\bar{m}) \) is the square of the figure 'SE' in Table 6.
3. Estimating the proportion of items in a chosen category

We estimate $P$ by $\hat{P} = \frac{EM \cdot p_i}{EM_i} = p$, since we use 'self-weighting' samples (i.e. $m_i/M_i = \text{const.}$)

Adapting a formula given by Cochran (1963, 302) leads to

$$\text{var}(\hat{P}) = \frac{1-f_i}{nM^2} \cdot \left( \hat{P}_i - \hat{P} \right)^2 + \frac{f_i(1-f_j)}{n^2M^2} \cdot \left( \frac{m_i}{m_i} \right) p_i q_i \cdot \frac{n-1}{m_i(m_i-1)}$$

For the costume survey, where $f_i = 1$, the first term disappears.

I used the formula for a simple sample,

$$\text{var}(\hat{P}) = \frac{(1-f_i)p_i q_i}{(m_i-1)}.$$ 

This formula under-estimates the true variance, and hence the s.d., if there are correlations between the condition of items at the same location. I therefore chose to ignore the correction factor $(1-f_i^2) = 3/4$ for the Costume Survey to compensate for a possible low level of correlation.

4. Estimating the number of items in a chosen category.

This question is best approached indirectly, using $\hat{Y} = \hat{P} \cdot M$.

Then $\text{var}(\hat{Y}) = \hat{P}^2 \cdot \text{var}(\hat{M}) + \hat{M}^2 \cdot \text{var}(\hat{P})$,

noting that $\text{var}(\hat{M})$ can be obtained from section (2) above and that if all locations are sampled, $f_i = 1$ and $\text{var}(\hat{M}) = 0$.

5. Survey design (From Keene and Orton, 1991)

We sample a proportion $f_1$ of the locations, with equal probability, and then a proportion $f_2$ of the objects at each location. Since the proportion $f_1$ is the same for all locations, this is a self-weighting sample. To estimate the overall proportion $P$ we use the ratio-to-size estimate

$$\hat{P} = \frac{EM \cdot p_i}{EM_i} = p$$

(hence the term self-weighting). A formula for the variance in the general case is given by Cochran (1963,302). By defining a dummy variable

$y_{ij} = 1$ if object $j$ in location $i$ belongs to the key category, $= 0$ otherwise, we have $p_i - y_{ij}$, and his formula becomes

$$\text{var}(\hat{P}) = \frac{(1-f_i)EM_i \cdot (p_i - \hat{P})^2}{nM^2(n-1)}$$

$$+ \frac{f_i(1-f_j)EM_i \cdot (m_i/(m_i-1))p_i q_i}{n^2M^2}$$
6. Designing samples for specific surveys

The task consists of striking a balance between the sampling fractions $f_i$ and $f^*$, depending on the relative variability between and within locations.

If all objects at a location are in similar condition, but the locations differ widely, we would need a high value of $f_i$ but a low value of $f^*$.

The overall size of the sample depends on the resources available and the time needed to survey - so,

\[
\begin{align*}
\text{fixed overhead per store:} & \quad c_0 \\
\text{overhead per storage location:} & \quad c_1 \\
\text{time per object:} & \quad c_2
\end{align*}
\]

Further,

- average number of objects sampled per location: $\bar{m}$
- within-location variance: $s_p^2$
- between-location variance: $s_r^2$

The overhead $c_0$ does not enter the equation directly, but must be subtracted from the total time available before the size of the sample is calculated. Factors $c_1$ and $c_2$ are best estimated from overall work rate figures, using linear regression.

Then, Cochran's formula (1963, 314) for optimal allocation:

\[
m_{opt} = \frac{\bar{m}}{\sqrt{\left(s_p^2 \cdot s_r^2 / \bar{m}\right)}} \cdot \frac{(c_1/c_2)}
\]
APPLICATION OF FORMULAE FOR SURVEY CALCULATIONS

7. Estimating proportion,
e.g. per cent. of objects in Priority 1 + Priority 2

Formula 3 can be written as:

\[
\text{var}(^\circ P) = \frac{(1-f_i)S_i^2 + f_i(1-f_2)S_2^2}{n}
\]

where

\[
S_i^2 = \frac{\sum M_i^2(p_i-^\circ P)^2}{\overline{M}^2(n-1)}
\]

and

\[
S_2^2 = \frac{1}{\overline{mM}} \sum M_i(p_i-^\circ P)^2
\]

For \(S_i^2\):

\[
\sum M_i^2(p_i-^\circ P)^2 \text{ is total of column } "M_i^2(p_i-^\circ P)^2", \text{ i.e. } 422,227
\]

n=18, so n-1=17; \(\overline{M}\) = av. of column "M", i.e. 264.9.

so \(S_i^2 = 422,227 / 17 \times (264.9)^2 = 0.353\)

For \(S_2^2\):

\[
\sum M_i(p_i-^\circ P)^2 \text{ is total of column } "M(p_i-^\circ P)^2", \text{ i.e. } 424.4
\]

n=18, \(\overline{m}\) = av. of column "m", i.e. 11.22

so \(S_2^2 = 424.4 / 18 \times 11.22 \times 264.9 = 0.008\)

Put them together:

\[
\text{var}^\circ P = \frac{(1-f_i) \times 0.353 + f_i(1-f_2) \times 0.008}{18}
\]

but \(f_i\) \text{ in this example} is so small that (i) \(1-f_i \approx 1\)

(ii) we can ignore second term

leading to \(\text{var}^\circ P = \frac{0.353}{18} \approx 0.02\)

\[\text{s.e. } (^\circ P) = \sqrt{\text{var}(^\circ P)} \approx 0.14 \quad (\text{or } 14\% \text{ if preferred})\]

We had \(^\circ P = 0.73 \text{ or } 73\%\), so taking a 95\% confidence interval of \(+ 2 \text{ s.e.s}, \text{ the interval is } 73 \pm 28\% = 45 - 101\%\)!
Chapter 5: The data.  Appendix 5.2.

8. Estimating total number of objects in collection

need a column, \( M_i - \bar{M} \)  (in our example, \( \bar{M} = 264.9 \))
and another: \((M_i - \bar{M})^2\)
Total of latter is \( \sum(M_i - \bar{M})^2 \)

\[
\text{var } \hat{M} = \frac{N(N-n)}{n(n-1)} \sum(M_i - \bar{M})^2
\]

In this example, \( N = 10,343 \), \( n = 18 \)
\[
\frac{N(N-n)}{n(n-1)} = \frac{10,343 \times 10,325}{18 \times 17} = 349,000
\]
\[
\sum(M_i - \bar{M})^2 = 2,500,000
\]

\[
\text{var } \hat{M} = 349,000 \times 2,500,000 = 349 \times 2.5 \times 10^9 = 87.23 \times 10^{10}
\]
\[
\text{s.e. } = 9.3 \times 10^5 = 930,000
\]

Already had \( \hat{M} = 1,076,000 \) objects
so the interval is 146,000 - 2,006,000 objects
(The data are from the pilot survey of the Historic Photographs collection. The collection is huge and the pilot survey was very small.)

9. Estimating total in a category, e.g. Priority 1 + 2

\[
\text{est. } = 0.73 \times 1,076,000 = 785,000
\]

\[
\text{var } \hat{Y} = \hat{P}^2 \text{ var } \hat{M}^2 + \hat{M}^2 \text{ var } \hat{P}
\]
\[
\hat{P} = 0.73, \text{ var } \hat{M} = 87.25 \times 10^{10}
\]
\[
\hat{M} = 1,076,000, \text{ var } \hat{P} = 0.02
\]
\[
\text{var } \hat{Y} = 0.73 \times 87.25 \times 10^{10} + (1,076,000)^2 \times 0.02
\]
\[
= 63.7 \times 10^{10} + 0.023 \times 10^{12}
\]
\[
= 66 \times 10^{10}
\]
\[
\text{s.e. } (\hat{Y}) = 8.1 \times 10^5 = 810,000
\]
### HISTORIC PHOTOGRAPHS COLLECTION: PILOT SURVEY DATA

Simple (pseudo-two-stage) approach: assumes 'self-weighting', but isn't

<table>
<thead>
<tr>
<th>n</th>
<th>Mi</th>
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<th>mi(1+2)</th>
<th>pi(1+2)</th>
<th>pipi</th>
<th>piqi</th>
<th>x(Mi)</th>
<th>(pi-^P) M2(pi-^P)^2</th>
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<th>Mi-M2</th>
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<td>0.19</td>
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<td>0.17</td>
<td>69.00</td>
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<td>4</td>
<td>2</td>
<td>0.50</td>
<td>0.25</td>
<td>5.00</td>
<td>6.70</td>
<td>0.23</td>
<td>21</td>
<td>4</td>
</tr>
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<td>142</td>
<td>27</td>
<td>15</td>
<td>0.56</td>
<td>0.25</td>
<td>35.50</td>
<td>36.90</td>
<td>0.17</td>
<td>583</td>
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<td>147</td>
<td>10</td>
<td>5</td>
<td>0.50</td>
<td>0.25</td>
<td>36.00</td>
<td>40.80</td>
<td>0.23</td>
<td>1143</td>
<td>10</td>
</tr>
<tr>
<td>12</td>
<td>276</td>
<td>10</td>
<td>4</td>
<td>0.40</td>
<td>0.24</td>
<td>66.20</td>
<td>73.60</td>
<td>0.33</td>
<td>8296</td>
<td>10</td>
</tr>
<tr>
<td>13</td>
<td>15</td>
<td>4</td>
<td>2</td>
<td>0.50</td>
<td>0.25</td>
<td>3.80</td>
<td>5.00</td>
<td>0.23</td>
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<td>4</td>
</tr>
<tr>
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<td>12</td>
<td>2</td>
<td>1</td>
<td>0.50</td>
<td>0.25</td>
<td>3.00</td>
<td>6.00</td>
<td>0.23</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>15</td>
<td>212</td>
<td>10</td>
<td>7</td>
<td>0.70</td>
<td>0.21</td>
<td>44.50</td>
<td>49.50</td>
<td>0.03</td>
<td>41</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>1130</td>
<td>11</td>
<td>11</td>
<td>1.00 [0.1]</td>
<td>[113]</td>
<td>[120.3]</td>
<td>0.27</td>
<td>93,085</td>
<td>11</td>
<td>121</td>
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<tr>
<td>17</td>
<td>1230</td>
<td>10</td>
<td>10</td>
<td>1.00 [0.1]</td>
<td>[123]</td>
<td>[136.7]</td>
<td>0.27</td>
<td>110,290</td>
<td>10</td>
<td>100</td>
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<tr>
<td>18</td>
<td>739</td>
<td>26</td>
<td>3</td>
<td>0.12</td>
<td>0.10</td>
<td>73.90</td>
<td>76.90</td>
<td>0.01</td>
<td>203,212</td>
<td>26</td>
</tr>
</tbody>
</table>

\[ \sum \]
- 4743
- 196
- 114

\[ \text{av.} \]
- 263.5
- 10.89

\[ \text{unweighted mean: } \hat{p} = 0.56 \]
\[ \text{weighted mean: } \hat{p} = 0.73 \]

\[ \frac{f_1}{f_2} \]
- very small
- 202 / 4708 = 0.042
Chapter 5: The data. Appendix 5.3.1

Appendix 5.3: Results of the analysis of survey data

LIST OF OBJECT TYPES IN SOCIAL AND WORKING HISTORY COLLECTIONS
(as used in survey analysis)

It would be preferable to use a standard system of nomenclature, such as that developed in the SHIC (Social History and Industrial Collections) system.

Store codes:

<table>
<thead>
<tr>
<th>Store Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CER</td>
<td>Ceramics + glass store</td>
</tr>
<tr>
<td>GEN</td>
<td>General store</td>
</tr>
<tr>
<td>MET</td>
<td>Metal store</td>
</tr>
<tr>
<td>LSG</td>
<td>Lever St. ground fl.</td>
</tr>
<tr>
<td>LS1</td>
<td>Lever St. 1st floor</td>
</tr>
<tr>
<td>LSP</td>
<td>Lever St. paper store</td>
</tr>
<tr>
<td>EPH</td>
<td>Ephemera store</td>
</tr>
<tr>
<td>LIB</td>
<td>Library</td>
</tr>
<tr>
<td>ARC</td>
<td>Archaeology store</td>
</tr>
<tr>
<td>STR</td>
<td>Strong Room</td>
</tr>
<tr>
<td>SPI</td>
<td>Spitalfields</td>
</tr>
<tr>
<td>TOY</td>
<td>toy store</td>
</tr>
<tr>
<td>VEH</td>
<td>vehicle store</td>
</tr>
<tr>
<td>ROT</td>
<td>rotunda store</td>
</tr>
<tr>
<td>PHO</td>
<td>historic photos store</td>
</tr>
</tbody>
</table>

Object type                      Store(s)
----------------------------------------------------
Architectural fittings           LSG
Ceramics and glass               CER
Cinema                           LS2
Civic regalia, etc.              STR
Clocks                            LSG, STR
Coins and medals                  STR
Domestic, lighting               LS2
Domestic, miscellaneous          LS2
Entertainment                    LS2
Equipment and fittings           LS1
Furniture - miscellaneous        LS1
Furniture - office               LS2
Furniture - schools              LS2
Jewellery                        STR
Machines                         LSG
Miscellaneous social history     LS1, LS2
Miscellaneous social history
  - large items                   LS2
  - small objects                 GEN
Trade                            LS2
Vehicles                         VEH
Weapons                          STR
Workshop contents                LSG, LS2
THE COLLECTIONS OF THE MUSEUM OF LONDON

Numbers of objects, estimated from collections surveys statistics and from curators’ estimates

<table>
<thead>
<tr>
<th>Collection</th>
<th>Number of objects</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td>19,000</td>
<td></td>
</tr>
<tr>
<td>Non-metals</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Archaeology interim, DUA + DGLA</td>
<td>140,000</td>
<td>179,000</td>
</tr>
<tr>
<td>(excludes bulk pot, etc.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Later: paper based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Images</td>
<td>261,000</td>
<td></td>
</tr>
<tr>
<td>Ephemera + general modern</td>
<td>101,000</td>
<td>402,000</td>
</tr>
<tr>
<td>Archives + books</td>
<td>40,000</td>
<td></td>
</tr>
<tr>
<td>Later: objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costume + textiles</td>
<td>16,000</td>
<td></td>
</tr>
<tr>
<td>Social history/ workshops</td>
<td>66,000</td>
<td>82,000</td>
</tr>
<tr>
<td>Vehicles</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Docklands/working history:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objects</td>
<td>50,000</td>
<td></td>
</tr>
<tr>
<td>PL Library: images</td>
<td>55,000</td>
<td></td>
</tr>
<tr>
<td>Do. : archives + books</td>
<td>172,000</td>
<td>277,000</td>
</tr>
<tr>
<td>TOTAL FOR ALL COLLECTIONS:</td>
<td>940,000</td>
<td></td>
</tr>
</tbody>
</table>

THE CONDITION OF THE SURVEYED COLLECTIONS*

Numbers of objects in different conservation priorities, calculated from survey statistics

<table>
<thead>
<tr>
<th>Collection type</th>
<th>Conservation priority</th>
<th>Calculated total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urgent</td>
<td>High</td>
</tr>
<tr>
<td>Paper</td>
<td>14,108</td>
<td>84,519</td>
</tr>
<tr>
<td>Costume &amp; text.</td>
<td>1,065</td>
<td>3,265</td>
</tr>
<tr>
<td>Applied arts</td>
<td>4,094</td>
<td>8,797</td>
</tr>
<tr>
<td>Archaeology</td>
<td>2,594</td>
<td>6,661</td>
</tr>
</tbody>
</table>

* Collections not included: Docklands, PLA Library, Historic Photographs, easel paintings, ceramics and glass, archaeology interim collections
COMPARING THE CONDITION OF OBJECTS BY GROUPS

Social history collections

a. Collections

b. Stores
### MODERN COLLECTIONS CONDITION SURVEY STATISTICS

#### NUMBERS OF OBJECTS IN SURVEY

<table>
<thead>
<tr>
<th>Store Type</th>
<th>Worst</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>General store</td>
<td>27</td>
<td>63</td>
<td>140</td>
<td>276</td>
<td>506</td>
<td></td>
</tr>
<tr>
<td>Metals store</td>
<td>2</td>
<td>7</td>
<td>9</td>
<td>9</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Lever St. ground</td>
<td>18</td>
<td>63</td>
<td>184</td>
<td>102</td>
<td>367</td>
<td></td>
</tr>
<tr>
<td>Lever St. first</td>
<td>10</td>
<td>19</td>
<td>29</td>
<td>5</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Lever St. second</td>
<td>26</td>
<td>74</td>
<td>302</td>
<td>321</td>
<td>723</td>
<td></td>
</tr>
<tr>
<td>Toy store</td>
<td>16</td>
<td>30</td>
<td>96</td>
<td>151</td>
<td>293</td>
<td></td>
</tr>
<tr>
<td>Vehicle store</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>12</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Spitalfields</td>
<td>36</td>
<td>28</td>
<td>50</td>
<td>4</td>
<td>118</td>
<td></td>
</tr>
<tr>
<td>Strong Room</td>
<td>4</td>
<td>13</td>
<td>23</td>
<td>300</td>
<td>340</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>141</td>
<td>303</td>
<td>837</td>
<td>1,168</td>
<td>2,449</td>
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</tr>
</tbody>
</table>

#### PERCENTAGE IN EACH PRIORITY RATING

<table>
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<tr>
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<th>Worst</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>General store</td>
<td>5.3</td>
<td>12.5</td>
<td>27.7</td>
<td>54.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals store</td>
<td>7.4</td>
<td>25.9</td>
<td>33.3</td>
<td>33.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lever St. ground</td>
<td>4.9</td>
<td>17.2</td>
<td>50.1</td>
<td>27.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lever St. first</td>
<td>15.9</td>
<td>30.2</td>
<td>46.0</td>
<td>7.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lever St. second</td>
<td>3.6</td>
<td>10.2</td>
<td>41.8</td>
<td>44.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toy store</td>
<td>5.5</td>
<td>10.2</td>
<td>32.8</td>
<td>31.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle store</td>
<td>16.7</td>
<td>50.0</td>
<td>33.3</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spitalfields</td>
<td>30.5</td>
<td>23.7</td>
<td>42.4</td>
<td>3.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong Room</td>
<td>1.2</td>
<td>3.0</td>
<td>6.8</td>
<td>88.2</td>
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<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5.8</td>
<td>12.4</td>
<td>34.2</td>
<td>47.7</td>
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### MODERN COLLECTIONS CONDITION SURVEY STATISTICS

#### NUMBERS IN EACH STORE WITH EACH DAMAGE FACTOR

<table>
<thead>
<tr>
<th>Store Type</th>
<th>maj</th>
<th>min</th>
<th>inf</th>
<th>inter</th>
<th>surf</th>
<th>disf</th>
<th>old</th>
<th>dirt</th>
<th>OBJECDST</th>
</tr>
</thead>
<tbody>
<tr>
<td>General store</td>
<td>20</td>
<td>35</td>
<td>0</td>
<td>118</td>
<td>10</td>
<td>24</td>
<td>30</td>
<td>119</td>
<td>506</td>
</tr>
<tr>
<td>Metals store</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>27</td>
</tr>
<tr>
<td>Lever St. ground</td>
<td>7</td>
<td>20</td>
<td>10</td>
<td>169</td>
<td>30</td>
<td>13</td>
<td>2</td>
<td>310</td>
<td>367</td>
</tr>
<tr>
<td>Lever St. first</td>
<td>14</td>
<td>29</td>
<td>3</td>
<td>17</td>
<td>15</td>
<td>36</td>
<td>1</td>
<td>60</td>
<td>63</td>
</tr>
<tr>
<td>Lever St. second</td>
<td>24</td>
<td>52</td>
<td>4</td>
<td>150</td>
<td>89</td>
<td>132</td>
<td>11</td>
<td>525</td>
<td>723</td>
</tr>
<tr>
<td>Toy store</td>
<td>18</td>
<td>45</td>
<td>2</td>
<td>39</td>
<td>56</td>
<td>10</td>
<td>9</td>
<td>67</td>
<td>293</td>
</tr>
<tr>
<td>Vehicle store</td>
<td>2</td>
<td>7</td>
<td>4</td>
<td>11</td>
<td>6</td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Spitalfields</td>
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<td>32</td>
<td>4</td>
<td>74</td>
<td>46</td>
<td>9</td>
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<td>118</td>
<td>118</td>
</tr>
<tr>
<td>Strong Room</td>
<td>9</td>
<td>10</td>
<td>0</td>
<td>7</td>
<td>9</td>
<td>17</td>
<td>1</td>
<td>13</td>
<td>340</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td>230</td>
<td>27</td>
<td>600</td>
<td>266</td>
<td>250</td>
<td>55</td>
<td>1233</td>
<td>2449</td>
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</table>

#### PERCENTAGE OF OBJECTS IN STORE WITH EACH DAMAGE FACTOR

<table>
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<tr>
<th>Store Type</th>
<th>maj</th>
<th>min</th>
<th>inf</th>
<th>inter</th>
<th>surf</th>
<th>disf</th>
<th>old</th>
<th>dirt</th>
</tr>
</thead>
<tbody>
<tr>
<td>General store</td>
<td>4.0</td>
<td>6.9</td>
<td>0.0</td>
<td>23.3</td>
<td>2.0</td>
<td>4.7</td>
<td>5.9</td>
<td>23.5</td>
</tr>
<tr>
<td>Metals store</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>55.6</td>
<td>18.5</td>
<td>0.0</td>
<td>0.0</td>
<td>33.3</td>
</tr>
<tr>
<td>Lever St. ground</td>
<td>1.9</td>
<td>5.4</td>
<td>2.7</td>
<td>46.0</td>
<td>8.2</td>
<td>3.5</td>
<td>0.5</td>
<td>84.5</td>
</tr>
<tr>
<td>Lever St. first</td>
<td>22.2</td>
<td>46.0</td>
<td>4.8</td>
<td>27.0</td>
<td>23.8</td>
<td>57.1</td>
<td>1.6</td>
<td>95.2</td>
</tr>
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<td>3.3</td>
<td>7.2</td>
<td>0.6</td>
<td>20.7</td>
<td>12.3</td>
<td>18.3</td>
<td>1.5</td>
<td>72.6</td>
</tr>
<tr>
<td>Toy store</td>
<td>6.1</td>
<td>15.4</td>
<td>0.7</td>
<td>13.3</td>
<td>19.1</td>
<td>3.4</td>
<td>3.1</td>
<td>22.9</td>
</tr>
<tr>
<td>Vehicle store</td>
<td>16.7</td>
<td>58.3</td>
<td>33.3</td>
<td>91.7</td>
<td>50.0</td>
<td>75.0</td>
<td>0.0</td>
<td>100.0</td>
</tr>
<tr>
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<td>9.3</td>
<td>27.1</td>
<td>3.4</td>
<td>62.7</td>
<td>39.0</td>
<td>7.6</td>
<td>0.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Strong Room</td>
<td>7.6</td>
<td>7.9</td>
<td>0.0</td>
<td>2.1</td>
<td>7.6</td>
<td>6.0</td>
<td>0.7</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTS PER STAFF MEMBER
Excluding Docklands, PLA Library & archaeology finds

Person/years to treat objects
needing urgent or remedial work
Chapter 5: The data. Appendix 5.3.6

Collections by object type

Comparison of collections size

Collections condition: Percentages compared

Person / years to treat objects needing conservation

Conservator / years to treat objects

<table>
<thead>
<tr>
<th>Objects treated per pers. / year</th>
<th>Person / years needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>Grade 4</td>
</tr>
<tr>
<td>Social history</td>
<td>380</td>
</tr>
<tr>
<td>Text + costume</td>
<td>188</td>
</tr>
<tr>
<td>Archaeology</td>
<td>72</td>
</tr>
<tr>
<td>Archaeology</td>
<td>307</td>
</tr>
</tbody>
</table>

156
### Table of ObjTypes (Rows) by Stores (Columns)

#### Frequencies

<table>
<thead>
<tr>
<th></th>
<th>CER</th>
<th>LS1</th>
<th>LS2</th>
<th>LSG</th>
<th>STR</th>
<th>VEH</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLASS</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>NEMA</td>
<td>0</td>
<td>0</td>
<td>89</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>89</td>
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<tr>
<td>MDL</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>173</td>
<td>0</td>
<td>173</td>
</tr>
<tr>
<td>JNITUR</td>
<td>0</td>
<td>34</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>39</td>
</tr>
<tr>
<td>MISC</td>
<td>0</td>
<td>12</td>
<td>160</td>
<td>3</td>
<td>59</td>
<td>0</td>
<td>234</td>
</tr>
<tr>
<td>WELS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>67</td>
<td>0</td>
<td>67</td>
</tr>
<tr>
<td>MISC</td>
<td>0</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>MACHINES</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>247</td>
<td>0</td>
<td>0</td>
<td>247</td>
</tr>
<tr>
<td>RADE</td>
<td>0</td>
<td>0</td>
<td>225</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>225</td>
</tr>
<tr>
<td>EH</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>WEAPONS</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>WORKSHOP</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>94</td>
<td>0</td>
<td>0</td>
<td>139</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>24</strong></td>
<td><strong>54</strong></td>
<td><strong>533</strong></td>
<td><strong>354</strong></td>
<td><strong>322</strong></td>
<td><strong>12</strong></td>
<td><strong>1299</strong></td>
</tr>
</tbody>
</table>
Chapter 5: The data.  Appendix 5.3.8

COMPARISONS AND NUMBERS
Social History collections

a. Percentages of objects in Priorities 1 + 2

b. Numbers of surveyed objects in Priority 1

c. Mean numbers of Priority 1 objects per location compared to the average
**Table 1** Contingency analysis to compare the proportions of each category of the collection falling into the four priority groups

<table>
<thead>
<tr>
<th></th>
<th>Worst 1</th>
<th>Priority Group 2</th>
<th>Priority Group 3</th>
<th>Priority Group 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women’s costume</td>
<td>207</td>
<td>216</td>
<td>128</td>
<td>20</td>
<td>765</td>
</tr>
<tr>
<td>Men’s costume</td>
<td>58</td>
<td>97</td>
<td>71</td>
<td>69</td>
<td>266</td>
</tr>
<tr>
<td>Accessories</td>
<td>293</td>
<td>205</td>
<td>175</td>
<td>175</td>
<td>693</td>
</tr>
<tr>
<td>Children’s costume</td>
<td>106</td>
<td>88</td>
<td>16</td>
<td>55</td>
<td>175</td>
</tr>
<tr>
<td>Theatrical costume</td>
<td>83</td>
<td>157</td>
<td>42</td>
<td>70</td>
<td>277</td>
</tr>
<tr>
<td>Domestic &amp; Misc.</td>
<td>102</td>
<td>32</td>
<td>23</td>
<td>58</td>
<td>239</td>
</tr>
<tr>
<td>Total</td>
<td>213</td>
<td>653</td>
<td>1166</td>
<td>515</td>
<td>2547</td>
</tr>
</tbody>
</table>

**Table 2** "Expected" - the numbers to be expected if the proportion in each priority group for each category reflected the percentages for the collection as a whole.

<table>
<thead>
<tr>
<th></th>
<th>Priority Group 1</th>
<th>Priority Group 2</th>
<th>Priority Group 3</th>
<th>Priority Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women’s costume</td>
<td>158.7</td>
<td>350.2</td>
<td>154.7</td>
<td>196.1</td>
</tr>
<tr>
<td>Men’s costume</td>
<td>53.6</td>
<td>121.8</td>
<td>55.8</td>
<td>68.2</td>
</tr>
<tr>
<td>Accessories</td>
<td>140.1</td>
<td>317.3</td>
<td>140.1</td>
<td>177.7</td>
</tr>
<tr>
<td>Children’s costume</td>
<td>26.7</td>
<td>80.1</td>
<td>35.4</td>
<td>44.9</td>
</tr>
<tr>
<td>Theatrical costume</td>
<td>60.4</td>
<td>33.8</td>
<td>26.7</td>
<td>11.0</td>
</tr>
<tr>
<td>Domestic &amp; Misc.</td>
<td>56.0</td>
<td>126.8</td>
<td>56.0</td>
<td>71.0</td>
</tr>
<tr>
<td>Dolls</td>
<td>48.3</td>
<td>109.4</td>
<td>15.0</td>
<td>61.3</td>
</tr>
</tbody>
</table>

**Table 3** Differences between 'expected' and actual data (Residuals)

<table>
<thead>
<tr>
<th></th>
<th>Priority Group 1</th>
<th>Priority Group 2</th>
<th>Priority Group 3</th>
<th>Priority Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women’s costume</td>
<td>-20.0</td>
<td>+10.9</td>
<td>+25.8</td>
<td>-16.7</td>
</tr>
<tr>
<td>Men’s costume</td>
<td>-2.2</td>
<td>+0.8</td>
<td>+15.8</td>
<td>-17.2</td>
</tr>
<tr>
<td>Accessories</td>
<td>-7.0</td>
<td>+33.7</td>
<td>-24.3</td>
<td>+64.0</td>
</tr>
<tr>
<td>Children’s costume</td>
<td>-9.6</td>
<td>+21.1</td>
<td>-7.9</td>
<td>-19.4</td>
</tr>
<tr>
<td>Theatrical costume</td>
<td>+14.0</td>
<td>+18.2</td>
<td>-16.4</td>
<td>-15.7</td>
</tr>
<tr>
<td>Domestic &amp; Misc.</td>
<td>-5.2</td>
<td>-11.0</td>
<td>+30.2</td>
<td>-14.0</td>
</tr>
<tr>
<td>Dolls</td>
<td>-16.3</td>
<td>-1.3</td>
<td>-7.4</td>
<td>-18.3</td>
</tr>
</tbody>
</table>

**Table 4** Contribution to overall chi-squared statistic

<table>
<thead>
<tr>
<th></th>
<th>Priority Group 1</th>
<th>Priority Group 2</th>
<th>Priority Group 3</th>
<th>Priority Group 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women’s costume</td>
<td>6.25</td>
<td>0.61</td>
<td>1.90</td>
<td>1.90</td>
</tr>
<tr>
<td>Men’s costume</td>
<td>0.22</td>
<td>0.01</td>
<td>2.05</td>
<td>5.50</td>
</tr>
<tr>
<td>Accessories</td>
<td>0.84</td>
<td>0.39</td>
<td>1.86</td>
<td>10.00</td>
</tr>
<tr>
<td>Children’s costume</td>
<td>8.31</td>
<td>9.72</td>
<td>0.70</td>
<td>10.63</td>
</tr>
<tr>
<td>Theatrical costume</td>
<td>17.80</td>
<td>9.00</td>
<td>4.45</td>
<td>9.23</td>
</tr>
<tr>
<td>Domestic &amp; Misc.</td>
<td>1.17</td>
<td>1.70</td>
<td>7.19</td>
<td>3.5</td>
</tr>
<tr>
<td>Dolls</td>
<td>45.0</td>
<td>0.65</td>
<td>0.50</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Note: Highly significant (over 10)
Significant
### Appendix 5.4: Examples of output from 'Works™'

#### DATA AS INPUT

<table>
<thead>
<tr>
<th>sub-coll</th>
<th>location</th>
<th>count</th>
<th>acc no name</th>
<th>waters</th>
<th>comments</th>
<th>remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>toys</td>
<td>24t-sh3-rhs</td>
<td>12</td>
<td>87.171/7 cash register</td>
<td>steep; pain; pl</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh5-rhs</td>
<td>10</td>
<td>as yo yo</td>
<td>steep; string;</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh5-rhs</td>
<td>6</td>
<td>85.131</td>
<td>glass; card; in appl</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh7-mid</td>
<td>36</td>
<td>A.23500</td>
<td>leat</td>
<td>ball</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh7-mid</td>
<td>10</td>
<td>82.218/6</td>
<td>cube</td>
<td>stop; pain</td>
<td>2</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh7-mid</td>
<td>1</td>
<td>80.496/33</td>
<td>bead</td>
<td>glas</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh7-mid</td>
<td>1</td>
<td>A.19901</td>
<td>ball holder</td>
<td>ivor</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh8-r-ba</td>
<td>10</td>
<td>10835</td>
<td>ball</td>
<td>wood</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh3</td>
<td>49</td>
<td>85.326/5</td>
<td>john bull</td>
<td>pri; card; wood</td>
<td>me</td>
</tr>
<tr>
<td>games</td>
<td>24t-sh3</td>
<td>85.324/12</td>
<td>game, wembley</td>
<td>plas; paper</td>
<td>ca</td>
<td>2</td>
</tr>
<tr>
<td>games</td>
<td>24t-sh3</td>
<td>81/486/25</td>
<td>game, twist</td>
<td>plas; card</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh3</td>
<td>84.375/6</td>
<td>kingfish</td>
<td>felt; plas</td>
<td>ca</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh3</td>
<td>84.413/8</td>
<td>basket weaving</td>
<td>card</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh3</td>
<td>84.447/10</td>
<td>citadel</td>
<td>card; plas; pa</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>toys</td>
<td>24t-sh3</td>
<td>84.447/6</td>
<td>citadel giant</td>
<td>card; plas; pa</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>dolls</td>
<td>box on floor</td>
<td>12</td>
<td>no doll</td>
<td>text; cera; me</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>orange</td>
<td>17</td>
<td>72.4/17</td>
<td>toy piano</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>toys</td>
<td>top of couch</td>
<td>6</td>
<td>82.117</td>
<td>model</td>
<td>gallow</td>
<td>wood; meta; gi</td>
</tr>
<tr>
<td>models</td>
<td>mod5-sh2-t/</td>
<td>10</td>
<td>22</td>
<td>no 2 horses</td>
<td>wood; pain</td>
<td>4</td>
</tr>
<tr>
<td>models</td>
<td>mod5-sh2-t/</td>
<td>5</td>
<td>no carr.</td>
<td>+ people</td>
<td>wood; pain</td>
<td>4</td>
</tr>
<tr>
<td>models</td>
<td>mod5-sh2-t/</td>
<td>1</td>
<td>7995/167</td>
<td>horse</td>
<td>card; wood; pai; fe</td>
<td>2</td>
</tr>
<tr>
<td>models</td>
<td>mod5-sh2-t/</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>models</td>
<td>mod5-sh2-t/</td>
<td>1</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>models</td>
<td>mod5-sh2-t/</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Locations in survey: Locations with surveyed objects: Objects sampled: Total objects in surveyed locations:

| 20 | 19 | 60 | #1 | #1 |
# Chapter 5: The data. Appendix 5.4.2

File: & | Sort: location, cond | Query all | Report: 2. list by locatn | 22/4/92

<table>
<thead>
<tr>
<th>Location</th>
<th>Sub-coll</th>
<th>Acc no.</th>
<th>Name</th>
<th>Cond.</th>
<th>Ma Mi Su Bi Ch Di O1 Ac Work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample from this location: 2</th>
<th>Total objects: 10</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>nn modi servi</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>1 0 1 0 0 0 0 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:1 c3:0 c4:0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>1 Total objects: 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>nn horse + ca</th>
<th>2</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>1 1 1 0 1 0 1 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:1 c3:0 c4:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>2 Total objects: 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>nn horse on w</th>
<th>4</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>1 1 1 0 1 0 1 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:1 c3:0 c4:1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>1 Total objects: 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>nn carriage</th>
<th>3</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>0 0 0 1 0 0 0 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:0 c3:1 c4:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>1 Total objects: 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>69.14 toy tram</th>
<th>2</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>0 0 0 0 0 0 1 0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:1 c3:0 c4:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>1 Total objects: 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>72.4/17 toy piano</th>
<th>2</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>0 0 1 0 0 0 0 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:1 c3:0 c4:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>1 Total objects: 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>location</th>
<th>models</th>
<th>82.117 model gall</th>
<th>2</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals for damage:</td>
<td>0 1 0 0 0 1 0 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals for condition:</td>
<td>C1:0 c2:1 c3:0 c4:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample from this location:</td>
<td>1 Total objects: 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Statistics on numbers of objects per location:

<table>
<thead>
<tr>
<th>Total samp:</th>
<th>60 objects; 471 in all locations in survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locations sampled:</td>
<td>19 from 20 in survey</td>
</tr>
<tr>
<td>Max objs/loc:</td>
<td>108 Min: 3</td>
</tr>
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<td>Standard deviation for number of objects per location:</td>
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### TABLE OF CONDITION GRADES BY DAMAGE TYPES

Counts and row per cents.

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Totals: 7 9 11 0 4 3 1 22 60

Number in condition grades: C1 C2 C3 C4
Per cent.: 48.3% 36.7% 6.7% 8.3%
Locs. sampled: 19
Locs. with too few objects: 1

Number of objects examined: 60
Tot. objects in all locs. in survey: 471

Average objects per location: 23.55
Maximum num. objects per location: 108
Minimum num. objects per location: 3
SD for counts of objects / location: 27.462
### Chapter 5: The data

**Appendix 5.4.4**

File: TOYSDAT.WDB | Sort: sub-col | Query: all | Report: 5. sub-collec stats | Z:\

### Statistics by Sub-Collection

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Chapter 6

Decisions and priorities

A major tool used in this research - systems analysis - has been explored and applied in Chapter 4. But a wealth of other information based techniques has been developed in management studies and science which could be applied to the management of conservation. Help is needed particularly in choosing between what can be a bewildering range of options. How do we prioritise and choose between the actions we could take? Is creating the right climatic environment more important for the survival of the collections than their physical safety? When funds are limited, should they be spent on conservation treatment, or on remounting objects for storage? What is the most cost-effective option? These are some of the conflicting priorities that conservators and museum managers have to choose between almost every week.

This chapter explores the range of techniques that exist in other areas of management that could improve the quality of decision making in conservation, by giving it a more rational basis. Out of a multitude of possible methods, a few are selected that meet the criteria of being easily understood by the professionals, mostly not very numerate, in museums and of being applicable to conservation problems.

6.1 THE DECISION AREAS AND THE METHODS

6.1.1 The field of choice

The classic dilemma in conservation is whether resources of time and money should be put into remedial conservation treatment, or into environmental control and first aid or improved storage methods.

Much depends on the nature of the objects and on the problem. For example, an extremely important and valuable object which required conservation would probably receive it even at the expense of hundreds of others which needed mounting or other first aid. Flood damaged objects would be top priority for treatment, because they will be highly unstable and liable to further deterioration.
Chapter 6: Decisions and priorities

unless worked on. There are many cases where a decision is not so clear cut, however. Other areas of choice are between different methods of achieving environmental control, for instance, mechanical air handling vs. "passive" control methods such as silica gel; in assessing the effectiveness of alternative treatments; and in choosing courses of action for long term strategies.

Farbey, Land and Targett (1992) have introduced the idea of a 'ladder of choice' in such circumstances, leading from what the institution must do because of commercial or other pressure, to the highest rungs which potentially bring the greatest benefits but also the greatest risk of failure. Their model has been developed in the context of strategy for information technology development in a company, but it has general applications. On the lower rungs of the ladder the institution has little choice. These are things it must do because its competitors provide a similar service or product, and thus this is expected by customers. On the higher rungs the measures are optional, and while the benefits may be much greater, because the organisation will be offering something distinctively different, the risks are also much greater, because it may turn out to be irrelevant.

Museums are not like commercial companies, in that it is exogenous factors, external to the organisation, that most determine their continuing existence. In commercial companies, the weight is more towards factors under the organisation's internal control. There are very few things that a museum must do in order to survive, so especially in the context of conservation, the lowest rungs hardly exist, since there are only sporadic pressures (from the National Audit Office and from peer opinion) on institutions to care for their collections. Performance in areas such as visitor numbers is more likely to determine whether the institution survives or not, but the major influence is probably the state of the local authority's finances. In the absence of commercial pressures in the real world of national and local authority museums, the director's personal commitment to professionalism is more likely to determine priorities than any perception of strategic advantage. The Museums and Galleries Commission is seeking to spread this commitment in its registration scheme, in which museums must meet certain standards, including those for care of collections (Museums and Galleries Commission, 1988). This pressure, however, only exists in the context of a weltanschauung where public service provision is a necessary good, and museums are provided as part of this. In a different world view, if only the minimum essential services are to be provided publicly, then the existence of permanent public collections becomes a net liability, not an asset.
Chapter 6: Decisions and priorities

However, if for an institution the lowest rungs do exist, then planning collections preservation can be seen as a 'ladder', leading from providing suitable storage, to having remedial conservation undertaken on contract, through investment in conservation research in the hope of better treatments, up to providing full environmental control and setting up 'centre of excellence' conservation facilities. Both the latter involve substantial investment and institutional disruption and change for benefits that will be quantifiable, if at all, only decades into the future. Examples of the highest rung, where the institution hopes to gain competitive advantage, are to be found in the recent plans by the National Maritime Museum and the National Museums on Merseyside, to construct top-flight collections care facilities with substantial elements of public access to the conservation process.

6.1.2 Available methods

Many logically and numerically based aids to decision making are included under the general heading of Operational Research or Management Science (OR/MS). General reviews such as those by Jackson and Keys (eds., 1987), Wyatt (1989), and Rosenhead (ed., 1989) point to possibly useful directions through the mass of literature on scientific methods to aid problem solving. Keys (1987) describes how the view of operational research has changed over the years since its first development in the second World War, to one where, as "the number of well-defined but unsolved problems declined", general limitations are recognised in its applicability to new problems, especially social ones. Keys (1987, 9) cites writers including Ackoff (1978), Checkland (1981) and Beer (1985), who have questioned the value of the reductionist, mechanistic view of life that it exemplifies. They also cite Friend and Jessop, who have emphasised the existence of different uncertainties in complex organisations such as local government (Keys, 1987, 16). Keys concludes (1987, 21) that management science remains an extremely useful tool, as long as these limitations are recognised: the presence of multiple views when defining the problem; the difficulties posed by the existence of many problems in highly complex systems; and the conservatism of the OR/MS approach, that is, the set of social, economic and political relationships of which OR/MS is a part. However, some well-known examples of the failure of classical OR/MS are cited by Stern (1976) (the Roskill Commission report on the site of London's third airport), and Bignell and Fortune (1984) (e.g. the accident at the Three Mile Island nuclear power station).
Rosenhead (1989) describes six methods which constitute "a new general direction for OR". Among these are soft systems methodology, strategic choice, and robustness analysis. Wyat (1989) examines a large number of numerically based planning techniques such as multivariate analysis, inferential statistics, goal hierarchies and goal planning (including multi-objective, multi-criteria techniques); optimisation, forecasting, and numerous others. Multi-objective, multi-criteria approaches have been developed by Saati (Saati and Vargas, 1991). Land describes a similar concept as it could be applied to the choice of information technology system (1976). The application of these techniques is explored below.

Apart from the general tools of scientific management, more specialised approaches may be of use. Risk management is one, the principles of which are summarised in Crockford (1986). Many texts on risk management focus on financial risk, in insurance or in currency dealing, but Crockford discusses the general principles of reducing risk as well as the financial consequences.

The main principles of cost-benefit analysis are accessibly reviewed by Walshe and Daffern (1990). Simpler approaches, cost-effectiveness analysis and pay-back period, are probably more relevant. In its more sophisticated forms, cost-benefit analysis necessitates the assignment of numerical measures to complex social and environmental benefits and disbenefits (described by many authors, such as Dasgupta and Pearce, 1972). This brings the risk eloquently described by Stern (1976): quantifying what are at heart matters of opinion will vary according to the viewpoint of each person consulted, and hence offers the considerable temptation to decision makers to weight the numbers in the equations towards their own preference - and to indulge in Sophistical Obfuscation of Self-Interest and Prejudice - "SOSIPing", as he labels it:

"... it is not so much that the experts prove or disprove something, but that, as a glance at the Roskill Commission's Report shows, they can make any proposition, no matter how simple, impenetrably complex and incomprehensible."

As in the health service, another difficult area, it is difficult to place values on the improved 'health' and longer 'life' of an object. On the other hand, Land (1976, 290) points out that more straightforward approaches can also distort, by ignoring many benefits that do not carry direct costs or savings.
6.1.3 Models for strategic planning

There are almost as many different approaches to strategic management as there are writers on the subject. Bowman and Asch (1987, Ch. 14 and Table 14.2) review these, and distinguish eight main views. They place these on a scale from 'deliberate' at one end (analytical, objectives consciously set) to 'emergent' (incremental, not analytically worked out) at the other. There is, they say, no one 'correct' method of strategic planning, although they incline to the more incremental processes; they propose applying contingency analysis to ensure that the most appropriate model is in use (discussed below, Section 6.3.3, Strategic planning).

A typical 'deliberate' model for strategic planning in business is summarised by Bowman (1990). A similar approach is more fully expounded by, e.g., Johnson and Scholes (1988). The emergent development of strategy is favourably reviewed by Ciborra (1992): although he discusses this in the context of information systems development, his conclusions appear to be generally applicable. Earl, researching particularly into information strategies, found that highly emergent, unplanned information technology developments, arising directly from operational needs, were the most likely to be implemented and used (Earl, 1990); he develops this into a call for information technology to be seen as any other operational tool, not an end in itself (Earl, 1992).

The techniques of robustness analysis and of strategic choice analysis (Rosenhead, 1989), discussed below, are also designed to assist in strategic planning.

6.2 ANALYSIS AND ASSESSMENT

In the conservation literature, attempts to apply scientific management principles are rare. As in environmental and health care decision making, there is the central problem of how to quantify the benefits of better preserved objects and the costs of deteriorated ones.

In selecting techniques, the overriding need is for the users (museum directors, managers, and conservators) to understand them, so that they can judge for themselves whether any assumptions are correct and so that they have sufficient confidence in the technique to use the results in taking decisions. The criteria used
Chapter 6: Decisions and priorities

by Wyat (1989) are: Is it "salient", concentrating on key features? Is it "smart", forging creative connections between notions? Is it "sympathetic", able to empathise with different people's points of view? Museum and conservation managers are not sophisticated users of the techniques of scientific management. For "sympathetic", we must in this context read "simple", which may be no bad thing.

6.2.1 "Probability of conservation" and "valuation of the cultural heritage"

Benarie, editor of the European Cultural Heritage Newsletter, occasionally explores these areas (Benarie, 1987 and 1989). In the first reference, Benarie discusses the "probability of conservation of cultural heritage", applying the principles of risk management from industrial engineering. Failure mode and effect analysis consists of: identification of the system components; definition of the 'failure modes', i.e. the way(s) in which the part could break; modelling the behaviour, often by a so-called event tree. Failure mode probabilities can be computed from the event tree. Benarie constructs an event tree from the factors leading to the preservation of an object:

Factors at its origin: its value at the time it was made; its bulk; the durability of its substance;

Owner or collector: the richer and more powerful, the more likely the object's survival;

Liability to looting, pilferage or destruction: intrinsic value; controversiality; geopolitical factors;

Fluctuations in taste;

Time.

Although it is interesting to analyse the survival of objects, or of types of object, using these factors, they are more helpful in explaining the past than in influencing the future. Being exogenous factors, outside the control of any institution, we are not likely to be able to affect any of them.

In Benarie's second article, he reflects on the valuation of the cultural heritage (Benarie, 1989). The value of an article follows "a 'catenary' curve, as in a freely hanging rope" (Fig. 6.1). When new, the value of an object is high. As it
gradually goes out of fashion and suffers damage, its value falls. In course of time, it becomes rare and acquires scarcity value, and so its monetary value rises again, Benarie suggests, to something near its original value. Benarie proposes formulae for calculating the amount of damage suffered, the expected half-life for an object and for a population of such objects, and the rise in price as a class of object becomes scarce.

Benarie's curves reflect monetary value, and there will be many different curves according to taste in the commercial world of owners and dealers. Changing taste, reflected in a varying purpose or 'mission', will also affect the perceived value of an object to a museum, perhaps to the point at which it is disposed of and becomes vulnerable to exogenous factors, but this is likely to be a much slower process. The 'value' of an object to a museum will be derived from its intrinsic historic relevance to the collections.

This concept could assist in quantifying the benefits of preservation actions. Preventive action will as always be even more effective than remedy in preserving value. If the object is prevented from suffering as much damage as might be expected, then it might be expected that the bottom of the value curve may
Chapter 6: Decisions and priorities

be truncated, and the eventual value of an object both rare and well-preserved will be the greater. However, antique dealers clearly find radical restoration to be effective in raising the value of an historic object.\footnote{For example, in a visit to the conservation courses at West Dean College, my guide was at pains to point out the courses were directed to the needs of dealers and the private sector, and hence the emphasis was on craft skills needed for restoration to return the object to an earlier appearance.}

6.2.2 Risk analysis

The principles of risk management are summarised by Crockford (1986). In order to control and reduce the risk to resources, we must understand the types of risk and the relationship between their severity and their natural frequency; systematically identify the sources of risk and measure it; take decisions on how to handle risk; develop systems of loss control; and finally plan how to recover from large-scale loss should it occur.

*The components of risks to collections*

Risk is seen as being made up of four components:

*Threats*, the forces which could cause loss;

*Resources* - what is at risk (in our case, historic objects and collections);

*Modifying factors*, which reduce the probability or the severity of the consequences of risk;

*The consequences* if the threat materialises: the effect of the loss on the operations of the organisation.

Michalski (1990) ignores exogenous factors, but sets out the causes of deterioration internal to the institution (the threats) and categorises the range of conservation responses (the modifying factors) using the principles of fire prevention theory. Threats he identifies as: physical forces, criminals, fire, water, pests, contaminants, radiation (light), incorrect temperature, incorrect relative humidity. These can be condensed into:

*Physical forces,*

Threats from people,

Threats from an *inappropriate environment,*

Threats from *disaster.*
Michalski analyses conservation responses in detail as a series of stages, as in fire prevention and control, "prevent, detect, contain, control, recover".

**Risk: severity and frequency**

There is a relationship between the severity of risk and the likelihood that loss will occur (Fig. 6.2). This analysis has obvious application to the deterioration of objects or collections (Table 6.1). A disaster such as a major fire will be catastrophic, rare, and difficult to predict, while each occurrence of damage due to a poor environment will be almost undetectable, but frequent and highly predictable. Yet a probability can be calculated even for rare, catastrophic loss. For example, there have been three disastrous fires in historic properties in the U.K. in recent years, Uppark, Hampton Court, and Windsor Castle. The probability that another will occur in a particular year and house, while small, is finite and could be calculated. It can be reduced by such measures as heat and smoke detectors, frequent patrols, strict control over the use of hot working methods and smoking by contractors, etc..

![Fig. 6.2. Loss analysed by frequency, severity and predictability.](image)

**Loss control**

*Loss control* is already familiar in museums as "preventive conservation": the holistic analysis and prevention of causes of deterioration of collections and objects, from environmental control to disaster recovery planning.
Table 6.1. Some threats to collections analysed by frequency, severity and predictability

<table>
<thead>
<tr>
<th>Threat</th>
<th>Frequency</th>
<th>Severity</th>
<th>Predictability</th>
</tr>
</thead>
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<tr>
<td>Unsuitable environment</td>
<td>Very high</td>
<td>Very low</td>
<td>Very high</td>
</tr>
<tr>
<td>Rough handling</td>
<td>High</td>
<td>Low</td>
<td>Reasonable over one year</td>
</tr>
<tr>
<td>Water services leak</td>
<td>Low</td>
<td>Medium</td>
<td>Reasonable over ten years</td>
</tr>
<tr>
<td>Major disaster (other than above!)</td>
<td>Very low</td>
<td>High</td>
<td>Minimal</td>
</tr>
</tbody>
</table>

In this we seem, although not perfect, to be somewhat ahead of our commercial counterparts, since Crockford (1986, Ch. 10) laments the compartmentalisation of loss control here into rigid specialisms: security, health and safety, data protection, etc. We can, however, accept the message that storage and conservation, and indeed security, are points on a continuum, not separate functions, where loss control is concerned. Table 6.1 is really multi-dimensional. The example shows a generalised analysis of some familiar threats to collections. In statistical analysis of complex problems such as those posed by collections, the average can often be less important than the distribution and the outliers - the extreme cases. In this example, some types of object will be much more vulnerable to some threats than to others (e.g., an unsuitable environment could be catastrophic for unstable glass) so such a table could be compiled for each specific collection, and perhaps for each different store. The shapes of the distribution curves for each column would differ according to the type of collection, and could be an aid to strategic planning.

The consequences of loss

When the consequences of loss are mainly financial, a business is likely itself to cover the small, predictable losses that present no threat to stability, but to insure against unpredictable but catastrophic loss: i.e., transfer the risk to another organisation (the insurance company) in exchange for a small, certain loss (the premium) (Crockford, Ch.8). When museum collections are involved, the risk (of serious loss of a collection or a valuable object) is not primarily financial (although
monetary value may enter into it), and so it cannot be passed on except by transferring the ownership of the resource. The institution has no choice but to take steps to reduce the risk. The costs and benefits of various actions are not easily calculated. The calculation of "loss" as it applies to collections and objects is further discussed below (6.2.4); the effect of the loss on the institution's operation could also usefully be considered. Apart from the effect on its ability to achieve its "mission" through exhibitions and collections available for research, it needs to bear in mind the possible damage to its reputation, and consequent effects on funding, either from a disaster that could have been avoided or through the discovery that collections have deteriorated through neglect.

**Decisions on risk**

The analytical approach described above will help to understand the risks to collections and their control. Priority for actions and funding will need to be allocated to risks which combine severity and probability. This may involve tightening up procedures rather than making costly investments. For example, contractors working on site always bring about a sharp increase in risk (for example, the Uppark fire was a consequence of contractors' work practices). Floods have been caused by roof drainage being blocked by contractors' lunchtime sandwich wrappers. The Uppark fire was caused by contractors hot-working lead on the roof. Damage to objects from handling can almost always be reduced through issuing instructions and training staff.

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**Table 6.2. Threats to collections and costs of prevention**

<table>
<thead>
<tr>
<th>Threat</th>
<th>Frequency</th>
<th>Severity</th>
<th>Predictability</th>
<th>Cost of prevention</th>
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</thead>
<tbody>
<tr>
<td>Environmental</td>
<td>Very high</td>
<td>Very low</td>
<td>Very high</td>
<td>Low if better controls; minimal equipment needed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High if building unsuitable</td>
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<tr>
<td>Theft, vandals</td>
<td>Medium</td>
<td>Medium</td>
<td>Reasonable</td>
<td>Normally low</td>
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<tr>
<td>Handling</td>
<td>High</td>
<td>Low</td>
<td>Reasonable</td>
<td>Nil - procedures only</td>
</tr>
<tr>
<td>Services leak</td>
<td>Low</td>
<td>Medium</td>
<td>Reasonable</td>
<td>Low at design stage</td>
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<td></td>
<td></td>
<td></td>
<td>Very high later</td>
</tr>
<tr>
<td>Disaster</td>
<td>Very low</td>
<td>High</td>
<td>Minimal</td>
<td>Can be high</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Normally lower at design stage</td>
</tr>
</tbody>
</table>
When it comes to choosing between disaster control measures (fire detection and control; intruder alarms) and environmental improvements, a judgment will have to be made on which threat should be addressed first. However, it is likely that the institution will eventually have to take most of the measures it identifies, and that prioritisation will be mainly a matter of spreading the expense over time. Really serious risks arising from environmental conditions are likely to require radical solutions, such as moving to a completely different storage building. Simply identifying risks and the costs of preventing them, and placing them in ordered lists, is likely to be a powerful aid to decision making.

Finally, many or even most threats to collections can be reduced by good management: planning to avoid them at the design and briefing stage, which will minimise costs. It may, for example, be more effective to divide stores into smaller fireproof enclosures, which will contain the threat of fire, rather than to install expensive sprinklers, which themselves constitute a risk should they discharge by mistake. Services should never be designed to run through stores. Stores should not be situated below the water table, or near a source of flooding. Exhibitions can be designed to minimise the threats to objects.

6.2.3 Cost-benefit, or cost-effectiveness, analysis

The most straightforward application of this technique, although all too infrequently adopted in museum applications, is that exemplified by Ayres et al (1989) in their analysis of the energy requirements of narrow vs. wide parameters for temperature and relative humidity, in different climatic zones. It was not in their remit to cost alternatives to air handling plant, such as energy-conserving and climatically stable building designs, for instance using the principles of thermal mass (Stehkaemper, 1973, referenced in Jones, 1991), but such an approach is becoming more acceptable as energy efficiency assumes a greater importance. On the whole, it is not that the technology does not exist: indeed, it has been used for centuries: but that architects, consultants and engineers are familiar only with mechanical environmental control.

Staniforth (1990 (1)) has made the only attempt so far to compare the estimated costs of remedial conservation treatment to those of installing environmental control equipment. She uses as examples for her model typical (albeit approximate) costs incurred in National Trust houses. Modifying a heating
system, light control measures, and purchasing monitoring equipment would cost in the region of £50,000. Staniforth 'guesstimates' that even these simple control measures can double the time between conservation treatments, from 50 to 100 years. Remedial conservation costs for a typical National Trust house could fall from £10,000 to £5,000, and so the environmental control measures could pay for themselves in ten years. Because the National Trust uses mainly private conservators, treatment costs are more apparent than for many museums. Added to this would be the benefits of the greater monetary value of the better preserved objects, as well as the difficult-to-quantify benefits of their greater 'historic integrity'.

6.2.4 Quantifying preservation

The costs of environmental control will never be nil, since it implies the modification of the ambient humidity, temperature and air quality. The more the environment has to be modified, the greater the costs are likely to be, both of initial investment and of running costs. In exhibitions, the costs may include less than ideal conditions in which to view the object. To provide proper information for decisions, we need a way to directly relate environmental conditions to the deterioration of objects.

Environment and deterioration: cause and effect

Although there is overwhelming international emphasis on the importance of creating a suitable environment for the preservation of objects, little attention has been paid to the quantification of the actual effects of climatic conditions on the deterioration of different materials. Michalski (1990(1)) claims that the existence of standards stifles debate on and research into these fundamental matters: for instance, does the law of diminishing returns operate, and at what point? What are the benefits of nearly or more or less or usually attaining standards, which may be far, far less expensive than attaining them completely for 100 per cent. of the time? Could the concepts of "fuzzy logic", which time does not permit to be explored here, help us with this? (Zadeh, 1973).

Measuring environmental "threat"

Some studies which quantify the relationship of adverse environmental factors and damage to objects are listed in Table 6.3. Early work was largely on the
Table 6.3. Published work including empirical measurement or modelling of the effects of environmental factors on objects.

<table>
<thead>
<tr>
<th>Object type or material</th>
<th>Environmental factor</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Textile fibres</td>
<td>Light</td>
<td>Stromberg, 1950</td>
</tr>
<tr>
<td>Paper</td>
<td>Light</td>
<td>Harrison, 1953</td>
</tr>
<tr>
<td>Natural dyes</td>
<td>Light</td>
<td>Cox Crews, 1986</td>
</tr>
<tr>
<td>Artists' colourants</td>
<td>Pollutants (nitrogen dioxide)</td>
<td>Whitmore + Cass, 1989</td>
</tr>
<tr>
<td>High volumes of wood or other</td>
<td>relative humidity</td>
<td>Padfield + Jensen, 1990</td>
</tr>
<tr>
<td>organic material (e.g. libraries</td>
<td>relative humidity</td>
<td></td>
</tr>
<tr>
<td>or furniture stores)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paintings on canvas</td>
<td>Temperature + relative humidity</td>
<td>Mecklenberg + Tumosa, 1991</td>
</tr>
<tr>
<td>Archaeological iron</td>
<td>relative humidity: desiccated storage</td>
<td>Keene, forthcoming (1)</td>
</tr>
</tbody>
</table>

Both calculated the relationship between strength loss of materials and exposure to light (lux-hours and wavelength).

The effects on objects of relative humidity and particularly temperature have received little attention until recently. However, in the Conservation Analytical Laboratory of the Smithsonian Institution a materials testing programme has been under way in recent years to develop a database of the mechanical properties of artists' materials such as paint, canvas, and grounds (Mecklenburg and Tumosa, 1991 (1), (2)). Some of the results will be applicable to other types of object made of comparable materials. Mechanical properties include strength, stiffness or flexibility, and elastic or plastic properties: i.e. the nature of the material's response to forces. The combination of its physical and mechanical properties will condition the material's response to changes in environmental factors such as temperature and relative humidity, and to physical forces such as those involved in transporting or moving an object. Response will vary from the delamination of layered structures, such as painted surfaces; cracking; distortion; and many other effects which are the familiar signs of deterioration.
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Except by Padfield and Jensen (1990), who have modelled the actual changes undergone by the surface of wood during variations in humidity, these research results have not yet been brought together with the costs of environmental control to make a quantified assessment of the benefits to be gained from different options. Benefits will be specific to each type of material or object: for example, Mecklenberg's work is on paintings on canvas, and the results can be extended to many types of social history object with paint films on flexible supports, but they will not apply to objects mainly of metal.

Measuring "losses": the deterioration of objects

The collections condition audit methodology described in Section 5.5, Data on collections condition, above, developed some terms for accurately and consistently describing condition.

In a way, we need a concept like that being developed for cost-benefit analysis in health care: "quality-adjusted life years", or QUALYs, though this concept too is plagued with shortcomings (Walshe and Daffern, 1990). QUALYS are an attempt to quantify the quality of life as well as how long a person lives. For example, for someone with severe rhumatoid arthritis each year lived might only be worth .25 of a QUALY. Standard QUALYS for different medical conditions have been developed by interviewing numbers of people. By using them, the benefits of an operation or course of treatment can be assessed against its calculated costs (McGuire et al, 1988). It would be difficult to apply this concept to objects, because unlike people they have an explicitly acknowledged value, cultural or monetary. This will have a greater bearing on whether they are treated or not than will the outcome of the treatment. For example, famous works of art damaged in attacks will always be treated, even if they have to be heavily restored, though this might well result in a low 'QUALY' score. Interestingly, the present public may well be satisfied, but one can envisage future publics recognising the low QUALY rating of an object and rejecting it. QUALYS for objects would obviously relate to historic integrity, although physical integrity may be a part of this.

A further difficulty in measuring treatment success is that, unlike people, we cannot say when an object is "dead" (unless we specifically define "death": Keene, forthcoming (1)), so even the simple measure of life expectancy is denied us.
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**Management without assessment of effectiveness**

In the absence of the rigorous assessment of different options, theoretical studies, undertaken using samples of new materials rather than the much more complex chemical and physical systems that real, aged objects represent, are translated straight into practice, and become 'received wisdom'. This is what happened in the adoption of storage standards set for archaeological iron objects. As part of Turgoose's work on the chemical processes causing partly mineralised iron objects to deteriorate afresh, he pointed out that relative humidities lower than 18% would prevent the most deliquescent of the minerals normally involved, iron β-hydroxide, from deliquescing (Turgoose, 1982). A standard was therefore set that archaeological iron be stored at 15% r.h. or lower. It is now the general practice in many countries to store this material in sealable boxes with desiccated silica gel. In 1991, however, the author employed a simple statistical technique used to evaluate the benefits of medical treatment, survival probability (Mould, 1981), to construct "Life Tables". These enabled the comparison of the actual state of preservation of iron objects stored at ambient, fluctuating humidity with that of those stored in desiccated conditions (20% or less relative humidity, using the best practicable technology) and found no difference in the preservation of the two groups (Keene, forthcoming (1)). Contrary to prevailing professional belief, observations of that sample of objects led to the conclusion that it had been far more effective to treat them than to store them in desiccated conditions. Although many more samples from different laboratories need to be assessed to confirm these results, they certainly point up the need for assessment before new treatment techniques are widely adopted as effective.

**A general theory?**

It is not clear whether we will ever be able to draw on a better understanding of environmental cause-and-effect to specify general ways of measuring cost-effectiveness. This would normally be through generally accepted standards, but those in current use are a contributing cause of the uncritical blanket imposition of parameters which may give rise to unnecessary costs. It may always be that the solution is particular to the specific material, collection type and institution. What is certain is that more systematic work should be undertaken to measure the effectiveness of treatment or of environmental control.
Fig. 6.3. A prioritised goal hierarchy for "well-being of historic collections"
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6.3 PLANNING AND STRATEGY

6.3.1 Goal hierarchies

There are a number of variants on numerical methods applied to planning. One of the most commonly cited is that developed by Saati (Saati and Vargas, 1991). The possible weakness of the technique as expounded by Saati is the extremely complex statistical formulae that it employs. Only an expert statistician could evaluate the results with any confidence. The technique therefore lends itself to SOSIPing (Statistical Obfuscation of Self-Interest and Prejudice: Stern, 1976, explained above, 6.1.2). A more straightforward precursor to Saati's method is the concept of goal hierarchies (explained in Wyat, 1989, 67-78). This technique focuses on highlighting the essentials of unclear situations: the connections between concepts, rather than the concepts themselves, which can be too debatable or vague.

An example of one possible goal hierarchy for the summary concept "well-being of historic collections" is set out in Fig. 6.3 (previous page). There is no single, or "correct" hierarchy: this version has been produced in order to assess the technique. Drawing up a goal hierarchy is not difficult. It can usefully be done by a group, in which case it will develop understanding of the choices available and a consensus on desirable actions.

Fig. 6.4. Fragment of goal hierarchy for the well being of historic collections
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Having set a general goal, the next step is to identify what would be needed in order to achieve it, then the second-level factors, and so on. Only four levels are shown in the example (Fig. 6.3), but one can sub-divide further, as in Fig. 6.4. By the time one gets to the bottom level, the elements of a practical plan are appearing. However, throughout the hierarchy it is desirable to use goals that are as abstract as possible, since this facilitates lateral thinking. The example in Fig. 6.3 descends to practicalities too near the top, but it shows the sort of thing that is intended.

Although a goal hierarchy can facilitate the development of a plan, it is still no help in prioritising what should be done. To assist with this, the relative importance of each goal at each level can be denoted by a weighting figure (Wyat, 1989, 74-78). The weightings for the sub-goals of each goal must add up to 1. Fig. 6.3 shows the weights assigned in the trial exercise; Fig. 6.5 shows a fragment of a weighted hierarchy.

The total contribution of each sub-goal to the central goal can be calculated. For example, the overall weighting of "Individually protected objects" is \(0.4 \times 0.6 = 0.24\). The overall weighting of "Effective treatments" is \((0.6 \times 0.6 = 0.36)\) plus \((0.3 \times 0.4 = 0.12) = 0.48\). It occurs twice, and so its weighting is the sum of both occurrences.

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Fig. 6.5. Fragment of a weighted goal hierarchy for well-being of historic collections.
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Some of the problems with assigning weightings will be immediately apparent to any conservator reading this. No two people will agree on the weightings of different factors, and weightings may well differ for different types of collection. It will be better if weightings are the result of a group consensus. The technique will of course lend itself well to SOSIPing (Stern, 1976), so the group should not be composed only of those with an interest in a particular outcome.

6.3.2 Paired comparisons

This is a technique developed to a highly sophisticated form by Saati (Saati and Vargas, 1991). Wyat gives an example of a simple version of it (Wyat, 1989, 82-86). A list of elements contributing to the main goal is drawn up. Each element is given a 'Dominance score' against each other element, on a ten-point scale.

Key: Dominance scoring:
9 = overwhelmingly dominates
8 = greatly dominates
7 = substantially dominates
6 = clearly dominates
5 = weakly dominates
4 = weakly dominated
3 = clearly dominated
2 = substantially dominated
1 = greatly dominated
0 = overwhelmingly dominated

<table>
<thead>
<tr>
<th>Table 6.4. Paired comparisons for factors leading to &quot;well-being of historic collections&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>Safety</td>
</tr>
<tr>
<td>Environment</td>
</tr>
<tr>
<td>Conservation</td>
</tr>
<tr>
<td>Stable chem</td>
</tr>
<tr>
<td>Appearance</td>
</tr>
<tr>
<td>Historic integrity</td>
</tr>
</tbody>
</table>

Note: Σ denotes "sum"; ΣΣ is therefore the sum of the sums.
The Importance Weighting is calculated as Σ / ΣΣ: it thus represents the contribution of each factor to "well-being" as a whole.

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Applying this to conservation factors as in Table 6.4 is an interesting exercise. It seems easier to be objective in this method than in weighting a hierarchy of objectives, at least the first time one carries out the exercise. For example, most would probably agree that Appearance was greatly dominated by Environment as a contributing factor to the "well-being of historic collections"; and that sheer Physical safety substantially dominated both Conservation and Environment. The overall results in this case, the Importance Weighting, show that in the author's opinion physical safety and the stable chemistry of the object are much the most important factors. Summing is only one calculation that can be used, and Saati and Varga (1991) give more sophisticated methods.

6.3.3 Strategic planning

The data, information, and, most important, insight and understanding gained from these analytical tools has then to be turned into practical plans for what to do. Short term (operational) plans and longer term strategies need to be developed in the context of attaining the larger, longer term objectives of the organisation.

Contingency analysis is a technique of management analysis which can be used to analyse in many organisational situations in order to determine what type of action will be in the best accord with them (Handy, 1984, 9-16). It fits with the view of organisations as purposeful systems, which will respond to the environment to maintain internal stability. The situation is analysed with reference to the variables which constitute it (Figs.6.6, 6.7).

Using Bowman and Asch's Table 14.2, and placing museums as "professional bureaucracies" (Griffin, 1987; Mintzberg, 1983, Ch.10), we may predict that "unconnected" strategies will have been found in museums in the past: these -

originates in enclaves: actors loosely coupled to rest of organisation produce patterns in own actions in absence of, or in direct contradiction to, central or common intentions; strategies organisationally emergent whether or not deliberate for actors. (Bowman and Asch, 1987, 366, 370).

However, as Fig. 6.7 shows, changes in the environment and power structure of museums, arising from governments' accountability requirements and organisational restructuring, are likely to have shifted the planning style well
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Fig. 6.6. Contingency analysis of the traditional strategic planning style likely to be found in a large museum.

towards the formal end of the spectrum. Although their technical systems and inertia due to age and size are still considerations, museums are shown to be being pushed towards "planned" strategies. These -

 originate in formal plans: precise intentions exist, formulated and articulated by central leadership, backed up by formal controls to ensure surprise-free implementation in benign, controllable or predictable environment; strategies mostly deliberate (Bowman and Asch, 1987, 366, 370).

"Moonshot" strategy

Leaving aside the many approaches to strategic planning which focus on commercial factors, three similar methods appear to be useful. Ohmae (1982) recommends first, identifying key factors for success; then the [customer’s] objective functions - what is conceptually required from the product or process. Scharf (1990) describes the benefits of avoiding dwelling on the present situation - what is wrong - and starting instead with what should be. Hay and Williamson (1991) again start with the mission, building a "staircase" up to it of capabilities which must be acquired and strategies which must be undereway.

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**Fig. 6.7. Likely strategy type for a national museum in the present operating context.**

However, these approaches are of the "moonshot" type (Rosenhead, 1989, 196); their weakness is that they rely on the world state when the strategy is devised being the same a number of years later. We have also seen above, Section 3.2.2, *Excellence and quality*, that there are benefits in an analytical, planned, approach, but also the risk that flexibility and creativity will be stifled. Earl (1990) and Ciborra (1992) have found evidence from real-life, empirical research for the success of emergent strategies. There is the risk with these that the organisation takes only a short-term view, and in the absence of a long-term purpose and strategy it can simply drift, responding only to immediate needs.

Strategic planning must take account of both these hazards. Each of the analytical approaches which have been explored have their virtues: it is likely that using more than one technique to explore the future will bring the greatest benefit. What is very clear is that whatever approach is used, simply spending time to consider and plan the future will bring better understanding, purposefulness and commitment to those involved in the task. Put another way, the value of strategic planning will lie as much in promoting institutional 'learning' as in devising superior plans. The manner in which the technique is employed - by *diktat* from above or by involving staff at all levels - is more important than which method is employed.
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Strategic choice analysis

This approach is described by Friend (1989), who has worked particularly with local government planning. It combines OR techniques with concepts developed in the Tavistock Institute of Human Relations. Friend distinguishes three categories of uncertainty in selecting from different alternative actions:

- uncertainty from the working environment;
- uncertainty about values;
- uncertainty about related decision fields;

and four modes in which people work when planning strategy:

- shaping
- choosing
- designing
- comparing.

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Fig. 6.8 Working modes in strategic choice analysis

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Friend describes several techniques for use in each mode. Fig. 6.9 illustrates the application of one of them, the analysis of decision areas and links between them, in "shaping mode". The scene as a whole is not very complex. In fact, all the decision areas are linked, but by the constraint of the availability of finance; most of these actions are likely to have to be taken eventually, and the main decision is one of prioritisation rather than alternatives. This cursory investigation (Fig. 6.9) suggests that this methodology is more applicable to strategic planning for the wider system, the museum itself, where a greater variety of strategic directions offer themselves, than to the conservation sub-system. This brief description is far from doing justice to the strategic choice approach, which clearly does offer many useful tools (for instance, analysis of comparative advantage, the setting out of feasible decision schemes).

![Diagram](image)

Fig. 6.9 A set of decision areas for the preservation of collections in the Museum of London.
Robustness analysis

Robustness analysis is "a format for exploring aspects of planning problems under uncertainty, not a method for finding an answer" (Rosenhead, 1989, 215). It is applicable to situations of uncertainty, which include the operational climate in many museums today. Robustness analysis is predicated on the recognition that it is impossible for anyone to know what the future will be like; that any strategy based on a future extrapolated from the present is likely to rapidly become irrelevant; but that it is possible to imagine a range of futures, and develop plans to take account of this.

There are two important keys to uncertainty planning: first, that the existence of multiple possible futures is acknowledged; and second, that decisions (the commitment of resources to an action) are distinguished from plans, "foreshadowing of sets of decisions". Plans can be altered losing nothing but time (and perhaps credibility and commitment!); but nothing is gained from this, either.

The whole methodology is quite complex (Rosenhead, 1989, 213, Fig. 12), but the concept of robustness analysis which lies at its heart is relatively simple. A plan contains a number of stages at which decisions on different courses of action must be taken. The alternative courses of action lead to different outcomes. The desirability of each outcome will depend on which of the possible multiple futures comes to pass. Decisions, outcomes and futures can be set out diagrammatically, as in Fig. 6.10.

A notional set of possible choices for investment in collections preservation, similar to those used above in Fig. 6.9, is depicted in Fig. 6.10 (overleaf). The context is greatly simplified, so as to illustrate this technique. The imagined futures are:

(1) that "the museum" will in future receive most of its funding from government, which will therefore be able to insist on accountability for both collections preservation and access to the collections, through the National Audit Office and the Museums and Galleries Commission Standards.

(2) that government funding, and therefore pressures for accountability, will sharply diminish. Pressures to attract more visitors will increase, and access to stored collections can assist this.
Chapter 6: Decisions and priorities

In both these futures, the most desirable outcome is one in which collections which are well cared for and also stored in ways that can be made accessible to the public.

The results of the analysis can be summarised as in Table 6.5. More sophisticated analytical methods are available, but would be pointless given the nature of this exercise. Even in this greatly simplified form, the analysis prompts some extremely interesting observations.

If desirable outcomes are of most concern, rather than the avoidance of undesirable ones, then no one decision has a clear advantage, but investment in packaging (protection and support for individual objects) alone will not contribute significantly. It is assumed that packaging will prevent objects being seen, and thus rule out visible storage (this need not necessarily be the case). A decision to invest in racking would open no more desirable outcomes than other options, but carries a much higher risk of undesirable outcomes (inaccessible storage), because of the need to decide between normal and roller racking. Roller racking would make the collections easy to retrieve, and maximise cost-effectiveness in the use of storage space, but it would preclude any practical form of direct access to the stored collections. The two decisions (conservation and air conditioning) that keep open the most desirable outcomes, and minimise the risk of undesirable ones, both imply investment in the preservation of the collections themselves rather than the means of displaying or storing them. Although this conclusion seems obvious as stated, it certainly was not at the start of the exercise.

Real life is not likely to be so simple. Insight can be gained, as above, by imposing simplicity. Analysis may prompt investigation of other choices. One needs to be imaginative, and to be ready to completely change the frame of reference for decisions. In the strategic planning element of the Case Study (see below, 8.3.3), choices are not between major avenues of investment, but between stores, as candidates for a coordinated package of store-by-store improvements.

This technique clearly needs a good deal of practice before its full potential is realised. Rosenhead points out, however, that it can be simplified as much as is desirable for a particular situation as long as its key features are retained. Its striking advantage is that it is directed to clarifying the key question, "but what should we actually do?", and explores actual consequences, when most of the other techniques that have been investigated only help to understand the desirability of different actions.
Planning stages

- Decide major area for investment
- Invest in air conditioning
- Invest in new racking
- Invest in stores
- Invest in object packaging
- Invest in conservation treatment

Outcomes

- Stand-alone air con. in stores
- Upgrade air con. to main galleries
- Roller racking in stores
- Standard racking in stores
- Vacate worst stores
- Invest in new store
- Containerise all objects
- Major conservation programme

Valuation of outcomes

- Desirable
- Acceptable
- Undesirable

It is assumed that investment decisions are mutually exclusive.

Fig. 6.10. Planning investment decisions for collections preservation, in the context of multiple futures
Table 6.5. Preferred and unpreferred options left open by alternative decisions on investment in collections preservation

<table>
<thead>
<tr>
<th>Investment choice</th>
<th>Options left open</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D</td>
<td>A</td>
</tr>
<tr>
<td>Air conditioning</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Racking</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Stores</td>
<td>2*</td>
<td>0</td>
</tr>
<tr>
<td>Packaging</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Conservation</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

* Outcome accessible by two routes

6.4 CONCLUSIONS

Several different logical and numeric aids to decision making and planning have been investigated. Each of them has uses in managing the conservation of museum collections. All of them assist in clarifying the nature of the decisions to be taken. All the methods will also assist individual learning, and organisational learning if staff are widely involved, especially if the planning processes is iterative, with evaluation and review at regular intervals. Although they may subscribe to the idea of corporate learning, it can be hard for institutions to find time and circumstances conducive to this. Tools in a wider sense for assisting this include the familiar corporate planning weekend, perhaps in a hotel away from work, and the innovative "Pod" which has been set up by the London School of Economics. The Pod provides a carefully designed venue with many computerised and other aids to planning.

Cost-benefit, or cost-effectiveness, analysis is at present hampered by the lack of data on the direct relationship of the environment to deterioration. Risk analysis, goal hierarchies and paired comparisons help in identifying what is desirable, and thus in setting priorities. These are all numerically based techniques which can potentially assign numerical values to different choices. Since the initial numerical data can only be assigned subjectively, such values will always be of doubtful use. However, they were found to be an aid to analytical thinking. For
example, it is quite interesting to note that where conservation treatment has been ranked against preventive measures (goal hierarchies, Fig. 6.3; paired comparisons, Table 6.4; robustness analysis, Table 6.5) it rates more importance and a higher priority than it is presently fashionable to assign it.

The non-numerical techniques of strategic planning can help in charting ways to a desired future state. Strategic choice and robustness analysis have a place in actually deciding what action to take. Finally, the importance of applying cost-benefit principles to the choice of technique should be borne in mind. The costs of indecision are well known: planning blight can severely affect morale and land the institution in a slough of inertia.
Chapter 7

Using the information

The results and insights gained from the analysis now have to be tested in the real and increasingly pressured world of museums, and in particular that of managing conservation within a busy semi-national museum. What information is needed to manage conservation? The information must meet the three requirements set out at the start: it must be based on values; it must serve objectives; and it must be useful to the people doing the work. We are talking not just about a narrowly defined "information system" here, but about the overall requirements for information for managing the function of conservation, at all levels.

In this chapter, the proposed elements of the scheme for managing conservation are defined. They are discussed in the light of other models for management information - both those described in the museum literature and those in the general management information literature.

7.1 EXISTING MODELS FOR MANAGEMENT INFORMATION IN MUSEUMS

Allden and Ellis (1990, Dec.) attempt a comprehensive review of the parts of a system for managing in museums:

"an attempt to reduce the tissue of social, financial and professional relationships that make up a museum into six boxes, with nothing left over".

Their "boxes" are: a mission statement; a corporate plan; a series of operational plans; a project management system; a financial information system; and a management information system.

Is there anything left over from Allden and Ellis's boxes? Handy (1981, p. 330) provides one check: he considers that the nature of an information system will depend on its purpose. He identifies four possible purposes for such systems: planning, logistic, control, and motivation. Each of these purposes is served by a
Chapter 7: Using the information

part of Allden and Ellis's scheme, except motivation. They envisage their "management information system" as being specifically "for line managers, senior management and third parties", but not the staff themselves.

Another way of checking what areas of information are necessary is to consider the logical steps needed to get something done:

- **Set objectives**: why is conservation work being undertaken?

- **Identify constraints**: an objective may be desirable, but what are the constraints on how it is to be achieved?

- **Establish processes and provide resources**: how are the objectives to be achieved? What processes are necessary in order for the work to be done?

- **Plan work**: what has to be done, and when? Long and short term plans and schedules are needed.

- **Monitor and control work**: are plans being fulfilled? Targets need to be set, and monitoring and reporting procedures established for both work and the use of resources.

- **Review objectives**: are they still appropriate? Purposes and objectives need regular review at a strategic level.

Many writers stress that everyone doing the work needs information about it, e.g. Peters and Waterman (1982, 266-270); Peters (1987, 609-613); Handy (1988, 125-132); Ohmae (1982, 216-227); Imai (1986). Information to allow conservators themselves, as actors in a "meritocracy", a substantial measure of control and feedback on their work will be even more important than usual: "complex work cannot be performed unless it comes under the control of the person who does it" (Bowman and Asch, 1987 and Griffin, 1987, both quoting Mintzberg, 1983). This has the ring of truth for conservation. There is another relevant factor: the strongly fulfilling nature of practical conservation. When conserving an object, one receives instant and powerful feedback on the progress of the work, even though the improvement one sees may be short term, if the wrong techniques or materials are used. So, if feedback on the wider value of their work is not available, the conservator will feel little commitment to the purposes of the organisation, and can instead transfer all their loyalty and energy to the objects or collections themselves. This in turn exacerbates the effect of the conflict which is inherent in the dual museum goals of preservation and display.
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Is anything else left out of Allden and Ellis's boxes? The role of information in motivation can be accommodated by extending the uses of their management information system. The processes are of course another necessary dimension. They are the source of the data which fuels the information system: but this is perhaps implicit in the same box. However, monitoring against standards (or risk monitoring) is such an important part of conservation information that it is best identified separately. There is no box for policies, which are the means by which the institution commits itself to specific standards and objectives. These lie at the heart of preventive conservation. Finally, they also omit a decision-taking system, in which information about different courses of action is gathered and evaluated, and priorities set; this can be included in the Corporate Planning process.

7.2 INFORMATION FOR MANAGING CONSERVATION

7.2.1 The scope of the scheme

The elements of the scheme

Taking account of all these considerations, the scheme to be investigated should have the following elements:

Mission Statement: to set out the purpose and values of the museum, and also, dependent on it, of the organisation section responsible for conservation, which we will call for this discussion the Conservation Department.

Policy for conservation: a written statement(s), which will address issues such as how the conflict of preservation with display is to be resolved, and set out broad strategies for the medium to long term. This will take account of strategic planning and analysis such as that described above, Chapter 6, Decisions and priorities.

Corporate Plan: the part of the Museum's overall plan which develops policies and strategy into practical plans. For museums funded by the Office of Arts and Libraries, this is for five years ahead, rolled forward each year. The formation of this will include the evaluation of options and decision-taking.

Operational plan: at Department level, for one-two years ahead. There will also be operational plans for organisation sub-units such as conservation sections.
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*Standards monitoring / risk management systems:* for gathering and distilling data on whether standards are being met - most familiarly for the museum environment, but also for collections condition, loan conditions, storage generally.

*Management information system:* for monitoring work against plans, and providing feedback to third parties, senior management, and all levels of the Conservation Department. This will include performance monitoring.

It is important to be aware that information in organisations has important informal components as well as formal ones (Land and Kennedy-McGregor, 1987). Formal systems should supplement and focus these, not be so rigid as to crush them.

**Areas not included**

Omitted from this scheme are:

*Financial information,* apart from its use in decision making (see above, Chapter 6, *Decisions and priorities*). Although the effective use of resources comes within the scope of the work, during day-to-day operations by far the major use of money for conservation is on staff (85-90% in the Museum of London). The measure of resources used is therefore person/time.

*Feedback for individuals on their own work,* i.e. personal work plans, performance appraisals, etc.

*Project management,* except as this impinges on work plans. This field is extremely well covered in the literature, and requirements for managing conservation in projects are no different from any other activity.

*Health and safety at work* related information.

**7.2.2 Mission statements**

A mission statement is a written encapsulation of the values and philosophy of an organisation. Klemm et al (1991) review the history, content, and rising prevalence of these. The concept, they say, seems to have first arisen in the late 1950's, supported by Drucker in the 1970's, who focused on the need for a
business to define its purpose. We have seen above (Chapter 3, *Management and information*) the powerful support the need for an organisation to make its purpose and values explicit has received from Peters and Waterman (1982), Ohmae (1982), etc. The concept is variously interpreted, the focus varying from underlying values to more specific objectives about scope, functions, etc. Klemm et al (1991) found that of 59 top European companies they surveyed, two thirds had both mission and strategic objective statements, and of these, 70 per cent. had drawn them up in the previous four years.

Mission statements have certainly caught on in museums. In 1987, the Museum of London held a series of public lectures by the directors of the major national museums. Every one of them had a mission statement, and they were swiftly followed by English Heritage, the Museum of London, and no doubt many others.

Mission statements are, strictly speaking, for the whole organisation rather than its parts. But it is obviously feasible for sub-mission statements to be drawn up by the various operating units of an organisation. This may carry the risk that units will pay more attention to their individual objectives than to that of the organisation, especially if the units are controlled by professionals, who adopt standards set by outside professional associations (Griffin, 1987, citing Mintzberg, 1983). However, institutions such as museums are essentially in the information business, and need "knowledge workers". They have no choice but to hire these highly-trained professionals. Debate in professional organisations can often be wider-ranging and deeper than in individual institutions, and outside professional standards help to counteract the inward-looking inertia which afflicts some museums (Priestly, 1985, quoting Neil Cossons). Furthermore, professional bodies campaign to influence public opinion. In the case of conservation, there is explicit Government support for this in the shape of the Conservation Unit of the Museums and Galleries Commission. So it seems that, in spite of the well-known disadvantages in professionalism, such as protected salary levels and the adherence of professionals to professional objectives rather than institutional ones, in a practical world museums would do well to take a positive view of the "mission" expressed by their conservators.

It is too early to know whether the adoption of explicit Mission Statements by museums has encouraged better performance - especially when the means of assessing that performance are so uncertain, as we shall see below (Section 7.2.6, *Performance indicators*). From the employee's point of view, they offer an
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apparently firm peg for attaching particular policies and procedures, which should supposedly reduce conflict. But there is no straightforward way of evaluating their usefulness in this way. What is more, many museums already have a "mission" - the legislation, etc., by which they are established. Mission statements are in some cases (for example, the Science Museum, personal knowledge) beginning to be altered shortly after they have been written. The Mission Statement may put a different emphasis on the purpose of the institution, but in the end it must still fulfil its legal purpose.

7.2.3 Strategic and corporate planning

Strategic planning

The techniques of strategic planning have been discussed above, Chapter 6, Decisions and priorities. There, it was pointed out that many different techniques existed for strategic planning, and that the type used depended on the nature of the institution (Bowman and Asch, 1987, Ch. 14 and Table 14.2). The process described by Griffin does coincide roughly with that named by Bowman and Asch (1987, Table 14.2) as unconnected. The corporate plans required by the Office of Arts and Libraries are forcing a much more "planned" approach to strategy in museums. Ironically, though not perhaps surprisingly, advanced study of successful strategic planning is beginning to suggest that unplanned, emergent methods have a greater success rate than consciously analytical methods (Ciborra, 1992; Earl, 1990). In these, as in museums in the past, strategy is not determined by the organisation setting out to design a strategy; rather, one emerges from the collective effort of individuals. A planned strategy for an organisation is likely not to confer competitive advantage, because it will be similar to those of other similar organisations. Emergent strategies allow individual creativity to be properly included, and will be in tune with the culture of the organisation. However, in the author’s experience this can also lead to no strategy, but to directionless drift. It seems that emergent methods may be more suited to museum organisational types, and are now seen sometimes to confer competitive advantage, but they are organisationally invalid to the government via the Civil Service - the source of funds!

For conservation, the determinants of size, age and technology are different from those which apply to museums as a whole. Conservation departments are relatively small, relatively new, and many have a fairly analytical style in how
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Fig. 7.1. Appropriate strategic planning type for conservation. Compare Figs. 6.6 and 6.7, above.

they manage their affairs. Where they do, a formal, analytical planning style may usefully be developed (Fig. 7.1). However, if the strategic development process is too far out of step with that of the rest of the organisation then it may suffer 'organisational invalidity': hostility or lack of credibility. Extreme care will be needed in its presentation if it is to be accepted; but if the organisation is being pushed in this unfamiliar direction the new approach may be welcomed if it is presented diplomatically.

Corporate planning

Allden and Ellis take the rational view that a corporate plan is written to translate the institution’s mission and strategy into a practical plan for a given period (Allden and Ellis, 1990, Dec.). Experience suggests that in real life it is likely to be either a primarily financial document, with only the barest bones of practical or impractical plans (as in the Science Museum) or else a compilation of different agendas reflecting a variety of aspirations from pressure groups, departments and powerful individuals (as in the first Museum of London plans). The latter is to be preferred to the former; at least some real-world agendas are thus made public for debate. As well as government-funded museums in the U.K. (including the Museum of London), museums in Canada, the U.S.A., and Australia

1 The concept of contingency analysis, on which this diagram is based, is explained above in Chapter 6.
have also been required for a number of years to produce such documents (Griffin, 1988). Managing a conservation department is more an operational matter than a corporate one. But managing the conservation of the collections as a function of a museum is a matter for broad strategy as expressed in the Corporate Plan.

Corporate Plans for the national museums perform a number of functions. They are strategic planning documents, in that they set out plans for a rolling five year period, with detailed objectives year by year. They are bids for finance, in that they contain proposals that can only be realised if extra funding is made available. They are reporting documents, with progress reported against the previous year’s objectives. With the advent of performance indicators, they also report the Museum's performance against these. They are thus the nearest equivalent to a business strategic plan for these museums.

What will drive the process of strategic planning in museums harder is the setting of performance objectives, discussed in greater depth in Section 7.2.7, Management information systems, below. It is only in 1991 that the Office of Arts and Libraries and the Audit Commission have grasped this nettle, and required museums to include performance measures in their Corporate Plans. The effect this will have on museum strategy will depend on how directly these measures are translated into funding. Drawing up corporate plans today (at least in the Museum of London) is a comparatively relaxed and optimistic "incremental" process. But this could be transformed if museums are judged on results in comparison one with another, and grant-in-aid is allocated accordingly. This is reported to be the direction being taken in Australia (pers. comm., Carol Scott, of the Power House, Sydney).

7.2.4 Operational planning

Operational plans are so specific to circumstances that the general management literature cannot usefully be discussed. Operational plans for conservation have to interleave work for the Museum's various projects with that for preventive conservation. This process is illustrated for the Museum of London in the Case Study (Chapter 8).
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7.2.5 Standards monitoring

It is becoming clear that the existence of outside standards for museum operations can be used as a valuable counterweight to the drive for accountability based on finance and public activities alone. Conservators are seizing on these, seeing them as an official validation of their professional standards. The relevance of standards to museums generally is discussed by Caton (1991), and specifically to conservation by Cassar and Keene (1990). Fortunately, many recognised standards and the more loosely applied guidelines exist for the conservation of collections.

Standards do have to be used with circumspection. Michalski has pointed out (1990) that fixed standards may sometimes be detrimental to collections: for example, standards for maximum lux exposure may be too high for some objects, and unnecessarily low for others.

The practical use of standards (and the data obtained from monitoring against them) in conservation management is developed in the Case Study, below (Section 8.6, Preventive conservation and environmental monitoring).

7.2.6 Performance indicators

The broader issues around performance indicators for museums have been discussed above, in Chapter 3, Management and information, Section 3.3.5. The performance indicators which are chosen will greatly influence the institution's priorities and directions, and so this topic requires careful discussion.

Measuring museum performance

In Autumn 1991 the Office of Arts and Libraries requested museums to produce performance indicators from 1992-93 onwards. For collections care, it is important to find performance measures that carry as much weight as those for public programmes, the most obvious of which are visitor numbers and financial performance. Performance measures should comply with Ashby's Law of Requisite Variety: control can be obtained only if the variety of the controller is at least as great as the variety of the situation to be controlled (Beer, 1972, 41). Scepticism has been expressed in some museum quarters as to whether the staff of the Office of Arts and Libraries do possess the requisite variety.

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The published work on performance indicators is discussed above, Section 3.2.5, *Performance measurement*. No attempt has been made to discover all the performance indicators presently in use in museums. This would be an extremely time-consuming exercise, as such sensitive information is only published in internal Annual Reports, not normally available to researchers. The examples discussed below are simply those which the author happened to come across; they do, however, give a useful, if not comprehensive, basis for comparison and discussion.

Ames (1990) sets out a scheme of indicators for museums. He follows Handy's useful recommendation: every number should be a proportion of some other number (Handy, 1988, 129-30). Ames advocates using the amount of finance devoted to different activities as the main measure, as being the most objective measure of a museum's true priorities. His proposed measure for care of collections would come, for the Museum of London, to approximately 20p per object:

---

Table 7.1. Performance measures used in the Western Australian Museum for the preservation and conservation of collections

<table>
<thead>
<tr>
<th>Specific Objective</th>
<th>Workload</th>
<th>Efficiency</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[under Collecting and Curating]</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For each main collection:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To ensure the security of the above collections and associated data so that they are available in perpetuity for reference, advancement of knowledge and enjoyment.</td>
<td>No. of specimens or lots [in collection] / FTE</td>
<td>No. of specimens, etc. / FTE</td>
<td>Extent to which objectives were met (adequate/inadequate)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Most entries read: &quot;Adequate; no specimens were lost or deteriorated significantly.&quot;</td>
</tr>
<tr>
<td><strong>[Under Conservation]</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To halt the physical and chemical processes which lead to damage to specimens, and to restore selected objects for display.</td>
<td>No. of specimens treated / FTE</td>
<td>Specimens / FTE</td>
<td>Per cent of specimens treated this year</td>
</tr>
<tr>
<td>To develop and refine techniques for conservation</td>
<td>No. of papers / FTE</td>
<td>Pages / FTE</td>
<td>Per cent. of completed projects published</td>
</tr>
<tr>
<td>No. of reports</td>
<td>Reports / FTE</td>
<td>Per cent. of projects adequately reported</td>
<td></td>
</tr>
<tr>
<td>To encourage the use of sound conservation techniques in Western Australia</td>
<td>Enquiries</td>
<td>Enquiries / FTE</td>
<td>[No quantitative indicator as yet]</td>
</tr>
</tbody>
</table>


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"Conservation budget as a proportion of number of objects in the collection"

Although conservators might enthusiastically support such a measure (if more meant better), it is not very clear how it would relate to the actual preservation of the collections.

The Western Australian Museum currently reports annual performance indicators. Those relating to the preservation of collections are reproduced in Table 7.1. Although there is a measure for loss or significant deterioration of objects, one can but feel some scepticism as to how this is measured, and how much time the measurement takes. To be detected over the course of one year, deterioration would have to be quite drastic. The measure of effectiveness, "Per cent. of specimens treated this year", immediately begs the question: why do all these specimens need treatment? And if by "treatment" is meant actual intervention, then this is clearly a risk to the "real" nature of the objects, since the less interference they undergo the better. No measure is proposed for preventing damage, which would be considered by most conservators to be of higher priority than is treatment.

The Office of Arts and Libraries (1991) Performance Indicators report suggests a framework for measuring performance in collections management, identifying two prerequisites:

1. A clear high-level statement on the institution's policy for collections care.

2. Objectives for necessary action, assessed against the policy by applying a three-dimensional analysis, the dimensions being the use of the collections, the standard of curation, and the collection unit.

Instead of specific measures, success is to be assessed by an external peer review group by reference to the institution's plans and targets as above. Although this is much more likely to supply the requisite variety (Beer, 1972), leaving the measurement of performance in this important area so open-ended gives it no quantitative weight to balance the simple measures that can be applied to display and public programmes. This seems a pity, when conservation and preservation are the subject of so much quantitative measurement, and of well-established standards, especially for the storage and display environment. For example, the two UKIC Surveys of museum facilities, in 1974 (UKIC, 1974) and 1987 (Corfield, et al, 1987) present information on proportions of display and storage areas which are monitored, which have a controlled environment, etc..
Table 7.2. Performance indicators for national collecting institutions in Australia

<table>
<thead>
<tr>
<th>OUTCOMES</th>
<th>CRITERIA</th>
<th>PERFORMANCE INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The collection, preservation, documentation, and management</td>
<td>1. A collection policy appropirate to the objectives of the institution</td>
<td>~ indicators for other criteria ~</td>
</tr>
<tr>
<td>of natural and cultural heritage of significance to Australia</td>
<td>2. A comprehensive collection in conformity with the collection policy.</td>
<td>3a. % of the collection adequately:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- controlled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- conserved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- documented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- and housed</td>
</tr>
<tr>
<td></td>
<td>3. An appropriately documented, maintained and preserved collection.</td>
<td>3b. Degree of endorsement and/or complaint about the collection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3c. % of collection lost or damaged.</td>
</tr>
</tbody>
</table>

The report written by Carol Scott (1991), for the Australian Department of the Arts, Sport, the Environment, Tourism and Territories (DASETT), puts forward indicators which serve "outcomes": the objectives of museums. Those for collections preservation are few and straightforward, and easy to administrate, provided a framework for defining "adequate" exists (Table 7.2). However, they still somehow miss the central point: are the collections being preserved?

Bud, Cave and Hanney (1991) set out a different scheme again, with yet another terminology. They identify preservation as one of only three areas to be measured, and suggest three practical indicators:

- per cent. of objects adequately stored;
- cost per item;
- per cent. of objects in good condition.

"Cost per item" is not really useful, because it will vary wildly according to the size of the object and environmental requirements, and penalise better storage; but the other two indicators go straight to the point.
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The performance indicators for conservation

We have seen above in reviewing general management literature on indicators for not-for-profit organisations that these must take account of conflicting objectives, and be carefully targeted towards the institution's objectives. In the words of a Guardian journalist, writing of the push for accountability in public services,

"what matters is not the activity of these agencies [the Health Service and the Department of Social Security], but the standard of health and the level of poverty". (The Guardian, 1989)

What truly matters for conservation? The way to analyse this, not adopted in any of the published papers seen, is first, to understand what the organisation is truly doing; and from this, to set out objectives and to identify the factors which are critical for success. The last part of a successful process would be to ask those on and by whom information is being gathered how they would measure success in their tasks.

A general scheme of performance indicators for collections preservation has been developed by applying the information analysis process described above in Section 4.4.2, The information analysis. Its trial implementation is discussed in the Case Study, Section 8.8. The scheme is summarised in Table 7.3. Strategic level indicators of performance, that ought to be in the Office of Arts and Libraries's Group 1, are shown in bold. They include those of Bud et al (1991) (excluding "cost per object"), together with those occurring as Office of Arts and Libraries Group 1 general indicators for the professional activities of the national museums. An attempt is made to measure quality, by quantifying numbers of enquiries from other professionals, requests to take students, and proportion of staff publishing articles or giving lectures rather than the sheer number. It is felt that these data will indicate peer opinion of the institution. The application of this scheme was tested, and the type of report that would be based on it is included as Paper 38.

7.2.7 Management information

Management information systems can provide "the framework by which all the activities in the operational plans are monitored, with indications of performance against stated targets" (Allden and Ellis, 1990, Dec.).
### Table 7.3: Performance indicators for conservation

Indicators and measures suitable for use outside the institution (Group 1) are shown in bold; those in plain text are useful as internal management information.

<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>CRITICAL FACTOR</th>
<th>PERFORMANCE INDICATOR</th>
<th>MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintain and improve the physical condition of the collections</td>
<td>Set standards for condition</td>
<td>Policy for condition exists?</td>
<td>1. Schedule for condition audits established and adhered to</td>
</tr>
<tr>
<td></td>
<td>Measure current and past condition</td>
<td>Programme for condition audits?</td>
<td>2. % of objects in good or stable condition vs. target set as policy</td>
</tr>
<tr>
<td></td>
<td>Repair past damage</td>
<td>Condition audit up to date?</td>
<td>3. Remedial treatment: numbers of objects in worst condition treated vs. target</td>
</tr>
<tr>
<td></td>
<td>Develop Improved treatments</td>
<td>Condition of collections</td>
<td></td>
</tr>
<tr>
<td>2. Preserve the historic integrity of objects in the collections</td>
<td>Recognise historic integrity</td>
<td>Objects needing treatment receiving it?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agree treatments with curators</td>
<td>Treatments developed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Record all work on objects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Prevent deterioration, by ensuring appropriate environment, etc.</td>
<td>Set policy on damage prevention</td>
<td>Policy and procedures exist?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide preservation conditions</td>
<td>Standards set and recorded?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor preservation measures</td>
<td>Environment monitored as appropriate?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suitable environment established?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good standards of storage?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pest control established?</td>
<td></td>
</tr>
<tr>
<td>4. Control 'use' of objects</td>
<td>Set policies and procedures on what is permissible 'use'</td>
<td>Policies and procedures exist?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor compliance</td>
<td>Damage to objects</td>
<td></td>
</tr>
<tr>
<td>5. Contribute effectively to museum activities</td>
<td>Prepare objects</td>
<td>Were deadlines met?</td>
<td>Number of events vs. deadlines met</td>
</tr>
<tr>
<td></td>
<td>Observe features of objects</td>
<td>Observations recorded?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide expert advice</td>
<td>Prompt input to storage and display designs?</td>
<td></td>
</tr>
<tr>
<td>6. Raise awareness of concepts and methods of conservation</td>
<td>Communicate</td>
<td>Lectures given?</td>
<td>1. Lectures by conservation staff: % of people who lectured; number of lectures; audience; courses and conferences organised</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visitors to lab. / workshop?</td>
<td>3. Number of visits: group, individual</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students taken on?</td>
<td>4. Number of student placements and source of students</td>
</tr>
<tr>
<td>7. Make the most effective use of resources</td>
<td>Identify priorities</td>
<td>Strategy for preservation exists?</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------</td>
<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plan work, allocate resources, monitor use</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work efficiently and effectively</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strategy for preservation exists?</td>
<td>~</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficiency: Inputs vs. outputs, e.g. time / cost per object, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Effectiveness: success in meeting targets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Acquire and maintain the necessary skills</td>
<td>Acquire and maintain skills</td>
<td>Courses, conferences attended?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Offer work for peer comment</td>
<td>Articles published?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outside view of quality?</td>
<td>1. Courses etc. attended: number/person</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Number of articles; % subject to peer review; % of staff publishing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Competitive grants obtained</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Number of enquiries from outside professionals</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Requests to take students, source</td>
<td></td>
</tr>
</tbody>
</table>
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In Lucey's view, they are "a means of processing data, i.e. the routine facts and figures of the organisation, into information which is then used for decision making." (Lucey, 1987, 1). In the model proposed here, high-level decision making is undertaken at the strategic planning stage, and so the management information system will conform more closely to Allden and Ellis's definition (1990, Dec.).

The management information system will consist of:

- the institution's specific objectives for conservation
- the means of monitoring whether these are being met (the performance measures and indicators)
- a system for reporting this information in an easily assimilated way, to all levels of the organisation
- a system for long-term monitoring

There are many organisations which do not rely on any particular system, but where information is still vital to managing successfully. There are also various general management techniques which management information may need to complement. Two of those in fairly general current use are management by objectives (MBO) and total quality management (TQM). The former has a venerable history, first being explicitly described by Drucker in the '50s (Clutterbuck & Crainer, 1990, 62). A cascading system of objectives for each individual from the most senior organisational level downwards is set up. Success in meeting objectives, and the objectives themselves, will normally be revised at least annually. TQM was developed by Deming, an American who found a ready audience in Japan in the early '60s. His approach is closely allied to Kaizen, described by Imai (1986), and is now being imported back from the East to the West (as in Munro-Faure, 1992). Its implementation as British Standard BS 5750:1991 relies heavily on information.

7.3 CONCLUSIONS

The information system is not directed solely towards performance measures and indicators; nor is it predicated on a particular management system. Experience showed that it is often useful simply to collate data on operations, without building it into a permanent, rigid, system; even when it is not immediately useful the Museum of London scheme was frequently drawn on for, e.g., estimating time required for tasks; calculating levels of charging; justifying staffing levels. If
motivation is one purpose of an information system, then the process itself of regularly reporting on what one has done exerts a subtle pressure, even if no judgment is made on the results: people work harder if it seems that someone considers what they are doing to be important. This is one of the reasons why only a limited part of the Museum of London reporting system is computerised. In this way, it is information for managing, not a management information system. The application of these precepts to the scheme that was developed for the Museum of London is described in the next chapter, the Case Study.
Chapter 8

Case Study:  
Information for managing conservation  
in the Museum of London

In this section, the system of information for managing conservation which was set up is described, based on the analysis set out in Chapter 4, and the discussion in Chapter 7, Using the information, above.

8.1 THE ORGANISATION

The Museum of London was established in 1976 by merger of two other museums, the Guildhall Museum and the London Museum. It exists by virtue of the Museum of London Acts 1965 and 1986. The statutory functions of its Board are:

a) To care for, preserve and add to the objects in their collections;

b) To secure that those objects are exhibited to the public and made available to persons seeking to inspect them in connection with study or research; and

c) generally to promote understanding and appreciation ... of London and of its society and culture ...

The staff were completely re-structured between 1989 and 1992, to form three Divisions, plus an Administration Department, with eleven operational departments of equal status. The Conservation Department remained organisationally unchanged, but its status was upgraded to give it a substantial role in policy making. The staff structures of the Museum, the Curatorial Division, and the Conservation Department are shown in Figs. 8.1 and 8.2. The newly created Objects and Information Administration Department is responsible for collections management and documentation; its work complements that of Conservation.

The Conservation Department had seventeen posts, some on fixed-term or other non-permanent contracts. They are organised into four Sections, each managed by a Senior Conservator. During the period of study (September 1987 to February 1992) the Department was involved in the projects and other activities listed in
Chapter 8: Case study

ORGANISATION OF THE MUSEUM OF LONDON
1992/93

Board of Governors

Director's Office
Policy, planning, finance, personnel, training

Director

Museum Service

Deputy Director

Assistant Director

Public Services Division

Production Marketing Education Visitor* Services

Curatorial Division

Early London History & Collections

Later London History & Collections

Later London Docklands

Object & Conservation Information Admin

Publications Operations Specialist Services Business Admin

*Not yet established

Curatorial Division: Revised Structure, May 1990

Deputy Director

Early London History & Collections

Head of Department

7 Curators (including Deputy Head of Department)
3 Assistant Curators Secretary

Archaeological Liaison Officers

Later London History & Collections

Head of Department

8 Curators (including Deputy Head of Department)
4 Assistant Curators 5 Secretaries

Fieldwork Officers

Object & Information Administration

Head of Department

*Registrar (& Information Systems)
Assistant Registrar

*Librarian
Assistant Librarian or Assistant Archivist

2 Conservation Officers
3 Curatorial Assistants

Conservation

Head of Department

4 Senior Conservators (including Deputy Head of Department)
5 Conservators
5 Laboratory Assistant Secretary

Museum Studies Officer

Secretary

2 Attendants

* Deputy Head of Department likely to be selected from this level of post.

† This number includes non-established posts

Fig. 8.1. Organisation of the Museum of London and the Curatorial Division
Table 8.1. This gave ample opportunity to develop and test the information required to manage this quite complex array of tasks.

At the same time as an extensive programme of public activities, the Museum was planning the radical improvement of its collections storage by setting up a large new store, the Collections Support Centre, to take a large proportion of the collections. This involved the purchase of a site and conversion of an existing building, with a major input to specifications, etc. from the Conservation Department. Building works were still in progress at the end of the period studied.

8.2 THE INFORMATION

The system of information which was developed was intended to serve the purpose described by Handy (1988, p. 121-2):
Chapter 8: Case study

"Proper systems are pathways not prisons, telephone wires not fences. They are the discipline which gives purpose to liberty, which allows one to be free yet part of a bigger whole. They cannot be left to chance because the principles on which they are built are not instinctively obvious."

It consisted of the elements described above (Section 7.2, Information for managing conservation). They can be envisaged as three main system components (Fig. 8.3):

- to set objectives and priorities and plan work;
- to monitor and report on whether plans are being met; and -
- to gather information by means of special investigations and reports.

In parallel with the formal information system - the written reports and papers, and formally constituted meetings - an informal information system also thrived. Land (1975 and 1985) has identified the importance of this other information dimension. The description and discussion of each of the components describe how the formal, paper or computer-based parts of the system worked in the real, messy world of giving the Department a sense of direction and purpose at the same time as organising it to get a multitude of things done on time and to a high standard.

Backed by analysis and the choice of the appropriate management information tools, the components of the system (Fig. 8.3) emerged over the three years of the study period, and were refined many times during that time. Some, such as time analysis, were developed at the suggestion of the conservators in the Department: the necessity for others, such as collections condition auditing, became apparent when the need was recognised for a broad strategic plan for the care of the collections.

The Conservation Department Statement of Purpose and Role was based on one of the Root Definitions derived from the Soft Systems Analysis. It was drafted by the author, as Head of Department, and finalised by discussion with all the members of the Department. It was then sent out for general comment by curators and others in the Curatorial Division, and formally agreed by the Museum's Heads of Department Meeting. The items comprising the Role of the Department were derived from the Systems Analysis objectives.
Table 8.1. Projects worked on by the Conservation Department, 1989-1991

**Archaeological Service projects:**
- Excavations: Numerous
- Publication projects: Numerous

**Preservation of the collections:**
- Collections Support Centre: specification and planning
- Preservation care of the watch collection.
- Collections condition audits of 50 per cent. of the museum collections
- Ongoing work as other projects permitted.

**Permanent gallery projects:**
- 18th century gallery: complete reconstruction
- The Blitz: reconstruction of small area of galleries
- Prehistoric and Roman Galleries: preliminary design stages.
- Redisplays: "Cheapside Hoard" case
  "Crystal Palace" case

**Refurbishment of existing galleries:**
- Roman,
- medieval,
- Tudor & Stuart,
- Early 19th century.

**Temporary exhibitions:**
- "Treasures and Trinkets": exhibition of jewellery
- "What Is It?" curious and unidentifiable objects, with coverage of scientific investigation.
- "Suffragettes"
- "London's Pride": London's gardens
- "The Blitz": photo documentation
- "Beatrix Potter": drawings of archaeological objects

**Off-site projects**
- "The Tower Hill Pageant" - off-site museum
- Large loan exhibition to Essen (June 1992)
- Loans, etc. - numerous
8.3 DIRECTIONS, STRATEGY AND PLANNING

8.3.1 Mission statements: Papers 1.1 - 1.3.

A central Statement of Purpose for the whole Museum of London was formulated during the course of the study. The impetus for this came, somewhat ironically, from the need to brief the designers of the new corporate logo. As part of the process of staff re-organisation, each Division and Department, including conservation, is drawing up its own Statement of Purpose and describing its role in the Museum.
8.3.2 Conservation policy: *Paper 2.*

A full conservation policy for the Museum of London had not been drawn up by the end of the period of study. This was because it is vital to secure curators' agreement and commitment to it, and many key curatorial posts still remained unfilled. The need for it was often felt by the conservators; they see written agreement on the headings to be covered as having the potential to make life much less of a power struggle with curators and the exhibitions staff. The issues which it will address are listed in the *Paper.*

8.3.3 Strategic planning


The Museum's first Corporate Plan was for 1989-90. During the period of study, the character of the Corporate Plans developed from somewhat optimistic "grand vision" schemes to much more practical planning documents with objectives against which the museum's performance could be judged. It is possible to see them as developing from an "unconnected" strategy, collections of individual aspirations, into "planned" strategies (Bowman and Asch, 1987, Ch.14). *Paper 3* is an example of the relevant section of the Corporate Plan for 1991-2 to 1995-6.

*Conservation strategy: Papers 4.1-4.3 and 5.1-5.8.*

Strategic plans in the museum were affected both by the objectives set by staff and Board, and by outside pressures.

For conservation, strategic planning consists of setting long-term objectives, and drawing up, selecting from, and prioritising strategies for realising them. The Conservation Department of the Museum of London was requested to draw up a strategy for improving collections condition to be included in the Museum's Corporate Plans for 1993-4 onwards. From choice, but also in order to appeal to the funding sources, the process adopted was consciously analytical, as contingency analysis would recommend (see above, Section 6.3, *Planning and strategy*).
There had already been a number of steps towards the strategic planning of collections care. In 1989, after the publication of the Auditor General's Report (Comptroller and Auditor General, 1988), Paper 4, *Strategy for the preservation of the Museum of London Collections*, was written and presented to the senior management. It set out the steps which would be required to develop a plan to ensure that the Museum fulfilled its statutory function, "To preserve [and] care for the objects in [the] collections ..." which at that time it clearly did not. This strategy has in fact been pursued by the Museum during the intervening years (though surely not by conscious reference to the exact document). The proposed strategy can be described in terms of Hay & Williamson's "Strategic Staircase" (1991)(Fig. 8.4).

The first step, to define preservation problems, prompted the development of the Collections Condition Audits (see Chapter 5, *The data*). The steps thereafter, establishing conditions for preservation and rectifying damage, were not serial for the collections as a whole, but have in practice to be undertaken in parallel for individual, or groups of, collections. In the strategic planning undertaken during the period of study, the first step, defining the problem, was completed, and the subsequent steps defined, and the approach to them set out.

The Audit of Condition was reported in several internal papers (e.g. Keene, 1990 (2)), and in the Corporate Plan for 1991-92 to 1995-6 (Paper 3, Para.2.2.iii and Table 2). A financial bid was flagged for "phased implementation of survey results" (Paper 3.7, Table 9a, 2.) and "Raised expenditure" (Paper 3.12, Table 9A, 2g). See below, Section 8.7.1, for a detailed description of the condition audit.

Following intensive monitoring and analysis of the stores environment, the next stage in defining the preservation problems took place in January-February 1992. In this, a Stores Assessment was undertaken, based on the U.S. Department of the Interior Directive (1986). The Stores Assessment consisted of a detailed review of conditions in each store (See Chapter 5, *The data*, and below, Section 8.7.2). An example of an assessment for one store is included as Paper 37.

Based on the results of the condition audits and stores assessments, the process of drawing up a *Strategy for the care of collections* began. It was important that this was subscribed to by the whole museum, from top management down. The process was therefore planned so as to involve as many Museum staff as possible, to gain their commitment to it. First, a whole-day seminar of the Conservation
Sections:

**Strategic Collections in appropriate condition**
- Damage rectified
- Maintain preservation conditions
- Maintain condition of objects
- Undertake necessary conservation

**Steps**
- Conditions for preservation established
- Cost improvements
- Commit resources
- Programme projects

<table>
<thead>
<tr>
<th>Problems defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify damage</td>
</tr>
<tr>
<td>Diagnose causes</td>
</tr>
<tr>
<td>Specify necessary improvements</td>
</tr>
</tbody>
</table>

![Strategic Staircase](image)

**Fig. 8.4.** Strategic Staircase towards the preservation of collections.

Department was held. The objectives derived from the Soft Systems Analysis were reviewed; with slight amendments they were taken to represent the desired future state of affairs. The information gathered in Collections Condition Audits was then matched against the Key Success Factors which had been identified in the systems analysis, and the record of the discussion was used to draw up alternative courses of action. This resulted in a new draft *Strategy* proposal, for discussion first with senior management and curators (*Paper 5*).

**Discussion**

The Conservation Department seminar certainly provided the whole department with an unrivalled overview of all the collections, not just the ones each Section was familiar with. This will promote cooperation and commitment to the care of the collections as a whole.

Many writers draw attention to the need to take account of the implementation of a strategy, as well as its formulation (e.g. Hay and Williamson, 1991). The latest draft *Strategy* thus built on and extended plans for stores moves that were already accepted, rather than proposing new departures that would be difficult to get properly accepted. Together with the processes of full discussion that
have been planned, these measures were designed to give implementation the best possible chance of success. Discussing such factual information on the problems of storage and care of collections was also an invaluable learning process for the whole institution.

8.3.4 Departmental planning: Papers 6 - 17.

Museum and Divisional planning is outside the scope of this work. It is still in the early stages of development in the Museum of London. The Public Services Division had been firmly established for some time, and planning for interpretation activities was vigorously promoted by the Assistant Director in charge of this Division (e.g. Paper 6, the exhibition schedule). Coupled with the preference of curators for public activities, this organised planning tends to take over resources for inter-departmental work, to the detriment of activities focused on the care of collections. By the end of the study period, the imbalance was becoming apparent, but no positive steps had been taken to redress it.

A broad schedule of activities for the Curatorial Division was agreed in February 1991. This did include some formal care of collections projects.

A more detailed forward work schedule for the Conservation Department itself was developed (Paper 7), and revised approximately two-monthly. Much of this was determined by the exhibition schedule (Paper 6). However, conservation work takes place up to eighteen months before the objects are needed for installation, because of:

(a) Conservation input to exhibition and showcase design in the early stages

(b) Many objects needed for illustration for catalogues and publicity material, which have their own production schedule.

Plotting the Department's work schedule on a chart (Paper 7) was the way in which the Department's ability to do the work for projects could be assessed during forward planning meetings such as Exhibition Committees. But the graphic Schedule was not good for checking through jointly with other Departments, to ascertain whether they can meet their parts of the required deadlines. For this, a written schedule was necessary (Paper 8).
8.3.5 Allocating resources: Papers 9.1-9.2

The resources needed to implement the Curatorial Division's broad plan were set out in a table, Application of main account staff time to projects, in February 1991 (Paper 9.1); Paper 9.2 shows the outcome after one year. Resources were taken to consist only of staff time, since this is currently what consumes overwhelmingly most funding (85-90% for the Conservation Department). The resource estimates were based on existing individual and overall time monitoring using timesheets (Paper 10.2). These estimates were subsequently used as the basis for monitoring the actual conservation resources available, and their use against that planned (Papers 9.2, 12, and 14, and below, 8.4, Monitoring and reporting).

8.4 WORK MONITORING AND REPORTING

These processes constitute the essential, complementary component of information for managing. Planning in the detail described above is unfamiliar to most museums, but monitoring and reporting on work is even more so, especially when this is closely related to plans.

While the previous section, Strategy and planning components, was dealt with "top down", from strategy to operational level, it is more convenient to address the monitoring and reporting system in the reverse order, "bottom up" (see Fig. 8.3).

8.4.1 Work monitoring

This evolved over some time. The computerised conservation records system was designed to produce many of the necessary data, but it is preferable to gather them on paper, using the data from the computerised records to check from time to time. Having to record and report on how they are spending their time has a motivating effect on staff, if the resulting information is used in ways that benefit them. If everyone is involved in reporting the necessary information this promotes a thorough understanding of the results.
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*Monthly work reports: Paper 10.*

Data on the work of the Department were collected monthly, and a summary compiled and circulated to all conservation staff. It was up to the head of each Section to decide how the data should be collected, but to facilitate analysis data were passed to the Head of Department in the same format as the monthly analysis (i.e. Paper 10).

*Quarterly summaries and reports: Papers 11 - 12.*

These same work reports were also summarised quarterly, as the basis for reports to the Head of the Curatorial Division (Paper 11) and the Board of Governors (Paper 12). While the work summaries were statistical, the Board reports themselves were mainly text, designed to give an overview of the activities of each Section. To encourage an element of reflection on general progress and direction, each Head of Section writes their own part of the report. The reports do not presently include the monitoring of progress against plans and objectives, although any Department that wishes to use them for this purpose may do so. The Conservation Department reports in fact began to report the use of conservation time against that planned in 1991, and will report these statistics six monthly (Paper 12).

*Annual analysis and reports: Papers 13 and 14.*

A more thorough analysis of data on work was also undertaken. This was principally to inform the Department on its performance against its own objectives, but it can also be drawn on as necessary in external reports on performance and progress.

**8.4.2 Longer term work analysis and monitoring: Papers 15, 16, 17.**

In fact, though, the most useful information does not emerge unless data are compared over a considerable period of time. If strategy is set for five years ahead, then this is the sort of period which should be reported on (Papers 15 and 16). Even exhibition projects usually extend over more than one year (Paper 17). Although conservation work data only began to be collected in full detail at the
beginning of 1991, sufficient could be gained from the records system and from 
earlier report formats to give a good picture of conservation work since 1987. This 
sort of information was of great interest to the Department's staff, not always in the 
way they expect. For instance, as Paper 17 shows, a substantial proportion of 
objects treated were for the Galleries Refurbishment project, a Conservation 
Department programme. This was a surprise to most of the conservators; it helped 
to dispel the feeling that the Department's own projects were not considered 
important, and encourages confidence in the possibility that real improvements can 
be made to the care of collections by means of other Departmental projects.

8.4.3 Commentary on the Papers on work: Papers 6 - 17.

This was the first time that the Department had seen information 
presented in a way that enabled them to appreciate and react to their overall 
performance, and its relationship to the plans which had been drawn up. These 
charts represent the start of what can be a valuable learning process both for the 
Department and for the rest of the Curatorial Division. The charts were presented 
without a written summary, since they were primarily for internal department use 
and learning. The following is a summary of the discussion which took place at one of 
the regular Departmental meetings.

Where did the time go? Paper 14.

Paper 14, top left chart, shows how the Museum-funded conservation 
time was spent. About 50% of total time was available for different types of activity 
or project, after "core" activities (liaison, preventive conservation, leave and 
vacancies) were allowed for. About two-thirds of conservation time was spent on 
display projects: loans and temporary exhibitions. This includes the Tower Hill 
Pageant, a major Museum project. One third of project time was spent on 
conservation-led projects: the study collections themselves and the refurbishment 
of the permanent galleries.

The top right hand chart compares the actual use of conservation as of 
February 1992 with what had been planned in February 1991 for the two years 
1991/93. More time had been spent on temporary exhibitions (8% time planned, 
19% time spent), and less on the conservation of the study collections (16% 
planned, 10% spent). None of the other variations was far outside the 5% 
departure which it is realistic to expect from the planned use of time.

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*Paper 14*, bottom left chart, shows the use of conservation effort as measured by numbers of objects conserved. By far the most objects numerically had been treated for the archaeology interim collections. This activity receives extra funding as part of the archaeology service. After that, most objects were conserved for exhibitions. These are seldom the ones that most need treatment. This question can be further explored when it is possible to analyse objects treated by their condition grade (conservation priority).

The proportions of objects treated are compared to the proportion of time spent on that activity in the bottom right-hand chart. The best ratio of objects treated:time was found for the archaeology interim collections, where many types of object are treated in batches, and for the galleries refurbishment. The worst ratio was for exhibitions, where there is a lot of necessary liaison, input to display design, etc..

**Productivity: Paper 15.**

This figure and the accompanying table show the total number of objects treated each quarter (top chart) and informed conservators on the contribution of each conservation section to that total. It also showed peaks and troughs of productivity. From the lowest point in 1987, the number of treated objects increased steadily to the end of 1990, and then fell away somewhat.

Each section's chart has the scale appropriate to its work rate, reflecting both staff numbers and the fact that, for instance, it takes many times as long to conserve a costume as to treat a print. The autumn and winter peaks for Paper and Textiles conservation were probably due to exhibitions opening at Christmas and in the spring. Applied Arts and Archaeology conservation have less marked peaks.

Although it was satisfactory that the output of objects had increased over the period, the following must be noted:

- The number of conservators increased over the period from a complement of 11 in 1987 to 17.5 in 1991. Numbers of objects conserved per conservator per year rose from 156 in 1987, to 234 in 1990 (a peak year for both archaeology and applied arts), and fell back to 163 in 1991.
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- As the figures in Paper 17 showed, a high proportion of objects was treated for display purposes. These objects tend to be those in the best condition. The Paper Conservators have noted that it takes on average nine times as long to treat an object in the worst condition grade as to treat one needing only minimal work for display. Therefore, if more time is directed towards the care of the study collections, output in terms of numbers of objects treated can be expected to fall.

- Statistics on numbers of objects treated are of interest to conservators and managers alike. But they provide no indication of whether the collections are being satisfactorily maintained, and little as to whether resources are being used effectively. They are best kept as internal management information.

The demands of projects (Paper 17)

These charts examine the question, "what generated the work?" in more detail, and over a longer period of time. Most of the projects listed in the figure were complete at the time these charts were drawn.

From the top chart, (a), the Department noted with interest the number of objects treated for the Galleries Refurbishment. This was a conservation project, and they had thought that it had lost resources to ones generated by other departments. The Archaeology Section were surprised to see how many objects they had treated for off-site displays. The hundreds of items treated for the "jewellery" exhibition look set to be outnumbered by those for "Suffragettes", not finished at the time the charts were compiled, which was forming a substantial proportion of work for both the Textile and Paper sections.

From the bottom chart, (b), it can be seen that the work of the Paper Section was more evenly spread over different projects than was that of the other Sections. It was often said that every exhibition includes items of paper, and this seems to be well-founded. The work of the other Sections tends to have been dominated by one or two projects each.
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8.5 THE CONSERVATION RECORDS DATABASE

A computerised conservation records system was developed in the Museum of London beginning in 1985. This was first, a 'flat file' database using the then minicomputer's operating system Xenix, and later, on a new computer, the proprietary database management software, Oracle™. The original fairly simple flat file database enabled the Department to test out what data they wished to record and what they wished to do with it; the Oracle™ system was a more sophisticated implementation of an essentially similar database. Problems were encountered with both systems, but they were particularly severe in the Oracle™ one.

8.5.1 The flat file database

Hardware and software

The computer hardware consisted of a PDP 11 minicomputer running under a Xenix operating system. There was no specific database management software. A convenient data input application, which could be tailored for data capture to particular databases had been created by one of the computer personnel (Writer, by Paul Tyers: e.g. Paper 19). Output and reports, some menu based, were generated by routines written in "C" or the Xenix shell.

The background

This project was a straightforward mapping (reflection) of the existing paper-based conservation records system onto a computer database, with some management information added. At the same time some other conservation records were computer indexed: x-radiographs (of all metal archaeological finds) and records of technical examination.

Project organisation

At that time, there were no professional analysts and only two specialist computer staff. In what now seems an incredibly simple and effective approach, the Conservation Department simply decided that they wanted a computerised conservation record system which would serve the needs of all four conservation sections. Even now, in 1993, there is no other system in use at least in the U.K.
which has such a general application over many conservation specialities. A working party was established, composed of representatives of the different sections of the Conservation Department - Archaeology, Paper, Textiles and Applied Arts - plus a project leader, the Head of Archaeology Conservation (the author occupied that post at that time). The issues which arose and which were eventually resolved are summarised in Table 8.2.
Table 8.2  Summary of issues and their resolution

<table>
<thead>
<tr>
<th>Issue</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Should the system attempt to record data bit by bit, as the treatment progressed, or all at once when complete</td>
<td>When treatment complete. Only limited number of terminals, and too time consuming to call up record several times.</td>
</tr>
<tr>
<td>Should the computer-based system entirely supersede paper-based records?</td>
<td>No. Computer could not include drawings; some treatments needed much detail. System should be an index to records.</td>
</tr>
<tr>
<td>What sort of format should be used - free text, controlled length fields, keywords?</td>
<td>Few advantages to free text, takes up much computer space and duplicates paper records. Controlled information preferred, keywords where possible.</td>
</tr>
<tr>
<td>What information would we want out of the system?</td>
<td>See below, Output</td>
</tr>
<tr>
<td>What data should be included?</td>
<td>See below, Input</td>
</tr>
<tr>
<td>Should the existing paper record format be changed to make it more convenient to computerise?</td>
<td>Not necessarily, but most Sections redesigned their record forms in due course</td>
</tr>
<tr>
<td>How would we control accuracy of data?</td>
<td>Conservators input and check their own records</td>
</tr>
</tbody>
</table>

Constraints

Constraints on the project were quite severe:

- Limited time available for systems development, both from conservators and from computing staff
- Relatively limited computer memory
- No finance for developing the system
System objectives

All the Sections kept records of conservation treatment in card indexes or files (Paper 18), but these could only be used in very limited ways. For example, to pick out all silver coins treated using a particular method meant going through all cards manually. To count objects conserved during a time period and analyse it in different ways meant compiling complex tables of data on paper. We also wished to know how work was generated: how many objects were treated for, e.g., exhibition projects rather than to preserve the study collections.

Computer held data vs. records on paper

The possibility of the computer system replacing paper records entirely was considered. Various factors were discussed:

Permanence is important for conservation records; paper and permanent ink have been well proven to last for hundreds of years.

Variability: the type of record varied from Section to Section, and even from object to object. For instance, textile conservation often requires an extended record with detailed drawings, photographs, test results and samples. In contrast, cleaning historical silver or treating archaeological copper alloy can mean dozens or hundreds of objects each with an identical, brief record.

Preferences: Some Sections strongly preferred their familiar and well-tried recording format.

It was concluded that, provided every treatment record included certain basic information, there was no reason why a variety of formats should not be used for paper records. The computer version would enforce the recording of the same basic information for every object treated, in a uniform format that would simplify analysis, information retrieval, and listing. In fact, all Sections eventually redesigned their paper records to make data input simpler, arriving at a similar or identical format in each case.
Table 8.3  Data to be held in the conservation records database

<table>
<thead>
<tr>
<th>Field name</th>
<th>Contents</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner:</td>
<td>Museum department, or non-Museum owner</td>
<td>Keyword</td>
</tr>
<tr>
<td>Accession number:</td>
<td>Number, or site, context, find no., or owner's identification number</td>
<td>Format checked</td>
</tr>
<tr>
<td>Simple name of object</td>
<td>(e.g. key, violin)</td>
<td>Free text up to 35 chars.</td>
</tr>
<tr>
<td>Title:</td>
<td>Mainly for pictures and drawings</td>
<td>Free text</td>
</tr>
<tr>
<td>Artist or maker:</td>
<td>Artist, or maker of machine, etc.</td>
<td>Free text</td>
</tr>
<tr>
<td>Material:</td>
<td>Up to 4 materials of which the object is made</td>
<td>Keywords</td>
</tr>
<tr>
<td>Conservator:</td>
<td>Name of conservator who did the treatment</td>
<td>Keyword</td>
</tr>
<tr>
<td>Purpose:</td>
<td>Reason for work - e.g. loan, exhibition, publication, etc.</td>
<td>Keyword</td>
</tr>
<tr>
<td>Outside conservation:</td>
<td>Was work done by conservator outside the Department?</td>
<td>Yes/no</td>
</tr>
<tr>
<td>Time:</td>
<td>Total time taken for the job</td>
<td>Hours/mins</td>
</tr>
<tr>
<td>Recall date:</td>
<td>Date to check the object (if any)</td>
<td>dd/mm/yy</td>
</tr>
<tr>
<td>Recall for:</td>
<td>Reason for checking</td>
<td>Free text</td>
</tr>
</tbody>
</table>

The following fields repeated until input terminated:

| Part:            | Name of the part of the object                                           | Free text up to 35 chars. |
| Materials:       | Up to 4 materials composing the part                                     | Keywords               |
| Treatment:       | The treatment used, e.g. REMOVED DIRT; DISASSEMBLED                       | Keyword                |
| Method:          | Method and materials used to carry out the treatment, e.g. washed, water | Free text with unchecked conventions |
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Use of the system


One of the strengths of the system was the convenience of data input. It would have been nice to call up a central copy of the administrative information about the object, as would be possible with a relational database, but the slight inconvenience of not being able to do this was far outweighed by its simplicity and speed.


Output was required both to quickly find details about the previous treatment of an object, and also to provide information about the amount of work done (measured through counting objects treated), the collections worked on, and the reasons for it. The following output could be obtained via simple user menus:

- List objects treated - full information or a brief summary
- Count and make tables of treatments done
  - by type of museum activity causing it
  - by curatorial department
  - by conservator/conservation section

Much other information could be obtained, but only by fairly expert users, since it was obtained by using the Unix operating system itself:

- List objects treated using a specified method, or using a specified material or chemical
- Check past records to see if object treated previously
- Recall details of past treatments for a particular object.

Some of the standard output is included as Paper 20.


The very valuable exercise of deciding on the form for such important data as treatment and materials was completed for this system. Keyword
lists now exist for materials (Paper 22) and for conservation treatments. There is a supporting dictionary for treatments which defines the meaning of each term and warns of terms that should not be confused with it (Paper 21).

Discussion and assessment

This straightforward 'flat file' system was in use from 1985 to 1989. It was popular with the conservators; input was very simple and fast, although output was only adequate to serve the needs of checking records and recording the amount of work an individual had done. The simple management information which could be gained was useful for quarter-on-quarter or year-on-year analysis of who had done what work, and why, but did not fully address the need for management information.

The system had a very considerable strength, however, in that it was agreed by all users that all the necessary data for treatment records was included, and in a convenient form. The only area which needed refining and slightly expanding was information on the purpose of work.

The other area needing development was in other related records: x-radiographs and scientific analysis. The need was increasingly felt to have this information also available within the same computerised system.

8.5.2 Relational database

Relationship to other records

Conservation records are only one part of the information and data relating to an object. In the first, 'flat file', system x-radiograph and some scientific examination records were held in separate computer files. It became very clear, however, that the conservation records should relate easily to these and to other records:

Outside the Department

- Archaeological finds inventories and catalogues
- The main Museum Accessions Register
- Curatorial catalogues of fuller information about objects

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Within the Department

- Records of technical examination
- Catalogue of objects x-radiographed
- Photographs and slides
- Samples
- Condition reports
- Collections condition surveys

The project

In Spring 1989 the Museum of London made a major investment in new computing hardware: a new minicomputer (a MIPS) and network cabling, with Oracle™ database management software. During the summer of 1989 a strategic systems analysis was made of the entire information needs of the Museum of London, with the exception of the archaeology service. The body of the work was undertaken by David Evans, Records Officer, and the author, with consultants from Oracle U.K. to instruct and provide quality control. A report was presented to the Museum's senior management (Evans and Keene 1989).

The analysis of the conservation work recording and management information system was developed by Evans jointly with Keene and with input from other conservators, and implemented partly by Evans and partly by consultants from Oracle U.K. as the system now in use.

Analysis procedure

This was as recommended by Oracle U.K.. It is summarised in Fig. 8.6 (overleaf). The Strategy stage is termed by Oracle a "soft box", or business analysis. This consists of interviewing a sample of managers about their areas of responsibility and the information they seek on these. Mission statements, corporate objectives, and other high-level documents such as board reports are also examined. The records of the organisation are analysed to determine the information functions that are required of the system. There are feedback sessions with senior management, with the intention that they participate in the analysis. The procedure appears to be essentially that described by Rockart (1979, p.84) as the 'total study process' (see above, Chapter 4, Section 4.4, Defining the information requirements). The Analysis stage consists of drawing up functional and data entity models. A data flow model is then prepared.
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Fig. 8.6 The Oracle analysis procedure

Paper 23 is a copy of the overall function map which was drawn up for the Museum. However, it is the conservation records application which concerns us here. The preliminary analysis for this was undertaken almost entirely by the author, drawing on the soft systems analysis and on the existing computer records system. The analysis was then prototyped, in discussion with the author. Selected members of the Conservation Department tested and commented on the various prototype stages. Parts of the application (mainly treatment records) were fully implemented and are in use at the time of writing.

The records system

Analysis The function and entity relationship models used are summarised in Chapter 4, Section 4.4.2, The information analysis. Papers 24 - 25 are the details of the entity relationship and function models.

Data development The data definitions and keywords which had been fully developed in the flat file database were able to be used in the new system.

The system The system was to have several different components (Fig. 8.7), to deal with treatment records, records of scientific examination, the x-radiograph
archive, and conservator personnel records. Due to various deficiencies and crises in the operation and management of computing in the Museum of London generally, only some parts of the system had been implemented by the end of the period of study. What did exist was an excellent screen for inputting treatment records, the conservation personnel records maintenance module, and some very limited reporting functions. A user manual containing a detailed description of the system and instructions for its operation had been written by a research assistant: a major effort in its own right. Not least, many of the conservation users remained, miraculously, strongly committed to a computerised records system, and several of them were becoming highly proficient in the operation of various user unfriendly systems. The problems encountered are discussed below in this section, Discussion and evaluation.

Input Examples of the Oracle™ system input screen are included as Paper 26.1 and 26.2. This took a great deal of time to build. It seems that the Oracle™ system is
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being stretched to its limits, as for convenience it was necessary to include data input to several information tables (entities) in the one screen. However, eventually a very convenient input screen was achieved.

**Output and reporting** Remembering that the previous flat file system had had only rudimentary reporting capabilities, a detailed specification was given for output from the new system (Table 8.4). Examples of the output that can be achieved are included as _Paper 26._

**Discussion and evaluation**

The Museum of London records system suffered such severe general problems that the Museum commissioned a report from an independent consultant, after the completion of the period of study. This report broadly confirmed the author's views; it will not be rehearsed in detail.

The conservation records relational database project suffered a number of handicaps. The organisation and management of computing in the Museum of London was extremely poor at the time of the main part of the work on the system, and the scope of the project as first embarked on was completely unrealistic. The conservation records system had a lower priority than building the cataloguing and inventorying parts of the system, even though so much work had already been done on it. The disadvantages of 'hard analysis' were well illustrated; principally, it was really very difficult to predict how analysis and specification, however carefully done, would translate into input screens and output. Too little attention was paid to the human aspects of the system - ease of use, speed of response, etc.. The input screen, although it has many good points, is extremely complex to use. This appears to be partly because of the constraints of the _Oracle™_ database system itself. For example, to move up the screen, one has to know whether one wishes to move a 'block', a 'field', or a 'record': pressing † will not do. Finally, the _Oracle™_ system also seems to have limitations which make it not ideal for this application: for instance, it does not cope easily with repeating fields, such as _material_, where up to four materials can be input.

On the plus side, the basis is there for a system that, it seems, really would do exactly what the Department wants. Judging from comments received by the numerous visitors who came to see it, it is, despite its incomplete state, one of the most comprehensive and potentially useful records systems in the U.K..
<table>
<thead>
<tr>
<th>OBJECT AND OBJECT HISTORY REPORTS</th>
<th>WORK REPORTS</th>
<th>PROJECT REPORTS</th>
<th>SCIENTIFIC EXAMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>What work is recorded as having been done on an object?</td>
<td>Report a list of conservation jobs by a conservator / Section during a period</td>
<td>Report a list of objects for a conservation project and count statistics during a period</td>
<td>List of objects examined using a procedure during a period</td>
</tr>
<tr>
<td>Report the current condition grade of an object</td>
<td>Statistics on the above, + graphs</td>
<td>Report a list of objects with a recall date falling within a period</td>
<td>Report the examination of an object: person, results</td>
</tr>
<tr>
<td>When/how did I treat [a specified object]</td>
<td>Report a list of objects treated during a period</td>
<td>Report a list of conservation projects</td>
<td></td>
</tr>
<tr>
<td>Report conservation jobs including a specified treatment during a period</td>
<td>Report a list of objects treated during a period by previous condition grade</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report the inventory / catalogue details of [an object]</td>
<td>Statistics on the above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What museum events has an object been involved in?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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keywords lists for treatments and materials have been very widely circulated and
drawn on. As of January 1993, much better progress has been made in completing
the system, and some of the planned output is beginning to be produced (Papers
26.3).

8.6 PREVENTIVE CONSERVATION AND ENVIRONMENTAL MONITORING

Monitoring against the various standards that exist for the environment or
that have been set by the institution is an important component of management
information on conservation. These, and the collection of data, have been discussed
above, Chapter 5, The data. Those who are responsible for operating environmental
control systems need first to know clearly what parameters have been set; and
second, whether these are being achieved.

8.6.1 The management of environmental control

The Museum of London's main building is held on a lease from its landlord. The landlord is responsible for providing an appropriate environment, but the lease
does not specify exact environmental parameters. In off-site stores, relative
humidity can only be controlled indirectly, through the temperature. Central site
stores mostly have individual mechanical air handling. Galleries and some storage
spaces are supplied by the main HVAC (heating, ventilating and air conditioning)
plant for the building.

At the time of the study, responsibility for providing the required
conditions was awkwardly split between two departments of the landlord. One
department employed engineers on site to maintain and operate the various items of
plant. The other was responsible for specifying and installing equipment and for
advice and consultation. The only effective monitoring was carried out by the
Museum's conservation department. At the start of the study period, the galleries
and many stores had been continuously monitored (using analogue recording
thermohygrographs) since the museum moved into the building in 1976. The
museum recognised that the environment was often far from what it required, and
often drew the attention of the landlord's engineers to this, but to little or no effect. There was no regular channel of communication: when members of the Conservation Department noted that conditions were unsatisfactory, they notified the engineers in informal conversations. Only in cases of serious system failure was dissatisfaction expressed in writing. The necessary control cycle (Fig. 8.8) was not in effective existence, because one party was doing the specifying, another the operating, and a third the monitoring.

To address the lack of regular, formal communication, two-monthly meetings were set up and chaired by the Head of Conservation, with representatives of the two departments of the landlord and the museum. It quickly emerged that the engineers had never had written specifications of the environmental parameters required for many of the stores (although that for the galleries was specified), so first a set of specifications was produced (e.g. Paper 29.1).

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**Fig. 8.8. The defective cycle of control for the environmental conditions in the Museum of London.**

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Next, a conservator was designated Environmental Liaison Conservator. This person would coordinate environmental monitoring by the different conservation sections, monitor and analyse the results, and be a single channel of communication with the engineers. As well as contacting the engineers informally as necessary, she prepared summary charts for the two-monthly museum environment meetings, and reported on them (e.g. Paper 29.2).
As soon as the state of the environment on the central site could clearly be understood, a programme to review the various air handling packages and modify them or install new ones as necessary was instigated. The cost of this turned out to be minimal: in the region of £3,000 - £4,000 per store if new equipment was needed.

Through these meetings and information, the museum was at last communicating its requirements clearly and creating a forum which planned, decided on and monitored the necessary action. It would be satisfactory to report a dramatic improvement in environmental conditions. It is true that some newly installed plant was brought up to correct operation, and the period of warranty extended. But in spite of much genuine cooperation by the landlord's senior representative, hardly any of the new equipment which had been planned had been installed eighteen months after it had been agreed. The environment in the galleries, never good, was deteriorating if anything still further (Paper28.4).

The reasons for this apparent lack of success were several. The museum had no real power over the landlord, because it was also one of the two major funding bodies. The air handling plant for the galleries represented a particular problem. Its age and condition was such that it would need large expenditure, but the building itself (of which the Museum is but part) was designed for '60s, not '90's, office use, making such expenditure unattractive. Finally, the landlord's personnel suffered from organisational problems of their own, as well as the general underestimation of engineering and technical expertise; the task of running an ageing system was in many ways more complex than they were qualified to undertake. Information may be necessary for effective operation, but alone it is not sufficient.

Nevertheless, the foundation of understandable, accurate and sufficient information and data on the environment will benefit the Museum, both as the basis for firmer diplomatic action with the landlords and also if the maintenance and operation of the environmental control plant is contracted out under compulsory competitive tendering. It was also of great benefit when planning and specifying the Support Centre, as environmental records for areas with and without mechanical air handling could be compared. As a result, the museum was able to decide with some confidence that the expense of mechanical HVAC would not be necessary for the new store if certain structural design principles were adhered to.
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The specify - implement - monitor - take action cycle was developed for other areas of preventive conservation: for instance, standard showcase specifications to be issued to designers, and consequent monitoring of the results. Relative humidity records for such an exercise are shown in Paper 30. Though showcase specification is not unique to the Museum of London, and will not be discussed in detail, assembling complete information in an orderly way was having its effect in much improved showcase design and consequently reduced maintenance of exhibits.

8.6.2 Commentary on the environmental monitoring: Papers 27 - 32

The discussion on environmental data, above, Chapter 5, Section 5.1, Data on damage prevention, also refers.

About 15 spaces altogether are monitored altogether for the Museum of London, using recording thermohygrographs producing either weekly or monthly charts. To aid analysis, vital data are extracted and recorded in log books (Paper 27). Using this summary data, it is relatively simple, though time-consuming, to produce hi-lo graphs for extended periods of time (e.g., Paper 28.4, and 29.2).

Comparing records from different sources for the same area at the same time is instructive. Papers 28.1 - 28.3 all relate to the Museum galleries during January. Papers 28.1 - 28.2 are copies of charts from analogue thermohygrographs (clockwork instruments with hair hygrometers) for four weeks in January 1991. The specified environmental parameters were 50 - 55% rh, 20°C. Although the traces look at first sight reassuringly level, close inspection shows that a high proportion of the time is outside specifications: up to nearly 60% rh for most of the week of 6th January, and down to 40%rh for most of a day in the week of the 20th January, with other sharp deviations from time to time. The charts, especially if seen one at a time at weekly intervals, do not permit an overall view of conditions, although they do provide a rich source of data.

In the Squirrel data logger (Grant Instruments) chart, for one of the same galleries during January (Paper 28.3), the vertical scale has been expanded, giving a much more dramatic picture. The same features can be seen as on the analogue
thermohygrograph trace, but in addition, the regular drops in rh which occur every Monday (when the plant is switched off for maintenance) stand out clearly - on the normal charts they are less obvious because they occur at the beginning of the week. This is a digital recording, and any area of the graph could be expanded. There is some loss of information at the scale and recording interval shown; for example, the distinctively shaped peak to 70% rh on 7th January (Paper 28.1) indicates a failure or cut-out of the chiller unit, but this could not be deduced from the data logger chart.

The summary graph (Paper 28.4) shows only the maximum and minimum RH, with no indication of how long deviations from specifications lasted. Like the "Squirrel" data logger presentation (Paper 28.3), it made deviations from specification much more apparent than did weekly thermohygrograph charts.

The question is, which visual impression is closest to the effects of such deviations on objects? There is little work this central question: how much do environmental fluctuations matter? Is there a Pareto curve for the benefits of a non-fluctuating environment? Padfield's theoretical data (1990) seem to show that in wood there is little response to short-term fluctuations. Until more work has been done on this it is a matter of professional judgment as to how damaging to delicate objects are fluctuations such as that on 7th January, shown both on the thermohygrograph chart (Paper 28.1) and on the Squirrel chart (Paper 28.3). In this event, the surface of objects may have had time to attain the higher humidity level and expand, setting up stresses with the interior of the object, before they shrank again in the ensuing sharp drop.

Papers 29.1 - 29.3 refer to the historic photographs store, in which the environment is controlled by a small package unit. Paper 29.1 is the specification for the environment. Paper 29.2 shows an analysis of the weekly maximum and minimum rh for eighteen months. Up until spring 1992 the air handling unit was malfunctioning; there is some improvement in 1992 generally. Again, the analogue charts themselves (Paper 29.3) convey more detailed information with different uses. That for the week beginning 4.03.91 is when the air handling unit was not functioning; the zig zag traces for 24.06.91 show that the temperature is being controlled with corresponding effects on the relative humidity.

From experience with monitoring the environment and interpreting the data, a specification was drawn up for a system to analyse digital recordings and
produce graphic or other output as required (Paper 31). It will be seen from the
discussion above that although electronic data loggers can potentially save a lot of
time, analogue instruments may still have their place, because of the richness of the
information they offer to an experienced user.

Pollution - nitrogen dioxide - was monitored at intervals (Paper 32),
and is discussed above, Chapter 5, The data.

8.7 SPECIAL REPORTS: Papers 33 - 37.

Included under this heading are reviews for special purposes, undertaken
at irregular intervals or for particular reasons. Examples are the Stores
Assessments and the Collections Condition Audits. Although it is seemingly difficult
to predict what information these important papers will need to draw on, collecting
data regularly against the scheme of objectives derived from the analysis should
cover every eventuality, and indeed prompt the production of these essential
management tools.

8.7.1 Collections condition audits

Once the crucial role of an overall, factually based picture of the condition
of the collections had been recognised in the first Strategy paper (Paper 4) a great
deal of this research was devoted to this.

The project

Because the research initiative was considered to be of general value and
relevance, the Museum of London was able to obtain a grant of six month's salary for
it from the Office of Arts and Libraries. This sum was used to employ conservators
to do the surveying. It was equally but arbitrarily divided between three
conservation sections: Textiles, Paper, and Applied Arts. For the textiles and
applied arts collections, two private conservators were employed on two month
contracts; for Paper, a fixed term contract for an existing employee was extended.
Therefore, there was a fixed time allowance for the project.
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Some work had already been done on condition surveying. The need to record the condition of the whole of the diverse collections, and to analyse and report results in a uniform way, catalysed agreement on a common set of data definitions for condition and damage: a key element of the research. The data definitions were embodied in the survey forms which were designed (Paper 33). The second imperative was to conduct the survey within the time available. If the process took too long, there was a danger that the politically fair wind created by the Auditor General's report would have died away. At the start of the project, there was no reliable information at all on how many objects the collections contained. Consultation with Clive Orton (my collaborator on statistical aspects of this project) quickly established that random sampling was the key to the time constraint.

Organisational groundwork

To make sure that the results of the audits were accorded due respect, the Director and Deputy Director were consulted over the project. A meeting was called with all curators in which the Head of Conservation presented the project, and sought curatorial cooperation and assistance. This was especially necessary because adverse findings would probably be interpreted by curators as criticisms of their former stewardship during the period when they had sole and almost complete responsibility for their care.

The surveys and reports

The relatively simple collection of Pictures, Prints and Drawings (PPD) was the first to be tackled. The technique of pilot surveying was developed first. From the results, the questions to be addressed in the survey design were decided on (Chapter 5, Section 5.4.5, The audit method). The other collections surveys followed. The third survey, of the Applied Arts collections, benefited from experience of the other two surveys.

The fully developed instructions for pilot surveying are shown in Paper 34.1, the results of the pilot survey, in Paper 34.2, and the resulting advice on survey design in Paper 34.3.

The surveys were all completed within the given time. Analysing the results and writing reports on individual collections were included in the task of the surveyors. We were not surprised to find that curatorial assistance mostly failed to
materialise when requested. It was decided that curators should only receive reports on their individual collections once a summary report had been compiled, so that the information could be seen in context. The summary report was written by me, the Head of Conservation. When faced with the task of understanding and summing up the contents of twelve individual, though factual and succinct, reports and their data summaries it became very clear that surveys on this scale should only collect the minimum necessary data. This was the first time that an institution with varied collections had attempted to report on the condition of its collections as a whole. This stage of the process has been published in Keene and Orton (1992), and Keene, 1991 (2).

**Organisational effects**

Once the summary report (Paper 35; Keene, 1990 (2)) was ready, it was circulated to all curators with copies of the relevant individual reports. A second meeting was held to discuss the results. As anticipated, curators with collections in poor condition generally took a dim view of the reports, and some challenged the validity of the sampling method. It was pointed out that an honest recognition of problems, based on factual evidence, would help us to obtain the resources to remedy them. Curators whose collections had not been surveyed, on the other hand, felt hard done by. Senior managers warmly welcomed the report, as extracts from successive Corporate Plans (Museum of London, 1991, para. 2.2iii, and 1992, para 8.4i) show. Indeed, a presentation was made to the Board of Governors (Paper 36), a very rare event on operational collections matters.

The Office of Arts and Libraries, who were sent copies of all reports, were equally pleased - indeed, they made a further grant to develop the method in a wider forum, and to address the computerisation and analysis of the data. The results of this are fully reported in Keene, 1992 (1), and summarised in Chapter 5, Section 5.4.7, *Data analysis and presentation*, and in Keene, 1991 (2). Some of the results of the data analysis are included as Chapter 5, Appendix 5.3. A prototype computer data collection and analysis program was built, and Appendix 5.4 contains examples of the output from this.

**Assessment**

The collections condition audits project achieved its major objective, of pushing the need for collections care higher up the Museum's corporate agenda.
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However, using the results to assess the actual amount of conservation resources required, in order to argue for increased resources, proved to be unexpectedly difficult. It was not easy to apply the statistical formulae to the results (Chapter 5, Section 5.4.7), and there was so much work to be done on each collection that simply to translate the analysis into arguments for a certain number of additional staff would be unrealistic. The results were therefore incorporated broadly into the first draft of the new Strategy paper (Paper 5), pending further development into a formal bid in a future Corporate Plan. Clearly, having the data available carried nearly as much weight than the actual figures.

Although it did no harm to demonstrate to curators that the Conservation Department now had real powers, their cooperation in future action to be taken to correct deficiencies might have been more willing had they 'owned' the results through assisting in the surveys. But it is unfortunately generally the case that work on the care of collections is given such a low priority by curators that this might simply have held up the process without achieving the desired results.

The method was applied to the Docklands collections after the author left the Museum of London with no direct supervision (and by other institutions, particularly the V & A), and seems to be found satisfactory. The Museum of London conservators are also using the analysis software based on Works™.

8.7.2 Stores assessments

At an early stage in the Collections Condition Audit project, it was realised that a complementary exercise needed to be carried out which would address the causes of deterioration: a stores assessment. However, it was not possible to carry this out until early in 1991, a late stage in the research. An example of a completed Store Assessment for the Glass Store is included as Paper 37. The survey forms closely followed the format of the U.S.A. Department of the Interior Special Directive. They proved broadly satisfactory, except that the use of double negatives (in order that the answer 'NO' always indicates a deficiency) caused confusion. The information had not been fully exploited at the end of the study period, except that it formed the basis, in conjunction with the Condition Audit results, for the second strategy paper (Paper 5, and above, 8.3.3, Strategic planning).
8.8 PERFORMANCE INDICATORS: Paper 38.

This controversial subject has been discussed at length above (Chapter 3, 3.2.5, *Performance measurement* and Chapter 7, Section 7.2.6, *Performance indicators*). *Paper 38* shows how the very detailed assessment based on the Conservation Objectives could be applied to the work of the Museum of London. It would form the basis for a very thorough annual report, if that were required. The year since this scheme was drawn up, however, has seen changes. First, the author has experienced an institution (the Science Museum) which has gone out of its way to implement performance indicators, in conjunction with a fully detailed system of management by objectives. Although justified in the present circumstances of that institution, the disadvantages of too thorough a formal system are apparent. It is time consuming, and there is the danger that a lot of energy goes into assessing the past rather than thinking creatively about the future.

The second change is in the format required by the new ministry responsible for museum funding, the Department of National Heritage, for corporate plans and performance measurement. It is now proposed that each museum reports only six to ten measures of performance of its choice, instead of the numerous detailed measures previously required. Collections management and curation is now no longer to be assessed by peer review (the Science Museum has already undergone this process), but to be included in these measures. At operational level the wish will be to include measures that demonstrate the need for improvement so as to exert pressure within the institution to do this. But at senior management level the desire is more likely to be to select measures which show the institution in a good light. Present inclination is to use measures which relate to the *Standards for Curation of Collections* being developed by the Museums and Galleries Commission (e.g. Paine, ed., 1992), since these actually do define what is a desirable state of affairs for collections care, based on a professional consensus. The particular advantages of performance indicators can perhaps best be harnessed if they are applied to standards for storage. Storage standards are easily measurable, and have a great effect on collections preservation. What is more, spending money will bring about easily identifiable improvements in the indicator.

8.9 CONCLUSIONS

Together, these information components comprise a regular flow of review and information. The system is set up to demonstrate and foster the
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performance of the whole team, and to facilitate organisational learning. It continues to develop incrementally, with discussions and suggestions on what is useful. Emphasis is as much on reporting down as up (in fact, the conservators are the more eager recipients).
Chapter 9

Evaluation and conclusions

"Even the dogs may eat of the crumbs which fall from the rich man's table; and in these days when the rich in knowledge eat such specialised food at such separate tables, only the dogs have a chance of a balanced diet"

- Sir Geoffrey Vickers, *The Art of Judgment*

9.1 EVALUATION

The question before us now is, will the system provide a table spread with a healthy, sustaining diet of information, or will it be only the dogs that thrive? It is not easy to evaluate the benefits and success of management information systems. They will seldom lead to any directly attributable and quantifiable improvement in performance. It has been found that even computer systems which have required major investments of finance and effort are rarely evaluated (Farbey, Land, and Targett, 1991). This is partly because significant components of their benefits are qualitative rather than quantitative; often, they enable more to be done than was the case before their introduction, rather than making savings. Indeed, experience suggests that effectiveness, assistance in achieving the goals of the organisation (Land, 1975), is a more likely benefit of information systems than efficiency, which entails all the problems of cost-benefit analysis when measurement is difficult.

Land (1975) suggests that the effectiveness of information systems may be evaluated by considering the change brought about in a series of organisational factors, which in this context can be taken to include:

Organisational structure;
The employees of the organisation;
The customers or clients;
Use of resources, particularly time.
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In Land's view, there are three major sources of information: the real world, which can be inspected; the informal system, information obtained by talking with people, which is the major provider of qualitative and evaluative information; and the formal information system, an artifact the purpose of which is to filter real-world data and present them in a relevant and easily understood form (Land, 1985; Land and Kennedy-McGregor, 1987). Another view on the function of information systems is offered by the cybernetics model developed by Beer. In this, an information system "reduces the variety of the real world" (Beer, 1985, Sect.2). The problem with information systems is not only that the wrong information may be chosen for the artificial approximation which is the system, but also that it may inaccurately or insufficiently depict the real world. These must be some of the reasons why emergent systems seem to perform better than planned ones: there is simply more chance to get them right.

Rockart and Delong (1988, Ch. 12) propose non-financial indicators of success for executive information systems, relating to the performance of senior managers:

- Increase in productivity
- Improved mental model of the organisation and its activities
- Power: well-informed, knowledgeable departments gain respect.

These authors also note the increased ability of organisations to learn, and the consequent impact on the quality of operations. They cite a manager in a large computer company, who looked at sales and production graphs each month with his line managers. In this way, they learnt to see the expense of mistakes and the value of preventing them.

Benefits for people at the lower levels of the organisation will include better motivation, commitment to objectives, and self-generated improvements in work practice, all of which are likely to be assisted by good information on work performance. A further factor to include in the evaluation is the robustness of the system: can it evolve through time as requirements change? Finally, the wider implications of the study should be useful to conservation professionals generally.

Drawing these points together, a metaphor for the greatest potential benefit can be a state of better self-awareness by the organisation, which will dispose it (i.e. all the workers in it) to make "real, desirable changes" (Checkland,
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1981). An evaluation should therefore seek evidence of such changes, or at least the predisposition towards them. This evaluation will therefore focus on five areas:

Efficiency: identify overheads arising from the system, even if benefits cannot be measured directly

Staff motivation

The organisation: changes assisted or brought about; institutional learning

Robustness: has the system continued in use, and has it been adapted to meet changing needs?

Usefulness to the wider profession

9.1.1 Efficiency

The Museum of London information scheme does consume time that might otherwise be spent on the conservation of objects. Such overheads consist of time spent -

By conservators:
- On completing timesheets and work reports
- In conducting collections condition audits
- In collecting and analysing environmental monitoring information
- In conducting stores assessment surveys
- In reading and digesting the reports that result

By middle managers:
- In collating and analysing timesheets and work reports
- In planning work more formally than might otherwise be the case
- In writing reports e.g. to contribute to strategic planning

By the Head of Conservation:
- In analysing and reporting both upwards and downwards on time used and progress against targets
- In spending more time than might otherwise be the case on planning and monitoring progress
Chapter 9: Evaluation and conclusions

• In planning, organising, and writing up special reports, e.g. on the state of stores and preventive conservation, collections condition audits, and preservation strategy

However, some of this time would have to be spent whatever system of management was in place. Although some extra time was spent on analysing, e.g. environmental monitoring data, the usefulness of such data is very limited without such analysis.

On the other hand, very large time savings were achieved from the adoption of sample surveying for collections condition rather than every-object surveys. In the early stages, the Archaeology Section examined 9,000 objects - only about a quarter of the collection, taking months of conservator time. A rapid calculation of confidence levels from the resulting statistics showed that equally reliable results could have been obtained from examining only 900 objects. Subsequently, collections containing about 250,000 objects were surveyed in only six person-months, including the time taken to analyse the data and write the reports.

In achieving efficiency, it was a great advantage that the Museum of London system was not imposed from the top, but developed in cooperation with the whole Department. Because only a few of the high-level components were common to the rest of the museum, the conservation system could be designed to do exactly what was required of it. If the collection and reporting of data became too onerous, then the producers of them could be relied on to say so and propose improvements.

9.1.2 Staff motivation

This is a particularly difficult area to evaluate. Although benefits cannot be directly attributed, there was a considerable improvement in productivity in all areas during the period of study. The information that would both indicate and affect

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1By chance, the author moved to a new post, in the Science Museum, in March 1992. Here, a formal system of management by objectives is in place. This has obvious uses and is specially applicable in the particular circumstances. The contrast with the MoL conservation system is that the management information provided by the broadly designed work monitoring system has not been so carefully thought out, and it is difficult to tailor it to the needs of particular organisational units. Although less time consuming, because less analysis and reporting is done, it is also less useful in the short term, has no motivating effect, and produces far more paper.

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staff motivation will be that directly related to output from what people spend most of their time doing: i.e., the level of activity - objects treated, lectures given, etc. It is not just information which will influence productivity, but the processes of obtaining it. Rockart and Delong (1988, Ch. 12) offer a quotation by the Director of the same company cited above, with which this author would wholeheartedly concur:

"The chief value I got was the organisation knew I was doing it. If the people below know you are taking an interest it affects their attitude."

9.1.3 The organisation: change and organisational learning

In evaluating this area, we may seek signs of changes in organisational structure or in work organisation which address the issues depicted in the Rich Picture (Chapter 4, Fig. 4.2).

During the period of study, the Museum underwent quite radical organisational change, from a staff structure of 'Keeper barons', all reporting to the Director, to the one shown in Fig. 8.1. In the latter, seven curatorial departments have been amalgamated into two, with two care-of-collections departments at the same organisational level. Although a major impetus for the change came from the outside operating climate, including discussion with managers of national museums and with the Government funding sources, there is no doubt that strong support from members of the Conservation Department for the need for better care and management of the collections, backed by statistics and rational argument, helped to bring about the new structure. The analysis undertaken for this research greatly clarified and sharpened for the author the nature of the issues: the role of conservation in the purpose of the museum as a whole. This proved very valuable (at least in pursuing the Conservation Department's own agenda) during the extensive debates that took place during the staff reorganisation.

The main resource of a museum is staff time. In the new Museum of London structure, many more staff than before are allocated specifically to collections care. The structure fits much better with the concept of a museum developed in the soft systems analysis (see Fig. 4.5). The reorganisation, and perhaps even more importantly the consequent adjustment of work priorities to...
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include those relating to care of collections, can be seen as evidence of institutional learning. Although the new Heads of Department all welcome this development, it must be acknowledged that many of the curators, who were previously the sole guardians of their collections, remain sceptical that anyone else could provide the level of care that they had done. This is in spite of the actual state of collections care and preservation, which reflected the low priority that had in fact been given to these tasks. Real progress on collections care may convince them that change has been beneficial.

Rockart and Delong (1988, Ch. 12) identify one benefit that can be derived from information as increased power: well informed, knowledgeable departments gain respect. Because it set out its objectives, plans, and monitoring information so explicitly, the Conservation Department achieved a reputation for efficiency. It was the only department in the Curatorial Division not to be reorganised. The Museum's senior managers to appreciated and made use of better management information, but many curators had art history backgrounds, and felt that a too-rational approach was alien to them, and would stifle creativity. This slight hostility sometimes manifested itself in reluctance to cooperate, or as a defensive attitude when problems that had arisen during joint tasks were investigated.

9.1.4 Robustness: has the system continued in use, and has it proved adaptable?

The author's successor as Head of Conservation, Kate Starling, was at the time of the study Senior Conservator for Archaeology Conservation, and had thus experienced the system as a user, as well as, latterly, its new owner. She was interviewed both on how she had perceived the information system at the time of the study, and on what use she was making of it now, as Head of Conservation. She had been Head of Conservation for nine months at the time of the interview.

Kate Starling said that she saw accountability as a major benefit from the information that was collected. The Department was able to say how its time was spent, and this helped in getting vacancies filled, and indeed in ensuring its survival. The information gave the ability to prioritise work, to organise it so that it fitted the
time available, and to accurately estimate the conservation resources needed for projects the Museum wished to undertake.

The fact that information was collected made staff feel that their work was important and salient to the organisation. In this way it improved morale. In fact, the Archaeology Section had held a seminar for itself before the study began to assess job design. A serious problem had emerged in that staff felt that they lacked any indication that the work they did was considered important to the Museum. Kate Starling felt that this had been rectified, and that management information had assisted this.

On collections condition audits, more of these had been carried out since the author left, using the same method, in response to requests from curators. The results had been analysed using the 'Works™' software. So far only a simple analysis of the statistics and a concise diagnosis of major problems had been carried out. The method had proved to be very usable, and the results were useful. The conservators who carried out the audit are about to publish an article describing the project.

The Museum is moving towards a new management technique: project based planning. In this, most work would be planned and carried out as projects, with specific objectives and targets. Staff will be required to commit themselves to achieving specific components of these projects, which would take up designated proportions of their time. The management information that the Conservation Department was used to using would be invaluable in such a system.

Finally, Kate Starling said that she was continuing to use the system, particularly one of its main components: work monitoring and reporting. She foresaw continuing major benefits from having the information, in planning work and responding quickly and flexibly to new initiatives the feasibility of which needed to be evaluated.

9.1.5 Usefulness to the wider profession

Elements of the results have been presented at intervals throughout the period in papers at conferences and in the associated publications (Keene 1990, (1)
Chapter 9: Evaluation and conclusions

These presentations have aroused considerable interest, evidenced by discussions during conferences and enquiries and comments afterwards.

The methodology developed for collections condition auditing will have a major impact on how this is done. The results of the Museum of London audits were presented to the Board of Governors in November 1990 (see Paper 36): the first presentation they had had on the performance of the Museum's normal operations, other than proposed acquisitions. The Museum of London Forward Plan for 1992/93 - 1996/97 states:

"The development of the 'condition of collections' surveys methodology was completed, and a full report was presented to the Office of Arts and Libraries (who assisted with research grants) and to the Museums and Galleries Commission. Four other national museums collaborated in this work ... and the method has since been adopted by the Victoria & Albert Museum, the British Museum, the National Museum of Wales, English Heritage, and others. It is likely that this method will become the national standard and the Museum of London is delighted to have fostered and encouraged this important work. Its application and development within the Museum will continue, enabling conservation and programmes of collections care to be soundly and rationally determined and resourced."

Following the publication of the method (Keene, 1991 (2)), many requests were received for offprints, from institutions both in the U.K. and abroad. A recent conference report described it as having been 'eagerly awaited' (Paper Conservation News, 1991). The Museums and Galleries Commission's Conservation Unit wishes to further develop the method into the national standard for assessing collections condition, by testing it further, by writing instruction manuals, and by providing training. Both the British Museum and the V & A are testing and developing it to meet their needs.

The soft systems analysis is also producing direct benefits to the general museum world. It is being used by consultants undertaking the feasibility assessment stage of the LASSI (Large-Scale Systems Initiative) study. They have described it as 'very valuable'. One objective of LASSI is to develop a data model which represents the information common to museums. Ultimately, it is hoped to cooperatively develop a database management system which can be used by museums generally, either in whole or in part. The success of this venture well depend entirely on a common view of what constitutes a collections information system.
9.1.6 Disbenefits

No endeavour results in perfection. Warning notes are sounded by some authors about the straitjacket that can be imposed by too conscious a system of planning and control. Although there were few signs of this during the phase of information development, it could be a danger if the system became fossilised, operated for the benefit of management only. It could be objected that the time spent by the Head of Conservation on paper-based activities such as analysing and reporting might have been better spent on keeping in close touch with the work of the Department. This could have been circumvented by a more thoroughly computerised system, or by greater clerical support, which should shortly be available.

9.1.7 Assessment

The *Introduction*, Section 1.4, states the intention that the information should be developed for staff at all levels, from operational to top management. The information system was developed as an emergent process, over the whole of the period of study. This promoted a great deal of departmental learning, because the primary recipients of the information were the conservators and their managers themselves. The information - work reporting and analysis, time analysis, collections condition audits, performance indicators - was periodically discussed during management and departmental meetings, and its analysis and presentation were often adjusted as a consequence. This can be seen as a process of iterative comparison of the information system with the real world.

There is evidence that the main benefits of the information system were better motivated staff (they felt that their work was more salient to the organisation than previously), the promotion of and support for beneficial organisation change (it was used by senior management), the development of improved information techniques (the more effective presentation of environmental data, for example), and a better mental model of the preservation process for the wider profession (through presenting the results at conferences, and publishing parts of them). Only minor disbenefits can be identified: the existence of a somewhat formal information scheme perhaps discourages the equally vital informal systems.
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9.2 CONCLUSIONS: A NEW VIEW

"The collection, conservation and documentation of original objects and research on them are the essential foundations on which all museum services rest." - The Road to Wigan Pier? Audit Commission, 1990,15.

The premise in this research was that information is essential to success in managing museum conservation, and that techniques which have been developed in general management can usefully be applied to this field.

In the wider professional field, before this work was undertaken there was no general conception of how information could assist conservation, as the almost total lack of publications on management and information in this field shows. Yet in The Survey (Corfield et al, 1989, 26) Conservators ranked "awareness of conservation needs by managers" as their first choice in importance among factors affecting the preservation of the collections - even above improvements to stores or more conservation staff. This is a symptom of the view that is commonly held by museum managers and curators: that conservators are primarily there to apply treatment to remedy the consequences of neglect and insufficient care of the collections. Among conservators themselves this is matched by the perception that many conservators are only interested in practical conservation treatment, and do not consider the real issues that affect collections preservation. The results of the research greatly assist a holistic view of what needs to be done to preserve the collections. They should help museum managers to see what needs to be done, and conservators to perceive what their role should be.

The Case Study illustrated these effects. In the Museum of London, before the system was developed there was no means of knowing how staff time was spent, and no means of planning how resources should be applied to the preservation of the collections. Work in most of the conservation sections was undertaken in reaction to requests from individual curators. Lack of control and proper management information had been castigated in a Civil Service staff review, carried out early in 1987. Rectifying the lack of management control was not itself a major research task. But developing the means of presenting meaningful information in an enlightening way required considerable analysis and thought. Even greater benefits were obtained from evaluating the needs of the collections as a whole. This meant that objectives could be set and communicated to all, and work could follow strategies
and plans for meeting objectives. Moreover, as the Conservation Department began to play an active, rather than reactive, role it became easier to get more resources, in the form of help from other Departments and support from the senior management. As conservators began to feel that they had more control over their work and that that their efforts were part of a common plan their morale rose, and they became more productive.

The development of such an information-rich environment within the Museum of London coincided with sharply increased outside pressures from funding bodies for a much more deliberately planned and analytical approach to the Museum's operations, and for greater accountability. Once the organisation became accustomed to the unfamiliar provision of information it welcomed and made use of it, indeed claimed it as a success. There were therefore identifiable benefits from the information system to the Museum of London generally.

Most of the elements of the system are transferable to other museums, as current experience in the Science Museum shows. If the good effects were to be replicated in museums generally there is no doubt that the general care and condition of collections would sharply improve.

The work also offers new tools for the future. An unexpectedly wide range of the techniques which are available for use in management has proved useful. In understanding and describing the situation being studied, soft systems methodology brought insights which proved to be directly applicable to information systems analysis and design. A systematic approach to presenting data resulted in more easily interpreted and professional looking tables and graphs. Formal methods of strategic planning have a definite applicability. Cost-benefit analysis, although it is of restricted use due the usual problems of quantifying quality, can clearly be used to evaluate investments in preservation. In choosing between courses of action, weighted goal hierarchies and robustness analysis are applicable. Finally, the area of performance measurement and indication can offer benefits for the management of conservation.

The new view of the role of museum collections which was developed through the soft systems analysis has had an effect. Both the author and other senior colleagues (for example, the Head of Conservation at the V & A: pers. comm.) found the idea that what we are striving to do is to maintain collections, not preserve them untouched for ever, quite liberating. The concept of museum objects as
embodiments of information and sources of enlightenment has equally far-reaching effects on the perception of the role of conservation. It shows why a system of professional ethics, subscribed to by both conservators and curators, and embodied in the practical policies of museums, is so essential. It supports the general movement in conservation techniques towards preservation, with minimal intervention in the object itself. It is generally held that conservation through management and monitoring is at least as effective in preserving collections as is conservation through treating objects. This is what organisational systems should be designed to achieve.

As the quotation at the head of this section shows, to preserve and care for its collections for the future is one of the first duties of any museum. Many museums still fail to do this adequately. Success will require changed attitudes, policies orientated towards more thoughtful acquisition, the exercise of better accountability, and the allocation of a larger proportion of resources for collections care. It has been demonstrated that the approach to information that has been developed in the real world can assist in bringing this about.

Future developments

How can these results be used most effectively? Students on conservation and museums studies courses should learn how to take the wider viewpoint that systematic information offers. Conservators themselves are already becoming more aware of the wider issues for preservation, from conference presentations and the spreading use of the condition audit methodology. The promotion of this by the Conservation Unit will help to raise awareness.

One of the most crucial issues for collections preservation is how to create the political will to balance that for the more obvious short-term benefits of display and exhibition. Providing hard facts - figures on the state of the collections, reliable estimates of the staff and finance needed to bring them up to standard - is almost the only effective way to do this. We need to construct a lever: a means of moving the political mass in favour of the long-term functions of museums. The bedrock can be the statutory functions of museums. The fulcrum can be the measurable, factual standards and accountability mechanisms of the Department of National Heritage's Performance Indicators (Office of Arts and Libraries, 1991), and the Museums and Galleries Commission's Standards for curation and Museums Registration Scheme (Museums and Galleries Commission, 1988; Paine, ed., 1992.
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and forthcoming). The lever itself is the information supplied by each institution: progress against clear strategies and plans, based on factual information on what needs to be done. It only remains then for the actors in the situation to have the imagination and determination to use the lever and shift the mass. This is the true preservation system.
The Case Study Papers

Missions, policies and strategies
Appendix

Statement of purpose and values

The Museum of London’s purpose is to make the history of London and its people, in all its diversity, intelligible to all. The Museum aims:

- to illuminate the past in such a way as to extend understanding in everyone who uses the Museum, from general visitor to researcher;
- to encourage as many, and as wide a range, of people as possible to use our services, through being responsive to their needs;
- to recognise that in a culturally diverse city there are many histories, each forming a valid strand in the identity of contemporary London;
- to promote opportunities for learning, entertainment and contemplation;
- to encourage and cooperate with other organisations concerned with the history of London;
- to relate London to other major cities in the world.

The Museum has a fundamental task, upon which all other activities are based: the formation and maintenance of a collection of objects and appropriate evidence related to a theme. The collections are subject to continuous critical evaluation by posing essential questions:

- what is the capacity of these objects or data to evoke the past or present of London in the mind of the Museum user?
- what does the object or item of data itself say about London or its people?
- either singly or severally, in a context either original or created in the Museum, can these objects and data provide opportunities for expanding understanding of London, when available to the Museum user?

The principal means by which the general user encounters the Museum’s theme and collections are exhibitions, education programmes, and publications. But these represent only a limited number of ways of looking at the history of London and its people. Therefore the resources of the Museum must be available through access to facilities for study and research.

Exhibitions, education programmes and publications must also be subject to continuous critical evaluation by posing essential questions:

- have the objects and information been used in a way which is consistent with realising their full potential while leaving the visitor free to ask questions? Is it consistent with our main purpose?
- have we been objective in our exhibitions and publications, and ethical in our advertising and promotion?
- have we reached the widest possible public in our approach?
- have we maintained editorial independence?

Our public duty is to the collections and to accuracy; and, in its pursuit, to the effective use of all financial resources.
CURATORIAL DIVISION: Statement of Values and Purpose

The collections and their associated records are at the heart of the Museum. All other tasks and activities the Museum undertakes must spring from this. The development, care and use of the collections is primarily the responsibility of the Curatorial Division.

The role of the Curatorial Division is therefore:

1. To assess, assemble and maintain for the future collections of objects and associated contextual information which uniquely or typically record or illustrate London Life and history.

2. To use the collections and records to make that history accessible to as wide a range of people as possible both now and in the future.

In pursuit of these objectives the Division will:

Foster and maintain the highest professional and intellectual standards, particularly by developing staff.

The collections

Preserve the objects and their historic integrity

Store, secure, document, audit and encourage access to the collections

Add to the collections in accordance with a consistent policy

Regularly review the collections and recommend the disposal of objects where appropriate.

Information and communication

Research the collections and their context: the history of London

Establish and run an accessible library, archive and information system

In liaison with Education and Public Services, generate exhibitions, publications, lectures, workshops and other media in order to communicate information about the collections and the history of London

Co-operate with other Divisions and with individuals and institutions outside the Museum.
CONSERVATION DEPARTMENT: ROLE AND FUNCTIONS

The Conservation Department's role is to:

Maintain the material and historic integrity of the objects in the collections, by preventing deterioration and rectifying it where necessary.

The Department will:

- Develop and apply policies for collections conservation.
- Advise on, specify and ensure the appropriate environment and procedures for storage, exhibition and use.
- Initiate and plan (together with O.I.D. and Early and Later Departments) programmes of remedial conservation.
- Treat objects only as necessary to remove causes of deterioration, and strengthen and clarify them as historic evidence, for retention or for display.
- Arrange or undertake the examination on objects for evidence of their nature, use, date or provenance.
- Keep accessible records of everything done to objects and communicate relevant information to others.
- Develop more effective and appropriate treatments and preventive measures and keep abreast of current research.
- Communicate with other conservators and professionals, and undertake and contribute to normal Museum activities such as lecturing, talks, publications, displays, etc.

In all activities, the Conservation Department will communicate, liaise and co-operate with other Departments in the Curatorial or other Divisions, to ensure active participation in Museum activities.

It will act in accordance with professional/conservation guidelines and agreed MoL policies.
Headings to be covered in a conservation policy

The environmental and other recognised standards which the Museum will adopt

Definition of what condition in objects will satisfy the MoL's duty "to preserve and care for the objects in the collections ..."

Statement on acquisition and collecting: constraints from preservation needs

What is acceptable "use" of objects - e.g. printing plates, musical instruments, vehicles

Work on objects: consultation procedures, how much restoration is acceptable and in what circumstances

The display environment - in what circumstances can the standards which the Museum has adopted be departed from

Loan conditions

Condition recording - for outgoing and incoming loans

Transport procedures

General preventive care, handling and marking
2. The Collections

2.1 The complex organisational structure of contemporary museums, which requires much time to be expended upon financial problems, fundraising, marketing and visitor satisfaction, often blurs the main reason for a museum's existence: its collections. Their successful curation and conservation are the principal objectives from which other activities flow.

2.2 The Museum has undertaken several initiatives to upgrade the care of its collections in the period 1988/91:

i) A major new Resource Centre has been acquired at Eagle Wharf Road, Hackney. This was purchased by the City Corporation on behalf of the Museum in 1989, and became vacant in 1990. At present a basic programme of conversion to provide two levels with self-contained bays and necessary services is being designed and will go out to tender in late Spring 1991. This work will cost approximately £1m-£1.2m.

In addition to this sum, available within the funding authorities' grants for the acquisition and conversion of the building, funds will be required for

- an appropriately equipped visitor centre to enable the widest possible use by groups and individuals
- a new costume and textiles store which can provide a more secure environment for this important collection.

Vigorous attempts will be made to raise this money from the private sector. The timetabling of this work is indicated in the Forward Plan, but implementation will depend on success in fundraising.

ii) A thorough survey of all collections from which a consistent Museum-wide policy for acquisitions and disposal can be devised, in line with the need to consider the cost implications of collections held by the Museum. Initial assessments indicate that £3500 per cubic metre as a capital endowment is the real cost to the Museum for the long-term curation of stored collections, maintained to an acceptable level. Additions to the collections will continue with particular emphasis on contemporary recording/collecting, and gradual assimilation of the archaeological archive.

iii) The introduction of 'condition of collections' surveys, pioneered by the Museum's Conservation Department, grant-aided by the Office of Arts and Libraries, and of considerable interest to other museums, has helped the Museum not only to quantify the necessary conservation and storage requirements of the collections, but also to assess their comparative size (Table 2a).

The resource implications of this survey will inform future planning in both conservation and storage provision.
2.3 The gradual computerisation of the documentation of the Museum's collections, complete in certain discrete areas but requiring much more work in others, has made it easier to answer enquiries, to plan exhibitions and publications, and to assist the burgeoning number of enquiries from museum development officers working for London boroughs. Within the five-year period 1991/96, it is intended that all collections should be documented to a basic common standard on the computer. Complementary technology, e.g. the storage and retrieval of images on video disc will be assessed; implementation will be dependent upon funding levels.

2.4 The Museum of London has important collections which are of interest to many organisations. It actively cooperates with many museums and galleries both nationally and internationally. In 1989/90 135 objects were lent to exhibitions in Great Britain and abroad and in 1990/91 agreement was given for 333 objects to be lent. Whilst the Board wishes to provide such a service, all loans present certain difficulties:

i) Administration of loans is diffuse and time-consuming. It involves curatorial, conservation, records office and secretarial time. The system needs centralising and rationalising to ensure that an efficient and cost-effective service safeguards Museum collections and assists those requesting loans. Conservation of objects, correct packing, couriering and installation often interrupts the Museum's own programmes.

ii) The Board has requested that loans to commercial organisations and foreign museums be wholly or partly self-financing.

iii) The Board has a particular interest in helping museums in London boroughs with larger-scale, longer-term loans of three to five years' duration. It would hope to maintain this service during the five-year period of this plan but reserves the right to reconsider its position.

2.5 The Museum is the only London-based museum which provides, in Docklands, a 'Museum on the Move'. This mobile trailer is primarily an educational service to schools, but is also widely promoted to adult audiences at special events. Temporary exhibitions drawn principally from the collections are displayed in and designed for the Museum's three gallery areas, each with its own structural idiosyncrasies, and are concerned with aspects of London history. Some smaller displays are lent within the London area. The strong emphasis on London is, on occasion, a deterrent to other venues both nationally and internationally. However, the Museum is willing to consider participation in travelling exhibition programmes if the organisation and funding are available to support the additional work entailed. This possibility is indicated in the Forward Plan in the form of a new small exhibitions unit, based at Eagle Wharf Road, from 1994 onwards.
The collections of the Museum of London

Numbers of objects, estimated from collections, surveys, statistics and from curators’ estimates; considerable adjustments are required and will be incorporated in the 1992/93 table.

<table>
<thead>
<tr>
<th>Collection</th>
<th>Number of objects</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early department</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td>19,000</td>
<td></td>
</tr>
<tr>
<td>Non-metals</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Archaeology interim, DUA + DGLA</td>
<td>140,000</td>
<td>179,000</td>
</tr>
<tr>
<td><strong>Later department (paper-based)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Images</td>
<td>261,000</td>
<td></td>
</tr>
<tr>
<td>Ephemera + general modern</td>
<td>101,000</td>
<td></td>
</tr>
<tr>
<td>Archives + books</td>
<td>40,000</td>
<td>402,000</td>
</tr>
<tr>
<td><strong>Later department (objects)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costume + textiles</td>
<td>16,000</td>
<td></td>
</tr>
<tr>
<td>Social history/workshops</td>
<td>66,000</td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td>300</td>
<td>82,000</td>
</tr>
<tr>
<td><strong>Docklands/working history department</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objects</td>
<td>50,000</td>
<td></td>
</tr>
<tr>
<td>PL Library: images</td>
<td>55,000</td>
<td>277,000</td>
</tr>
<tr>
<td>archives + books</td>
<td>172,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total for all collections</strong></td>
<td>940,000</td>
<td></td>
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</tbody>
</table>

The condition of the surveyed collections*

Numbers of objects in different conservation priorities, calculated from survey statistics.

<table>
<thead>
<tr>
<th>Collection type</th>
<th>Conservation priority</th>
<th>Calculated total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urgent</td>
<td>High</td>
</tr>
<tr>
<td>Paper</td>
<td>14,108</td>
<td>84,519</td>
</tr>
<tr>
<td>Costume &amp; textiles</td>
<td>1,065</td>
<td>3,265</td>
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<tr>
<td>Applied arts</td>
<td>4,094</td>
<td>8,797</td>
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<tr>
<td>Archaeology</td>
<td>2,594</td>
<td>6,661</td>
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</tbody>
</table>

Conservator/years needed to treat objects in urgent or high need of conservation treatment*

<table>
<thead>
<tr>
<th>Collection type</th>
<th>Conservation rate</th>
<th>Person/year needed:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(objects per person/year)</td>
<td>Urgent</td>
</tr>
<tr>
<td>Paper</td>
<td>380</td>
<td>38</td>
</tr>
<tr>
<td>Costume &amp; textiles</td>
<td>72</td>
<td>14</td>
</tr>
<tr>
<td>Applied arts</td>
<td>188</td>
<td>24</td>
</tr>
<tr>
<td>Archaeology</td>
<td>307</td>
<td>8</td>
</tr>
</tbody>
</table>

*Collections not included: Docklands, PLA Library, historic photographs, easel paintings, ceramics and glass, archaeology interim collections.
Public Programmes

3.1 The reason for a museum's existence is its collections and, flowing from this, correct care is dependent upon secure buildings to house them and qualified staff to curate them. This, however, is only one side of the balance. The other side is, in most instances, public funding, and thus public accountability. The public, society — if that exists — the audience, are all portmanteau words describing those who do and do not visit museums. They are fundamental to our continuance, but museums know too little about them.

3.2 Measuring visitor attendance figures (Table 3a) gives a rough indication of rises or falls, or steadiness. Analysis of these figures is costly; market research can be undertaken in-house, but it is labour- and systems-intensive. All museums know that they attract A, B and C1 groups and, if they run education services, children from every group in society. However, knowing more about visitors and/or non-visitors, may indicate preferences which museums are ill-equipped to meet. This is at the heart of much of the present soul-searching in museums. Can our limited resources allow an institution to be everything from a 'fun palace' to a scholarly interpreter of complex artefacts and evidence? The answer has to be a limited affirmative; limited by the basic policies of sound curation and conservation, but not limited by entrenched attitudes.

3.3 The 1990s should be a period of experimentation in which curators try making complex information accessible to wider audiences. In this area, social history museums are better placed than those dependent upon disciplines based on classes of refined or technical material. History is concerned with people, their individuality and their collective achievements; this basic knowledge provides a doorway into wider understanding of social, artistic and cultural history.

3.4 This report mentions in the Introduction (para 1.4), the concept of a museum providing primary, secondary and tertiary education for all visitors, regardless of age. It is noticeable that many adults find family events, school worksheets, quizzes and informal discussions with staff, rewarding. More work on analysing this response needs to be undertaken, taking into consideration the fact that information is pitched at easier levels, i.e. for the non-specialist. Building on this idea, providing introductions to complex subjects, is one of the tasks the Museum will undertake in the period 1991/96.

3.5 How will this be achieved without dismayng the better-informed visitor? There are a number of possibilities, some already tried and tested, others in embryonic or planning form:

i) Gallery events with curatorial and education staff regularly and actively discussing, talking and demonstrating to visitors.

ii) Guided visits round stored collections. Successful pioneer work at the Docklands Visitor Centre and Lever Street store will be expanded into programmes for every level of visitor to the Visitor Centre at Eagle Wharf Road.

iii) An introductory statement in the main Museum building is an urgent necessity. This could incorporate an activity area in which visitors can discover how to use the Museum and its collection. Modest expansion out into the Podium area, perhaps as an integral benefit within the City Corporation's scheme to make the Barbican area more accessible and attractive, would allow space for the Museum to explain its purpose.
iv) Recent history is often more accessible than earlier history to those with little or no knowledge of the subject. It is therefore important to provide a permanent statement on post-war London, to be installed in 1993/94. In addition, within the permanent gallery sequence the Prehistoric and Roman galleries will be revised in 1991/93.

v) People-centred exhibitions offer the opportunity to build new and different audiences. *The Peopling of London*, planned for 1993, will explore immigration into London across the centuries. This is being pursued in active collaboration with communities and groups who do not, at present, form other than a small minority of museum visitors. An exhibition in 1992/93 will analyse the women’s suffrage movement, drawing upon the Museum’s extensive Suffragette collections. It offers a subject which is of national as well as local interest.

vi) An active publications programme, including ‘popular’ and academic titles, is an integral aspect of the Museum’s work. Museum publications should provide information about exhibitions, collections and archival resources, thereby promoting the Museum’s public profile. The publications programme is continuously assessed for financial viability: although there may be a reduction in publishing activity in the 1991/96 period, titles that are produced will be academically sound, written for identified audiences, affordable and saleable. Co-publishing activity (with other museums or independent publishers) will be encouraged as a cost-effective means of expanding the Museum’s publications list.

vii) Education for adults needs to be reassessed. At present children receive excellent tuition in handling objects and discussing topics, using good inexpensive worksheets. There is no equivalent provision for adults with limited knowledge. Formal lectures and specialised study days attract those who are already familiar with museums. This must be rectified, with the emphasis on regular family, weekend activities which draw new audiences. The acquisition of new knowledge can be made as agreeable for adults as it is for children.

viii) Specialist users of the Museum have always received a ready welcome. Their needs and interests will continue to be met by the discipline-based exhibitions, scholarly publications, study days, evening classes, film seasons and similar traditional forms of interpretation. With the formation of a Friends organisation, closer links will be possible.

3.6 The Museum’s public is reached beyond the main building and its Lever Street store in a number of different ways:

i) The ‘Museum on the Move’ provides an education service to primary schools in Docklands. It also attends community and wider public events.

ii) Museum staff lecture and publish widely, at all levels of comprehension. Regular tours are arranged for visitors at the Visitor Centre, at Royal Victoria Dock, and at Lever Street.

iii) The history of the Museum was published in March 1991. This is the first, fully researched history of the Guildhall and London museums and the present Museum.
iv) Collaborative projects, of a commercial or reciprocal nature, extend the Museum's boundaries in London:

the Tower Hill Pageant, researched and devised by Museum staff in association with Culverin Consortium, will open to the public in September 1991.

an exhibition drawing upon the Museum’s major collection of royal dress is being planned for display at the Barbican Art Gallery in 1994

and abroad:

the Museum is providing the coordination and much research and loan input for the London um 1800 exhibition to be held at the Villa Hugel, Essen, Germany in 1992. H.M. The Queen has graciously agreed to act as British patron; President Richard von Weizsäcker is the German patron.

All these initiatives will enable important collections to be displayed and appreciated in a manner which cannot be achieved within the physical constraints of the main Museum building.

3.7 A more limited but significant public is that of the wider museum community in the British Isles and beyond. Museum staff are actively involved with committees of the London Federation of Museums and Galleries, AMSSEE, the Museum Training Institute (MTI), the Museums Association (of which the Director is President in 1990/92), the International Council of Museums, and the European Commission. Visits from overseas museums' staff and archaeologists, often arranged by the British Council, have increased in recent years and this is likely to continue. Advice is regularly given to other museums and galleries on all aspects of work, notably on initiatives such as the condition of collections surveys, documentation and marketing. A newly formed Museum Marketing Group for London’s national museums and galleries was recently started by the Museum. The Museum is regularly consulted by London borough museums or museum development officers in boroughs where new museums are being planned. This is in addition to loans (section 2.4) and involvement with specialist discipline groups and committees and trustee functions undertaken by staff. Senior staff also act as independent advisers for the Reviewing Committee on the Export of Works of Art, advise upon Government Indemnity valuations and upon Works of Art offered in lieu of taxation. The Museum also provides tutors for the Museums Diploma. This essential interchange of ideas and skills is a strength of British museums, but has not been the subject of formal analysis.

3.8 In the 1990s the Museum would wish to take a lead in promoting conferences and seminars which consider topics of concern to museums specialising in aspects of London’s history, social history, material culture and archaeology.
### TABLE 9A

Note: —► indicates a continuing activity or programme.
—* 1* indicates the year in which a project is to be completed.

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<tbody>
<tr>
<td>1. Resource Centre, Eagle Wharf Road</td>
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<tr>
<td>a) Design and use study for introduction when building work completed.</td>
<td>a) Occupation of Resource Centre.</td>
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<td></td>
<td>a) Feasibility study for a small travelling exhibition unit to be based at Eagle Wharf Road.</td>
<td>a) Bid for new funds to set up Unit.</td>
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<tr>
<td>b) Preliminary fundraising for Visitor Centre and new Costume &amp; Textiles store; works to be costed.</td>
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<tr>
<td>2. Conditions of collections surveys</td>
<td>a) Completion of surveys.</td>
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<tr>
<td>3. Documentation</td>
<td>a) Continued programme of computerisation.</td>
<td></td>
<td></td>
<td>a) Requirement for upgraded computer to cope with continued documentation.</td>
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<tr>
<td>c) Centralisation of loan procedures.</td>
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<tr>
<td>4. Acquisition and disposal (all collections, including Archaeology &amp; Docklands)</td>
<td>a) Categorisation of collections according to their significance to a Museum of London history.</td>
<td></td>
<td></td>
<td>Introduction of a refocused policy incorporating these views.</td>
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<tr>
<td>b) Review of disposals policy linked to 4a.</td>
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<td>c) Review of proposed cost of collecting policy.</td>
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<td><strong>1. Visitors</strong></td>
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<td>a) Assessment of the effect on visitor figures if entrance charges are introduced.</td>
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<tr>
<td>b) Regular market research amongst visitors and non-visitors to the Museum.</td>
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<tr>
<td>c) Building new audiences—the main report gives examples of lines of new work.</td>
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<td><strong>2. Education</strong></td>
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<tr>
<td>Review of educational provision to adults, specifically considering the needs of those deterred by specialist academic programmes.</td>
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<tr>
<td><strong>3. Permanent gallery displays</strong></td>
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<tr>
<td>a) Regular maintenance and replacement of graphic panels and captions as appropriate.</td>
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<tr>
<td>b) Continued preparation of research and design for Tudor theatres case.</td>
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<tr>
<td>c) Preparation and submission of plan for new post-1945 gallery.</td>
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<td>d) Discussions on content of revised Roman gallery.</td>
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<td><strong>4. Exhibitions</strong></td>
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<tr>
<td>a) Revised programme, allowing staff to spend more time on gallery maintenance work and other programmes.</td>
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<td>b) Sadhu and the Peopling of London</td>
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<tr>
<td>c) Future programmes under discussion.</td>
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<td><strong>5. External Liaison</strong></td>
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<tr>
<td>a) Building closer liaison</td>
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<td>with London borough museums.</td>
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<tr>
<td>b) Opening of Tower Hill</td>
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<td>Pageant in September; all</td>
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<td>costs met by developer;</td>
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<td>minimum income of £10,000 p.a.</td>
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<tr>
<td>c) Coordination of exhibition</td>
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<tr>
<td>and catalogue for London</td>
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<tr>
<td>urn 1800; all costs met.</td>
<td></td>
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<tr>
<td>d) Preliminary work on Royal</td>
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<td>Dress 1815-1914 exhibition in</td>
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<tr>
<td>conjunction with Barbican Art</td>
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<tr>
<td>Gallery; sponsor(s) to be</td>
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<td>found.</td>
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<tr>
<td>e) Installation of London</td>
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<tr>
<td>urn 1800, Villa Hugel, Essen,</td>
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<tr>
<td>f) Establishment of a Friends</td>
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<tr>
<td>organisation for the Museum.</td>
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### TABLE 9A

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<tbody>
<tr>
<td>1. Restructuring</td>
<td>a) Implementation of curatorial restructuring in so far as grant-in-aid will permit.</td>
<td>b) Reassessment of the balance of staff required to fulfill all planned collections-based and public programmes.</td>
<td>a) Assessment of the success of restructuring in all aspects of its application.</td>
<td>b) Bid for funds to fill all Museum establishment posts.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Consideration of the departmental structures for Archaeology (main account) and Docklands-based staff. Possible assimilation into the main Museum structure.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Resource Centre staffing</td>
<td>a) Assessment of minimum number of security and curatorial staff required to operate this Centre: costings to be finalised.</td>
<td>a) Security and other staff installed at the Centre.</td>
<td></td>
<td></td>
<td>b) Bid for additional staff to operate exhibition units.</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>3. Reviews</td>
<td>a) Review of the Museum's financial operations: staff, equipment and training.</td>
<td>a) Implementation of results of review.</td>
<td>a) Assessment of new operation and adjustment if required.</td>
<td>b) Assessment of new operation and adjustment if required.</td>
<td>c) Assessment and adjustment of new operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) Review of House Management, Security and Attendant staff.</td>
<td>b) Implementation of results of review.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>c) Review of Personnel department.</td>
<td>c) Implementation of results of review.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Training</td>
<td>a) Phased implementation, after review of training programme based upon the Pannell, Kerr, Forster report: no Training Officer post.</td>
<td></td>
<td></td>
<td>a) Bid for full- or part-time Training Officer post.</td>
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<tr>
<td></td>
<td>b) Increased expenditure on training from c. £50,500 (91/92) to c. £75,000.</td>
<td></td>
<td>b) Expenditure on training raised by 15%.</td>
<td></td>
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<tr>
<td>5. Museum Establishment</td>
<td>a) Regular monitoring of vacant posts, followed by assessment of whether the Establishment continues to reflect the Museum's objectives.</td>
<td></td>
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</tbody>
</table>

279
### TABLE 9A

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<tbody>
<tr>
<td><strong>1. Leased premises excluding main building and Resource Centre</strong></td>
<td></td>
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<tr>
<td>a) Review of leased premises to be vacated in 1992/93.</td>
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<tr>
<td>b) Completion of negotiations for leases on W &amp; K warehouses, Royal Victoria Dock.</td>
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<tr>
<td><strong>2. Resource Centre</strong></td>
<td></td>
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<tr>
<td>a) Conversion of Resource Centre at estimated budget of £1m-£1.2m.</td>
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<tr>
<td>b) Planned design and use for Visitor Centre, Eagle Wharf Road and Costume store.</td>
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<td><strong>3. Maintenance</strong></td>
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<tr>
<td>a) Routine maintenance of all Museum buildings.</td>
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<tr>
<td>b) Assessment and timetabling of major works on roofs and air-conditioning/heating in the main building.</td>
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<td><strong>4. New entrance</strong></td>
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<tr>
<td>a) Discussions with City Corporation about possible colonisation of Podium area.</td>
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<tr>
<td><strong>5. Museum site</strong></td>
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<tr>
<td>a) Continued discussions with City Corporation to ascertain future of Bastion House and therefore of the Museum. Decisions related to cost of 3b and the desirability of such expensive work.</td>
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<td>b) Regular review of all leased premises.</td>
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<tr>
<td>b) Review of occupancy of W &amp; K warehouses.</td>
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<tr>
<td>a) Transfer of collections as 1(a) above.</td>
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<tr>
<td>b) Installation works for Visitor Centre and Costume store.</td>
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<tr>
<td>c) Identify any areas of Resource Centre which could be let on short-term leases.</td>
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<tr>
<td>c) Lettings</td>
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<tr>
<td>a) To be time-tabled if agreed and funded outside grant-aid.</td>
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<tr>
<td>a) Decision about Museum site will be a key factor in bids for this and successive financial years.</td>
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## TABLE 9A

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<tbody>
<tr>
<td>1. Grant-in-aid</td>
<td>Projected minimum shortfall of £176,000 over grant.</td>
<td>Projected minimum shortfall of £263,000 over grant.</td>
<td>Projected minimum shortfall of £531,000 over grant.</td>
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<tr>
<td>2. Expenditure</td>
<td>a) Fixed overheads £3,981,000.</td>
<td>a) Fixed overheads £4,101,000.</td>
<td>a) Fixed overheads £4,229,000.</td>
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<td></td>
<td>b) Operating costs £4,432,000.</td>
<td>b) Operating costs £4,774,000.</td>
<td>b) Operating costs £5,172,000.</td>
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<tr>
<td></td>
<td>c) Revision and reallocation of all departmental budgets after restructuring.</td>
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<td></td>
<td>d) Raised expenditure upon training provision, increase of 15% p.a.</td>
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<td></td>
<td>e) Revised expenditure upon staff required to operate Resource Centre.</td>
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<td>f) Potential raised expenditure as result of financial review.</td>
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<td></td>
<td>g) Raised expenditure on programmes related to conditions and care of collections.</td>
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<td></td>
<td>h) Raised expenditure on documentation and information systems staff.</td>
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<td></td>
<td>i) Potential raised expenditure as result of House Management review.</td>
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<td></td>
<td>j) Included in new bid for grant-in-aid 1995 or 1996 (see S).</td>
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<tr>
<td>3. Revisions to meet reduced budget</td>
<td>a) Board decision about staffing levels, possible net savings of c. £35,000.</td>
<td>a) Net savings of £200,000 on staff reductions.</td>
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<td>b) Board decision about entrance charges for introduction in September 1991; income of c. £167,000 excluding VAT.</td>
<td>b) Entrance charges income of c. £125,000 excluding VAT.</td>
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<td></td>
<td>c) Board decisions about further economies if 3a and 3b below target for 1993/94. To include a review of all contracted services provided by the City Corporation if the Board so wish.</td>
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<td></td>
<td>d) All exhibitions to be sponsored in part if not wholly.</td>
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### TABLE 9A

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<td>4. Income</td>
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<td>a) Development Council target of £100,000.</td>
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<td>b) Lettings, sales functions. The Shop will be dependent to a greater or lesser extent on reaction to admission charges. Possibly a net sum (excluding staff costs, overheads etc) might be c. £75,000.</td>
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<tr>
<td>a) Development Council target of £175,000.</td>
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<tr>
<td>5. Bids for increased grant-in-aid</td>
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<tr>
<td>a) Bid to Wolfson Fund to support revised post-1945 gallery.</td>
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<tr>
<td>b) See section 2 for raised expenditure (2e-2i).</td>
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<tr>
<td>c) Overall requirement to fill Establishment.</td>
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<td>d) Feasibility study on exhibitions unit at Resource Centre.</td>
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<tr>
<td>e) New contract (3-year) post of Training Officer.</td>
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<td>f) Repairs roof -- capital programme c. £1m.</td>
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<td>g) Replacement of air-conditioning system; no estimates.</td>
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</table>

N.B. All income from private or commercial sources is unpredictable. It cannot be expected to fund permanent core functions, eg buildings, staff, but must be seen as an additional source of funds for finite projects or programmes.
### COST OF NEW PROPOSALS

**TABLE 9B**

N.B. *These sums are additional to the cost of existing proposals shown in Table 6A.*

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<td><strong>Collections</strong></td>
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<td>Visitor Centre and C &amp; T Store</td>
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<td>3a) Extra computer equipment</td>
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<td>1b)</td>
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<td>1a) Trav. exhib. unit</td>
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<td><strong>Public programmes</strong></td>
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<td>Tudor Theatre display</td>
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<td>Post-1945 Gallery</td>
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<td>3a)</td>
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<td>5d) Royal Dress</td>
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<td>3a)</td>
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<td>2a) Filling all estab. posts</td>
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<td><strong>Buildings</strong></td>
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<td>New entrance</td>
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<td>Roof replacement</td>
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<td>Air conditioning</td>
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<td><strong>Expenditure &amp; Income</strong></td>
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<td>Staff cuts</td>
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<td>Admission charges</td>
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<td>VAT refunds</td>
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<td>Development Council</td>
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283
STRATEGY FOR THE PRESERVATION OF THE MoL COLLECTIONS

1. Present situation

At present a very high proportion of the collections can be estimated to be actively deteriorating (see Appendix A). This is due to:

- Overcrowded and unsuitable stores with poor or no environmental or dust control
- Displays in which the design actively promotes deterioration
- Acquisition policies which have until recently taken no account of whether additional objects can be housed or displayed without detriment to themselves or to existing material
- Too few staff to treat objects in order to reverse deterioration and to remove its causes

This situation must be of serious concern: the Museum is substantially failing to perform its function of preserving and caring for the collections. This Museum is not alone. Recent reports from the Auditor General and the Commons Public Accounts Committee have highlighted parallels in the National museums. The deterioration of publicly owned collections is attracting considerable public attention at present. Arguments have been put forward for enhanced Government funding for the care of the collections, with costed proposals for the V. & A. and the British Museum.

2. Action needed

The Museum of London should take advantage of this climate of opinion to seek additional funding for preserving its own collections. Several of the improvements outlined below (Section 3) are already planned or being implemented. For example, substantial funds have already been gained for the Support Centre proposal; the Galleries Renewal is under way; and acquisitions policies are being revised. However, other improvements, for instance the extra resources needed for remedial treatment, have not been planned. We now need to draw these lines of action together into:

- A clear strategy for improvements as a whole, with a co-ordinated plan for implementation
- Quantification of what needs to be done
- Realistic costings for both resources and staff.

3. Outline strategy

3.1 Management – Ensure that the preservation function is represented at all levels of the Museum's management
3.2 Storage - vigorously develop and pursue Support Centre plan:
- review all stores and storage systems and plan improvements
- apply Support Centre concepts to all existing stores
- vacate Spitalfields store at earliest opportunity

3.3 Displays - take advantage of galleries redesign to incorporate best current conservation display practice.
- Make ad hoc improvements to existing displays where possible.
- Devote more curatorial and conservation time to upkeep of displays.
- For loans, aim to: record condition of objects before and after loan; specify and monitor display conditions
- Improve provisions for safe transport.

3.4 Acquisitions - develop much tighter policy
- assess resources implications when decision to acquire is taken.

3.5 Museum in Docklands
- Resolve relationship of Docklands collections to central Museum.
- Take policy decision on whether same standards of care are to apply.
- If so, survey and cost improvements to care as in 3.6
- Incorporate conservation advice into museum and display design.

3.6 Quantification of remedial work required
- Identify priority types of collection and undertake sample surveys of condition and work required.
- Develop A, B, C, categorization of objects.
- Urgently clarify the status of presently unrecorded material in collections.
- Develop outline work programme.

3.7 Resources (staff and space) - A priority has been to develop the marketing and public services staff and accommodation, in line with the need to generate increased income.

If the condition of the collections is to be improved, and the Museum is also to expand its gallery space, loan programmes, etc. then the next priority must be to develop resources for preservation, i.e.:

- Initially, appoint conservation staff recommended in OAL staff review.
- Quantify additional staff needed for work programme, including curatorial Museum Assistants and Support Centre technicians.
- Plan additional work space.
- Develop approximate costings.
4. Conclusion

Substantial improvements to the care of the MoL collections are already planned, but they need to be extended. We should capitalize on the current climate of public concern by candidly describing our problems, extending our existing plans, and costing their full implementation, in order to make our own response to these public reports.

Suzanne Keene
January 1989
STRATEGY FOR THE CARE OF COLLECTIONS

DISCUSSION DOCUMENT

SUMMARY

This is a discussion document, which utilises the results of the Collections Condition Surveys: the first stage towards a practical plan for improving the condition of the collections, to be included in the 5 Year Plan.

A prerequisite is for the Museum to define or adopt standards to aim for, for both preventive care and for the condition of the collections.

Collections care needs greater commitment and input from senior management.

To complement the Collections Condition Audit, each store has now been assessed, and detailed information is available.

Our proposals for how to move forward use the plans for stores moves as a basis for action. Broadly, collections should be cleaned and re-packed, and improved storage equipment purchased, as the collections are moved.

The storage space on the main site should be completely reviewed, and collections moved to more suitable spaces where necessary.

Programmes of archival packaging, etc., for the paper collections should be established, concurrently with work on the three-dimensional object collections.

For remedial treatment, particular collections should be targeted, and projects set up.

More time, and thus resources, will be needed for collections care, conservation, technicians, objects administration, and curatorial. There also needs to be investment in storage equipment and materials. Consideration should be given to contracting out certain simple, large-scale tasks (e.g. making archival boxes, garment bags and padded hangers).

Suzanne Keene 18th February 1992
for the Conservation Department
CONSERVATION DEPARTMENT

STRATEGY FOR THE CARE OF COLLECTIONS

DISCUSSION DOCUMENT

The 5 Year Plan has objectives in 1992 onwards for the phased implementation of the results of the Collections Condition Surveys (Condition Audits) undertaken in 1989-91. The Conservation Department has just undertaken a complementary survey of preventive conservation needs, and this information is now available. This paper sets out the conclusions of an initial discussion of the results, as suggestions for wider debate and agreement.

1. POLICY FOR COLLECTIONS PRESERVATION AND CARE

The duty of the Museum towards its collections is set out in the Museum of London Act: "... to preserve and care for the collections ...".

To perform this duty, two specific objectives need to be set: one to take all possible measures to prevent and control the deterioration of the collections; and the second to physically maintain the objects themselves.

For both these objectives, a prerequisite is for the Museum to define the standards which it considers acceptable.

2. PROPOSED STANDARDS

The proposed standards can clearly only be achieved over a period of time. But it is important to state what the ultimate objectives are, and to design the strategy so as to move towards them.

2.1 Standards for preventive care

Deterioration can never be completely halted, only controlled; nevertheless, there are well-recognised ways of greatly slowing it. These are embodied in the various international and specific STANDARDS which exist for the environment and other preservative measures.

Standards will increasingly be imposed as part of the Museums Registration Scheme. The Museum should aim to adhere to the following standards, as appropriate:

Generally, and for display:


For archives, the library, and for paper based collections:

BS 5687: Recommendations for storage conditions for silver image photographic plates for record purposes.

Museums and Galleries Commission, 1990: Code of Practice on archives for museums in the U.K.

For the Archaeology Collections:


For the Costume and Textile Collections:

ICOM Costume Committee: Guidelines for Costume Collections.

And other relevant standards, as they are developed, especially those set by the Museums and Galleries Commission.

2.2 Standards for the maintenance of objects in the collections

These should be defined using the condition grades developed in the Collections Condition Audits. The Museum's ultimate objective should be that no objects in the permanent collections should be rated Priorities 1 or 2 (i.e., within the limits of they should not be deteriorating due to rectifiable factors).

The terms "STABLE" and "ACCEPTABLE" need to be defined in the context of each collection.

Priority 1: URGENT Object actively deteriorating
Priority 2: DETERIORATING Unstable, needs remedial treatment
Priority 3: STABLE Not deteriorating, but needs much work before display
Priority 4: ACCEPTABLE Little or no conservation needed.

3. MANAGEMENT AND ORGANISATION

3.1 There has been a very commendable shift of finance and staff towards collections care. But at present, there is no management forum for organising projects to effectively use these resources. Even well-established conservation projects with management support such as the Galleries Refurbishment have been disrupted, due to the unresolved conflict of priorities for care versus display. In contrast, the Exhibitions and Publications Committees are working extremely effectively.

A proper committee needs to be established to redress the balance. Like the other committees, this needs to be: a) composed of senior managers, who can agree joint work programmes and commit resources; b) meet at regular intervals and not be cancelled or deferred; and c) have the
serious commitment of the Deputy Director or Acting Head of the Curatorial Division, who should chair meetings, organise minutes, chase up agreed action, etc. Without this commitment, the large-scale improvements that should, and could, take place, are unlikely.

3.2 Improvements to specific collections

As well as this, fora need to be established to plan and monitor improvements for specific collections, following the model of the Costume Forum. These groups should consist of conservators, curators, and OID staff. Their running can also be delegated to these staff; with careful monitoring and support they will provide valuable opportunities for staff development.

3.3 The curatorial collections audit

It is supposed that this will result in objects being disposed of. In an ideal world, this would precede improvements to collections care. But we think that improvements to storage and housing should not await this process (just as inventorying is proceeding now).

4. DISPLAYS AND GALLERIES IMPROVEMENTS

Many of the best objects are on display. Improvements to conservation aspects of our displays are already under way: the existing galleries are being worked through in the Galleries Refurbishment Project; and as galleries or displays are reconstructed, the design takes full account of conservation requirements, as do temporary exhibitions.

5. SOCIAL HISTORY AND EARLY LONDON COLLECTIONS: Lever Street and Spitalfields

It should be the aim to do as much preventive and urgent remedial work as possible as part of the stores move, i.e.:

5.1 remove surface dust and dirt; provide better support and packing for the most vulnerable objects; re-attach loose parts.

5.2 specify and plan improved storage equipment (cupboards, dustproofing, etc.), and plan its purchase.

These measures are already in train, but time for preservation work, scheduled for the summer and early autumn this year, must be protected. Conservation time has been scheduled, but curatorial / OID time will also be required if we are to extract the maximum gain from this move.

5.3 Social History and Early London collections: main site stores

A series of minor building works are needed, which could be put in train next year. The Stores Assessment Sheets detail these.
5.3.1 The General, Metals, Ceramics and Glass, and Archaeology

Racked stores are likely to be vacated to the Support Centre in the second occupation phase. Preventive and remedial improvements should be scheduled for this event, as above; but much can be done by way of repacking and better protection for objects in the meantime.

5.3.2 Collections to stay on this site: A final decision on which collections are to move should be taken as soon as possible. Then, main site collections storage should be thoroughly re-assessed. For example, better locations should be sought for the Costume Collection and for the Prints, Drawings and Watercolours. These are two of the most vulnerable collections, and the present stores are very far from meeting the appropriate standards.

Preventive and remedial care should then be scheduled in line with re-housing the collections.

6. THE COSTUME COLLECTION

The Collections Condition Audits identified main areas needing conservation, and a start is being made on this.

However, many faults stem from overcrowded conditions and unsuitable storage equipment. Though the store is not now to move to Eagle Wharf, it may well be that it should move to a better site here. As with other collections, major improvements should be planned for this event.

7. THE PAPER BASED COLLECTIONS

Numerically, over half the Museum objects are of paper or related materials. As well as collections such as Printed Ephemera, Historic Photographs, and the Library and Archives, it is easy to overlook the vast amount of paper objects in Lever Street, as part of the Social History collections, as toys, and as overflow printed ephemera.

7.1 The need for curatorial decisions

Before planning improvements, there needs to be a discussion of what material is to be retained, and how it is to be curated. If the Lever Street material is a business archive, then it must be organised and housed in a particular manner. If it is simply a selection of display objects, then it seems to us that a very large proportion need not be retained. Either way, decisions at least should be taken before the move to Eagle Wharf. Similar urgent decisions need to be taken for the Whitefriars Archive.

7.2 Strategy for improvements

Although there is a vast amount of paper-based material, a determined and co-ordinated approach will make a difference. The PLA Library is a shining example of what can be achieved with no more staff or money than the Museum has had.
7.2.1 **Material in Lever Street**

Decide fate, dust and re-box as part of move.

7.2.2 **Material in main site stores**

For each collection (Printed Ephemera; Prints, Drawings and Watercolours; Historic Photographs, Library and Archive), whether that store is the best location needs to be considered when the use of the main site storage space is discussed. The Print Room has a very damaging environment, and either air conditioning or re-location of the collection is needed.

Establish programme of preservation care - archival storage, re-mounting, etc. - for each collection.

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8. **DOCKLANDS AND WORKING HISTORY**

8.1 "W" and "K" warehouses.

The problems facing these collections are only too well known to the Docklands team.

Both stores have structural defects, such as roof leaks, deteriorated brickwork, etc. These need addressing before any other work is contemplated. Objects are undoubtedly deteriorating, and control of the environment is urgently needed. Although a simple measure such as covers to keep off dust and debris might be possible, experience with the vehicles in Ewer Street suggests that in poor environmental conditions this creates an even worse local environment around the object.

Some objects - watches and scientific instruments - should be moved to the main site or Lever Street at once. First aid conservation can be administered to prevent the severe deterioration which is about to happen.

It is highly desirable that the most vulnerable objects move to Eagle Wharf, as is already planned. They should be cleaned, etc., in preparation for the move, as for the Lever Street material.

A Collections Condition Audit will be organised by the Conservation Department, with assistance, in late spring. An obvious priority for practical action is to re-assemble objects that have previously been stripped down, before they become disassociated and people forget how they fit together.

8.2 The Docklands Library and Archive.

This library is well housed and has benefitted from simple but systematic and regular care and investment. Although there is much remedial treatment to be done, preventive care is streets ahead of most of that in the main Museum.
However, there are collections of large plans, archives, etc. (not seen by us) for which measures similar to those needed for the Lever Street paper are required: decisions on status, dusting, boxing, etc.

A Collections Condition Audit would be desirable, but the means need to be discussed.

9. THE ARCHAEOLOGY ARCHIVE

This consists of site archives, both objects and records, in a number of stores and locations. Its assessment is currently being discussed.

The objective for the Museum will be for the archive to be prepared to the standard being drawn up for all such archives before the Museum becomes responsible for it.

10. REMEDIAL AND CONSERVATION TREATMENT

10.1 Roles and organisation

The urgent need of many objects for actual treatment must not be overlooked.

The Conservation Department's role is much as it has been vis a vis the archaeology Finds Processors and the Early Department: we -

Specify standards for storage equipment, packing materials, etc., and help to find suitable products;

Specify standards for the stores and display environment, and assist in identifying the measures for meeting these;

Monitor the environment, including checking pests, handling, physical storage, etc. and advise on or take necessary action - sometimes co-operatively, as in the Costume Collection;

Assist or set up re-packing, preservation cleaning, mounting, etc. as part of co-operative projects.

Who does what, and regular ongoing programmes, need to be set up for each collection as in the Costume Forum (see above, ***).

10.2 Treatment programmes

Collection areas are defined for this discussion as:

- Early London Collections
- Social History / Applied Arts
- Costume and textiles
- Paper-based collections
- Archaeology: MOLAS collections
In each collection area, a few specific collection groups should be identified for remedial work each year. These will initially be those considered both the most vulnerable in condition, and the most important curatorially. Curators will need to undertake their Curatorial Audits of these ahead of conservation work, and set aside the time to provide the necessary consultation, etc.

Specific targets should then be set for the condition of these collections, and the necessary work and programmes of conservation set up as projects. These projects must be protected from marauding for time for public programmes.

Remedial projects need to include complementary programmes of re-packaging or storage improvements.

11. RESOURCES

At present staffing levels, more than one Section of the Conservation Department has too few staff to keep pace with the exhibition programme. Private conservators are having to undertake overflow work on contract. Few objects can be treated for the study collections.

Figures will shortly be available on the conservator-years that would be required to treat objects so as to meet the objective proposed above (2.2). Requirements are likely to be large; but even though the timescale may be long, movement towards it must be planned.

In addition to conservation time, more time from the existing Technicians, and from support staff such as curatorial assistants is certain to be needed.

There will also need to be a steady investment in storage equipment and materials, to be costed by the OJAD.
Work planning, monitoring
and reporting
# EXHIBITION PROGRAMME 1992-1994

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## Permanent galleries
- **Tinder and Earls Court Thieves**
- Contemporary paintings and drawings
- 20th-Century corridor

## Temporary exhibition area
- **Suffragettes** (14/9/92 - June 1993)
- **Peopling of London** (Sept 1993 - June 1994)

## Treasury
- **What is it?** (3/12/91 - 26/4/92)
- Documentary photography (1992 - 1993)
- **Tidmarsh** (1992 - 1993)
- **RCA Gordon Frazer Award**
- **Mugda Segal photographs** *Londoners in the context of their homes*
- Working history display
- **Ceramics from the Jonathan Horne exhibition**

## 20th-Century corridor
- **Images of the Blitz in Essex**
- **Images of the Blitz at Flambards**
- **Peopling of London touring box**
- **Jonathan Horne**
## PROVISIONAL EXHIBITION PROGRAMME 1994-1996

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<td><strong>Permanent galleries</strong></td>
<td>Installation of new Post-War gallery</td>
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<td><strong>Temporary exhibition area</strong></td>
<td>Peopling of London</td>
<td>Ḥюсь Steelyard</td>
<td>Saddlers Company</td>
<td>London in Film</td>
<td>Royal Costume (1997)</td>
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<td><strong>Treasury</strong></td>
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<td><strong>20th-Century corridor</strong></td>
<td>Installation of new Post-War gallery (space unavailable for temporary exhibitions)</td>
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<td>Peopling of London touring exhibition</td>
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</table>
CONSERVATION SCHEDULE 1992-1994

1992

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sept  Oct  Nov  Dec

Appl/Arts
Essen
Galls ref
Spitalfields / Lever St. preparation

T+T
Jona. Home
Peopling

Archeol
Study Collections projects
Lever St. prep
Archaeol archive

Tu

Paper
Essen
Suffragettes
Peopling
Es

Lever St. prep.
Imp. Cap. gallery ref.

T+T

Teaching
Essen
Suffragettes
Peopling
Es

18th cent. gallery costume

Opening dates
Essen
Suffragettes

Galleries
?Library
Docklands
Arch

Refurbish
Move

Sec

Exh

Imp. Cap. gallery refurb

20th cent. gallery refurb.
### Paper 8: The Conservation Department work schedule: deadlines

#### CONSERVATION SCHEDULE 1992-1994

<table>
<thead>
<tr>
<th>Project</th>
<th>Start date</th>
<th>Finish date</th>
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<tr>
<td>Essen loan</td>
<td>Ongoing</td>
<td>End May '92</td>
</tr>
<tr>
<td>Treasures + Trinkets dismantling</td>
<td>Jan. '92</td>
<td>Jan. '92</td>
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<td>Early London study collects. projects</td>
<td>Jan. '92</td>
<td>July '92</td>
</tr>
<tr>
<td>Suffragettes</td>
<td>Ongoing</td>
<td>1st Sept. '92</td>
</tr>
<tr>
<td>Galleries refurbishment - end of early 19th c.</td>
<td>Ongoing</td>
<td>April '92</td>
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<tr>
<td>Docklands survey</td>
<td>1st May '92</td>
<td>1st July '92</td>
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<tr>
<td>Support Centre move: Spitalfields / Lever Street</td>
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<tr>
<td>preparation: Applied Arts</td>
<td>1st May '92</td>
<td>1st Jan '92</td>
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<tr>
<td>Jonathan Horne exhibition</td>
<td>1st May '92</td>
<td>1st Aug. '92</td>
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<tr>
<td>Tudor + Stuart theatres case</td>
<td>1st May '92</td>
<td>1st June '92</td>
</tr>
<tr>
<td>Archaeology interim collections evaluation</td>
<td>1st June '92</td>
<td>1st Sept. '92</td>
</tr>
<tr>
<td>Lever Street preparation: Early Dept.</td>
<td>1st July '92</td>
<td>1st Oct. '92</td>
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<tr>
<td>Lever Street preparation: Paper collections</td>
<td>1st July '92</td>
<td>1st Oct. '92</td>
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<tr>
<td>Peopling of London - publication items</td>
<td>1st Oct '92</td>
<td>7th Dec. '92</td>
</tr>
<tr>
<td>Galleries refurbishment: Imperial Capital</td>
<td>1st Oct. '92</td>
<td>1st Apr. '93</td>
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<tr>
<td>18th Cent. gallery costume</td>
<td>1st Oct. '92</td>
<td>1st May '93</td>
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<tr>
<td>Essen loan return</td>
<td>7th Nov. '92</td>
<td>1st Dec. '92</td>
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<tr>
<td>Collections move: Metals and General Stores</td>
<td>1st Dec. '92</td>
<td>1st June '93</td>
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<tr>
<td>(Early Dept.)</td>
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<tr>
<td>Galleries refurbishment: Imperial Capital (textiles)</td>
<td>1st Feb. '93</td>
<td>1st Apr. '93</td>
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<tr>
<td>Galleries refurbishment: 20th Cent. gallery</td>
<td>1st Apr. '93</td>
<td>1st Oct. '93</td>
</tr>
<tr>
<td>Peopling of London: main work (Early Dept.)</td>
<td>1st May '93</td>
<td>1st Sept. '93</td>
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<tr>
<td>~ ditto ~ (Applied Arts, Paper)</td>
<td>1st June '93</td>
<td>1st Sept. '93</td>
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<tr>
<td>?Royal costume</td>
<td>14th May '93</td>
<td>1994</td>
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<tr>
<td>Roman gallery reconstruction</td>
<td>1st June '93</td>
<td>1st Dec. '93</td>
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<tr>
<td>Late 20th cent. gallery - catalogue objects</td>
<td>1st Oct. '93</td>
<td>1st Jan. '94</td>
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<tr>
<td>Prehistoric gallery reconstruction</td>
<td>1st Dec. '93</td>
<td>Ongoing</td>
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<tr>
<td>Toys exhibition</td>
<td>1st Jan. '93</td>
<td>Ongoing</td>
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18th February 1992
APPLICATION OF MAIN ACCOUNT STAFF TO PROJECTS - 1991/2 - 1993/4

FORECAST, 15th February 1991

<table>
<thead>
<tr>
<th>Person/ months</th>
<th>% time</th>
<th>post-equivalent</th>
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<tr>
<td><strong>CORE ACTIVITIES</strong></td>
<td></td>
<td></td>
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<tr>
<td>Eagle Wharf move</td>
<td>11</td>
<td>1</td>
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<tr>
<td>Preservation</td>
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<td>1</td>
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<td>Priority conservation</td>
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<tr>
<td>Archaeology archive</td>
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<tr>
<td>Historic photos evaluation</td>
<td>1</td>
<td>.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>39</td>
<td>16</td>
</tr>
</tbody>
</table>

| **STUDY COLLECTIONS** | | |
| Eagle Wharf move | 11 | 1 |
| Preservation | 11 | 1 |
| Priority conservation | 11 | 1 |
| Archaeology archive | 5 | .5 |
| Historic photos evaluation | 1 | .1 |
| **Total** | 39 | 16 | 3.6 |

| **PERMANENT GALLERIES** | | |
| Prehistoric / Roman | 6 | .5 |
| Galleries refurbishment | 23 | 2 |
| 18th cent costume | 6 | .5 |
| **Total** | 35 | 14 | 1.2 |

| **TEMPORARY EXHIBITIONS** | | |
| Suffragettes | 18 | 1.6 |
| 20th cent corridor | 1 | .25 |
| Peopling | 1 | .1 |
| **Total** | 19 | 8 | 1.85 |

| **PUBLICATIONS** | | |
| Tudor, Stuart, 19th cent booklets | 3 | .3 |
| | 3 | 1 | .3 |

| **LOANS, OFF-SITE DISPLAYS** | | |
| Off-site displays | | |
| Loans | 4 | .4 |
| Essen (main a/c time) | 6 | .5 |
| Pageant (""") | 7 | .6 |
| **Total** | 17 | 7 | 1.5 |

| **REQUIREING ADDITIONAL RESOURCES** | | |
| Pageant | 7 | .6 |
| Essen (additional time) | 15 | 1.4 |
| **Total** | 22 | 2 |

Current arch sites
Archaeol publications
APPLICATION OF MAIN ACCOUNT STAFF TO PROJECTS - 1991/2 - 1992/3

OUTCOME, 10th February 1992

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<tr>
<th>Personnel/</th>
<th>% time</th>
<th>% time</th>
<th>Variation</th>
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<tbody>
<tr>
<td>months</td>
<td>from</td>
<td>actual</td>
<td>planned</td>
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</table>

**CORE ACTIVITIES**

- Eagle Wharf move: 11
- Preservation: 11
- Priority conservation: 11
- Archaeology archive: 5
- Historic photos evaluation: 1

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<th>134.1 (+ 19 mths posts vacant etc)</th>
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<tr>
<td>134.2</td>
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**STUDY COLLECTIONS**

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<th>% time</th>
<th>Variation</th>
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<tr>
<td></td>
<td>months</td>
<td>from</td>
<td>actual</td>
<td>planned</td>
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**PERMANENT GALLERIES**

- Prehistoric / Roman: 6
- Galleries refurbishment: 23
- 18th cent costume: 6

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<tr>
<td>14</td>
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**TEMPORARY EXHIBITIONS**

- Suffragettes: 18
- 20th cent corridor: 1

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<th>19</th>
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**PUBLICATIONS**

- Tudor, Stuart, 19th cent booklets: 3

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**LOANS, OFF-SITE DISPLAYS**

- Off-site displays
- Loans: 4
- Essen (main a/c time): 6
- Pageant: 7

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<th>17</th>
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<tbody>
<tr>
<td>7</td>
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</tbody>
</table>

**REQUIRING ADDITIONAL RESOURCES**

- Pageant: 7
- Essen (additional time): 15

| 22 |

Current arch sites
Archaeol publications
CONSERVATION DEPARTMENT

MONTHLY WORK REPORT for NOVEMBER 1991

Major conservation: Shipwrights Co. chest; objects from Vintry site; wet wood treatment facility; large posters; costumes for Essen; 19th cent. gallery costume displays

"CORE" WORK:

General management: Senior Staff seminar & consequent planning:
Cons. management: New staff induction; Fulham pottery conservator assessed; financial planning for 1991 (arch.)
Exhibitions: Conservation & liaison for: "Watch with Mother"; "What is it?"; Essen; planning and advice: Prehistoric & Roman galleries

Collecs Centre: Refinement of specifications

Surveys: Candle snuffers surveyed
Archaeology: Cheapside presentation; Leadenhall Court publication; pilgrim badges publication report written; Spital publication. Courage Brewery timber checked.
Other: Lord Mayor's coach in and out; Pageant environment monitoring; B.A. research project continues

VISITORS:

Groups: = 2
NACF day
Fine metals course, West Dean

Individuals: = 4
English Heritage
Royal Armouries
National Gallery
Costume researcher

ENQUIRIES:

Public: = 3
1 - clock mechanism
1 -cons. of photographs
1 - moth damage on Mayoral robes

Outside professional: = 8
1 - jobs
1 - wet wood
2 - internships
4 - treatments/ techniques/ supplier:

LECTURES & SEMINARS - attended:
Rob Payton, Tim Hayes, Lyndsey Morgan: Recent advances in stone conservation
S. Keene, D. Goodburn Brown: Ancient and Historic Metals Symposium; Getty Institute, San Francisco
J. Hermans: IPC, Pigments (own time)
T. Mahoney: "Saving Energy", National Gallery/ MGC

LECTURES & SEMINARS - given: = 1
S. Keene: "Survival rates for treatments for archaeological iron", at Getty Institute seminar.

PUBLICATIONS: = 1

OTHER: Meeting with British Museum re iron surveys; visit to Northampton Leather Centre; visit to York & Jorvik Viking Centre

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## Conservation Department

### Monthly Work Report for November 1991

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<thead>
<tr>
<th>Study Collections</th>
<th>Time: Person/Hours</th>
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<td>Current arch sites:</td>
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<td>Archaeology pubs:</td>
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<td>Core collections:</td>
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<td>Basic clean, care:</td>
<td>8</td>
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<tr>
<td>Priority cons:</td>
<td>1 33</td>
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<tr>
<td>Surveys:</td>
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<td>Permanent Galleries</td>
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<tr>
<td>Prehistoric/Roman:</td>
<td>4 2</td>
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<td>Galleries + refurb.:</td>
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<td>Temporary Exhibitions</td>
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<td>Jewellery:</td>
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<td>What is it?</td>
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<td>Suffragettes:</td>
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<td>Royalty:</td>
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<td>Loans, off-site displays</td>
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<td>Tower Hill Pageant:</td>
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<td>Off-site displays:</td>
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<td>Essen:</td>
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<td>&quot;Core&quot; Activities</td>
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<td>Environment:</td>
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<td>Records + computer:</td>
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<td>Train., research, arts.:</td>
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<td>Money earning:</td>
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<td>Admin, leave, etc:</td>
<td>108 273 175 61 617</td>
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<td>Other:</td>
<td>40 18</td>
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<td>Totals:</td>
<td>21 144 46 20 231</td>
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### Other Work:
- Clock maintenance; Lord Mayor's Coach; IPMS / UKIC;

### Staff in Post:
- JH, TM, 1/2HM; BH, ZT, .25 contract

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### Conservation Department

**Quarterly Work Summary Jan - March 1991**

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<th>Objects Treated</th>
<th>Jan</th>
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<td>STUDY COLLECTIONS</td>
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<td>Basic clean, care</td>
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<td>Priority cons.</td>
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<td>29</td>
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<td>Current arch sites</td>
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<td>PERMANENT GALLERIES</td>
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<td>Prehistoric/Roman: J.</td>
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<td>Beatrix Potter</td>
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**Money Earning**

- Loans, acquisits.: 403
- Environment: 403
- Loans, off-site displays: 172
- Off-site displays: 172
- Loans, off-site displays: 172
- Loans, off-site displays: 172

**Equipment**

- "CORE" ACTIVITIES
  - Train., resear., arts.: 23
  - Money earning: 107
  - Admin., leave, etc: 552
  - Computer & records: 37

**Total**

- 2160

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**Quarterly Work Summary April - June 1991**

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**Equipment**

- "CORE" ACTIVITIES
  - Train., resear., arts.: 107
  - Money earning: 107
  - Admin., leave, etc: 552
  - Computer & records: 37

**Total**

- 2160

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**Note:** 23 objects treated for money earning in Feb.
48 ditto in March.
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### CORE ACTIVITIES

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<td>Train., reser., arts:</td>
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<td>Money earning:</td>
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<td>Managem., leave, etc:</td>
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|                         | 1937 | 1432 |

|                         | 42%  |      |

### TOTALS excl. arch.:  349  387  271  646  1720  1472  1612  4259  4004

### TOTALS incl. arch.:  1007

### STAFF:

- ApplA: SC; 1 C
- Arch: SC; 4 C
- Paper: SC; 1 C; 1/2 mth. stud.
- Text: SC; 1/2 mth. contr.
MUSEUM OF LONDON
Director’s Report to the Board
September 1991

9. Conservation Department

(i) General Departmental Management

Jill Barnard and Rose Johnson organised a Colloquium in May, on the conservation of archaeological iron, a controversial topic: this was highly successful and attracted much outside interest.

A lot of activity is planned or confirmed for next spring and summer: “Suffragettes”, loans to Essen, a loan of several crowns to The Hague, the Eagle Wharf move, and the construction of the Prehistoric and Roman Galleries. We have accordingly recommended against one loan which will come before the Board, since we cannot accommodate more work at this time. The Department now faces serious problems with regards access to suitable workspace.

(ii) Reporting

The statistics we presented to the Board have been revised. They show that more time has been spent on temporary exhibitions (“What is it?” was added since the first plan), and less time on the Study Collections than was planned by the Curatorial Division Heads of Departments.
However, a lot of this time was allocated for preparation for the Eagle Wharf move, and so should in fact be spent next year. The Galleries Refurbishment Programme has been kept up - the permanent galleries also need their share of attention. Nearly as many objects have been treated this year as were last, despite maternity leave, staff turnover, and archaeology problems: a creditable achievement by conservation staff.

(iii) Applied Arts Conservation

The Applied Arts section has been particularly busy with exhibitions and new display work during the summer: A wide range of unusual materials and objects, from a rubber piano to a plastic egg cup, have been cleaned and conserved for the forthcoming ‘What is it?’ exhibition. Objects have also been conserved and prepared for photography for next year’s ‘Suffragettes’ exhibition.

Some work has been carried out on the general gallery refurbishment programme, with the display of enamelled signs in the 19c shops area being cleaned and conserved. However the emphasis of the work has centred on new displays within the early 19th century gallery, most notably a new case, ‘Man of Science’, where furnishings have been conserved and advice has been given on the selection of period furniture. Objects have also been assessed for inclusion in the two costume cases in the early 19th century gallery that will be refurbished.

The section was involved in the return of the painting ‘Popularity’ after outside conservation, and in the recently acquired painting of an early panorama of London.

Work has continued on the several long term study collection projects: a 17th century bead basket; George IV piano; Dymoke armour; and the museums’ collection of watches.

(iv) Departmental Statistics

OBJECTS TREATED, April to August

<table>
<thead>
<tr>
<th></th>
<th>This Year</th>
<th>Last Year, 1990</th>
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<tbody>
<tr>
<td>1. Archaeology interim collections:</td>
<td>389</td>
<td>668</td>
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<td>2. Study collections:</td>
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<td>3. Permanent galleries:</td>
<td>132</td>
<td>282</td>
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<td>4. Temporary exhibitions:</td>
<td>359</td>
<td>391</td>
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<td>5. Loans, off-site displs.:</td>
<td>265</td>
<td>158</td>
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<tr>
<td>TOTALS:</td>
<td>1195</td>
<td>1499</td>
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CONSERVATION DEPARTMENT

STATISTICS FOR JUNE - AUGUST 1991

Use of conservation time in 1991:

Actual vs. planned per cent.

| Graph columns: Study collections, Galleries, Temporary exhibits, Publications, Off-site displays and loans, Core activities |
## Paper 13: Annual Work Analysis

**Conservation Department:** Cumulative Work in 1991

<table>
<thead>
<tr>
<th>Objects treated in quar.</th>
<th>Time: pers/hrs in quar.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar</td>
<td>Jun</td>
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</tbody>
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### Study Collections

<table>
<thead>
<tr>
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<th>Jun</th>
<th>Sep</th>
<th>Dec</th>
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<td>Current arch sites</td>
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<td>319</td>
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### Core Collections

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### Temporary Exhibitions

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<th>Sep</th>
<th>Dec</th>
<th>Total</th>
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<td>1</td>
<td>74</td>
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<td>Jewellery</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>What is it?</td>
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<td>119</td>
<td>28</td>
<td>148</td>
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<td>238</td>
<td>109</td>
<td>392</td>
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<td>Royalty</td>
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### Publications

| | | | | |
| (non-exhibition) | | | | |

### Loans, Off-Site Displays

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<th>Jun</th>
<th>Sep</th>
<th>Dec</th>
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<td>Tower Hill Pageant</td>
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### "Core" Activities

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<td>Managm.,leave,etc</td>
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Conservation: management information
for work in 1991

Where did the conservation time go?

Did we use time as we planned
(within 5%)?

<table>
<thead>
<tr>
<th>Collection</th>
<th>Loans + off-site displays</th>
<th>Exhibitions</th>
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</table>

Why did we conserve these objects?

Note: there are more archaeology conservators, due to separate funding

Which activities carry the highest time overheads?

Source: work monitoring data, MoL, 1991
Paper 15: Objects conserved each quarter 1987-1991

Textiles and costume

Paper

Applied arts

Archaeology

SUMCHA XLS

312


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<th>Arch</th>
<th>Appl A</th>
<th>Paper</th>
<th>Text</th>
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<td>251</td>
<td>139</td>
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**Notes:**
- The figures for "purposes" are lower than for Sections, because the latter include non-Museum objects.
- The table includes objects treated from 1987 to 1991, with quarters from March to December.

1987-91 XLS
Paper 17:

Numbers of objects treated for different projects,  
October 1989 - December 1991

a. Total objects treated for each project

<table>
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<tr>
<th>Project</th>
<th>Number of objects treated</th>
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<td>Non-mus. objs</td>
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<td>Priority cons.</td>
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<td>Beatr. Potter</td>
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<td>What is it?</td>
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<td>Showcases</td>
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<td>Gardens</td>
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<td>Pageant</td>
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<td>Jewellery</td>
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<td>Study collecs.</td>
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<td>Refurbishment</td>
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b. Proportions of objects treated by each Section, by projects

Note to (b): Conservation for archaeology publications and current sites omitted. Data for some projects have been combined.
The conservation database
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<th>C</th>
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<td>ACCESSION NO.</td>
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Type of object:  
Title:  
Date/Period:  
Maker/Artist:  
CONS. SECTION:  
CONSERVATOR:  
PURPOSE:  External Consn:  
Date received:  Date returned:  Hours:  
Recall year:  Reason:  
Photo: Trans.:  B & W:  Other:  
Condition:  
NOTES:  
Technical Report:  YES/NO  Signature:  Date:  

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**Time taken (hrs):** Recall: Recall date: Received by date: WEA type

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**CEA**

317
Paper 19: Flat file database: example of input using “Writer”

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<tr>
<td>Treatment</td>
<td>RINS</td>
</tr>
<tr>
<td>Method</td>
<td>deion. water/3 wks</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
</tr>
<tr>
<td>Part treated</td>
<td></td>
</tr>
</tbody>
</table>
Paper 20: Flat file database: examples of output

LCT04 9365 (1125) coin
DUA 02.87 3 STUD
ARCH D.G-BROWN
COPP -
whole -
RMCO mech
DEGR acetone/1 min
TNHI BTA/3% in IMS/16 hrs (vacuum 2 hrs)
DRIA ambient temp/3 days
COAT Incralac in toluene/Santocel x3
RECN Paraloid B48N in acetone

LCT04 9941 (1442) coin
ROM -
DUA 02.87 3 STUD
ARCH D.G-BROWN
COPP -
whole -
RMCO mech/limited
DEGR acetone/1 min
TNHI BTA/3% in IMS/16 hrs (vacuum 2 hrs)
DRIA ambient temp/3 days
COAT Incralac in toluene/Santocel x3

W. Ranwell: 'Building St. Katherines Dock'
WOVE WATE GOUA PENC WOOD GLAS J.HERMANS 02.87

(79.512/1) PRI 20 th.c.
Grace Carter: 'Thames Southside'
HWOV PENC WATE J.HERMANS 02.87

(84.302/10) PRI 1926
Grace Golden: 'Tower hill 1'
WMNV PENC INK J.HERMANS 02.87

MLK76 (989) 1193 DUA med
WOOD L.MORRISON 02.86

PDN81 (1733) 1892 DUA rom
WOOD L.MORRISON 02.86

PDN81 (1734) 1892 DUA rom
WOOD L.MORRISON 02.86

PDN81 (1988) 1897 DUA
WOOD L.MORRISON 02.86

PDN81 (1990) 2267 DUA rom
WOOD L.MORRISON 02.86

PDN81 (1717) 3216 DUA rom
WOOD L.MORRISON 02.86

319
-REASSEMBLED: To put the component parts of the object back into place by mechanical means.

-do not confuse: Reconstructed, clothed.

-rebound: see bound.

-RECONSTRUCTED: To join fragments or parts together using adhesive.

-do not confuse: Reassembled, adhered.

-RECOVERED: To provide a new outer covering layer.

-ex. The book was recovered with buckram.

-REINFORCED: To adhere an additional physical support to part of an object.

-do not confuse: Lined, supported.

-RELAXED: To cause the object to become limp and/or more flexible, by applying moisture or solvent vapour.

-ex. The parchment was relaxed by placing in a humidity chamber.

-do not confuse: Dressed.

-RELAID: To reattach existing thin layers.

-ex. The India-laid print was relaid.

-REMOVED: To take away things not to be returned to the object, chemically or mechanically.

-do not confuse: Disassembled, dismantled, bleached.

-specify: REM-BACKING: To remove old lining or backing and its adhesive.

-REM-CORROSION: To remove corrosion products.

-REM-DIRT: To remove unidentified unclean matter

-do not confuse: Rem dust, rem-soil.

REAS =reassembled
RECN =reconstructed
RECV =recovered
REIN =reinforced
RELA =relaid
RELX =relaxed
RENU =renumbered
REPL =replaced
RESH =reshaped
RETO =retouched
RINS =rinsed
RMBA =removed backing
RMCO =removed corrosion
RMDI =removed dirt
RMDU =removed dust
RMDT =removed other
RMRE =removed old repair
RMSO =removed soil
PRON =bronze
CAIR =cast iron
CALO =calotype
CANE =cane/bamboo
CARD =card
CEAC =cellulose acetate film
CELL =celluloid
CEME =cement
CENI =cellulose nitrate film
CERA =ceramic, unspec.
CHAL =chalk
CHAM =chamoise
CHAR =charcoal
CHIN =china
CLAW =claw
CLAY =clay, unfired
CLOT =cloth, bookbinding
COAL =coal
COIR =coir
COLP =colour print (photo)
COMP =wood composite (ply, etc)
CONT =conte pencil
COPP =copper (alloy)
COPR =collodion print
COPY =copy pencil
CORA =coral
CORK =cork
GOUA =gouache
GRAS =grass, straw, rush
GRP =glass reinf. plastic
GUM =gum
GUNM =gunmetal
GUTT =gutta-percha
HAIR =hair
HALF =half-tone
HAND =hand-made
HARD =hardboard
HEMP =hemp
HLAI =hand-made laid paper
HORN =horn
HMOV =hand-made wove paper
INK =drawing & writing ink
INTA =intaglio print
IRON =iron
IVOR =ivory (all kinds)
JET =jet
JUTE =jute
KAPO =kapok
LACQ =lacquer
LAID =laid
LOPO =lead point
LEAD =lead (alloy)
LEAF =leaf/papyrus
LEAT =leather
### MAP OF FUNCTION MODEL

**Develop and maintain the best possible understanding and record of Historic and Contemporary London**

<table>
<thead>
<tr>
<th>Determine strategies &amp; set up organisation</th>
<th>Collect, Excavate &amp; Record</th>
<th>Transmit concepts by exhibition, publication etc.</th>
<th>Manage Finance</th>
<th>Manage goods, buildings &amp; services</th>
<th>Manage information systems</th>
<th>Manage personnel services</th>
<th>Market ourselves &amp; our products</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Set objectives &amp; performance measures</td>
<td>2.1 Maintain a record of collecting policies</td>
<td>3.1 Maintain a list of events &amp; services provided by the Museum</td>
<td>4.1 Maintain accounts</td>
<td>5.1 Plan stocks of consumables</td>
<td>6.1 Maintain a record of systems architecture</td>
<td>7.1 Maintain employee &amp; employment data</td>
<td>8.1 Determine policies for marketing &amp; promotion</td>
</tr>
<tr>
<td>1.2 Create staff &amp; pay structures</td>
<td>2.2 Acquire objects, inventory &amp; catalogue</td>
<td>3.2 Maintain records of events</td>
<td>4.2 Manage cash flow</td>
<td>5.2 Plan stocks of equipment</td>
<td>6.2 Control &amp; record access; maintain systems security</td>
<td>7.2 Recruit staff</td>
<td>9.2 Develop marketing activities</td>
</tr>
<tr>
<td>1.3 Specify resource types and standard costs</td>
<td>2.3 Record London by excavation and fieldwork</td>
<td>3.3 Define and schedule events, projects</td>
<td>4.3 Secure finance &amp; collect income</td>
<td>5.3 Procure goods, equipment &amp; services (including internally)</td>
<td>6.3 Maintain a log of systems use</td>
<td>7.3 Monitor equal opportunities</td>
<td>10.3 Develop sponsorship &amp; funding</td>
</tr>
<tr>
<td>1.4 Make corporate plan, schedule activities</td>
<td>2.4 Maintain a record of areas of interest in the collections and records</td>
<td>3.4 Organise lectures, classes etc</td>
<td>4.4 Maintain insurance</td>
<td>5.4 Maintain valuation records of assets &amp; stocks</td>
<td>6.4 Maintain an inventory of library books &amp; records</td>
<td>7.4 Maintain records of attendance &amp; admission</td>
<td>11.4 Promote appreciation of the MOL</td>
</tr>
<tr>
<td>1.5 Set up and manage projects</td>
<td>2.5 Care for and conserve objects</td>
<td>3.5 Organise publications &amp; other media</td>
<td>4.5 Provide audit services</td>
<td>5.5 Move goods &amp; equipment etc</td>
<td>6.5 Maintain public interest in exhibitions</td>
<td>7.5 Record disciplinary hearings</td>
<td>12.5 Monitor the performance of revenue generation</td>
</tr>
<tr>
<td>1.6 Monitor &amp; report on performance</td>
<td>2.6 Store objects &amp; move them</td>
<td>3.6 Book rooms for events &amp; report use</td>
<td>4.6 Produce financial reports &amp; returns</td>
<td>5.6 Run buildings &amp; accommodation</td>
<td>6.6 Maintain public access to information</td>
<td>7.6 Maintain health &amp; safety standards</td>
<td>13.6 Monitor public perception of the MOL</td>
</tr>
<tr>
<td>2.7 Monitor and report on collections and collections management</td>
<td>3.7 Provide information on intellectual output and use of collections</td>
<td>3.8 Monitor public use of intellectual resources</td>
<td>3.9 Maintain information on visitors, enquirers etc</td>
<td>5.7 Plan &amp; secure legal services</td>
<td>5.8 Plan &amp; provide security</td>
<td>7.7 Manage staff appointments</td>
<td>14.7 Record training &amp; skills of staff</td>
</tr>
</tbody>
</table>

---

**Definitions:**
- Collect, excavate & record: Acquire, catalogue, and record objects and events.
- Transmit concepts: Develop and exhibit ideas.
- Manage finance: Ensure financial stability.
- Manage goods, buildings & services: Maintain infrastructure.
- Manage information systems: Protect and utilize data.
- Manage personnel services: Support staff.
- Market ourselves & our products: Promote collections and services.

---

**Notes:**
- DC 1999
- MAP of Function Model
- Paper 23: Relational database: complete museum functions
Key: The function model is hierarchical. "DETAILED" beside a function indicates that it is broken down into further sub-functions, shown in subsequent pages of the model.

TOP LEVEL INFORMATION FUNCTIONS

Maintain the physical and historic integrity of objects and collections

1. Set standards for and monitor the condition of objects and collections

2. Set standards for, monitor and record conditions in the stores and display environment, and other factors affecting the condition of objects or collections

3. Analyse and examine objects; record findings; communicate results

4. Record agreed treatment proposals; record treatments carried out on objects

5. Plan, schedule and monitor conservation work, activities and projects

6. Manage resources of time, money, equipment and people

7. Acquire, maintain, and use skills and expertise

8. Provide management information on the preservation of the collections and the use of resources

NOT DETAILED
SECOND LEVEL INFORMATION FUNCTIONS

1. Set standards for and monitor the condition of objects and collections
   1.1 Record a current condition survey of a collection: survey i.d.
   1.2 Maintain a record of condition surveys: survey i.d.s, dates, and collections surveyed
   1.3 Maintain condition records for an object, optionally noting the conservator making the record, and optionally as part of a condition survey: date, damage factors, descriptive text and associated object record occurrences in physical records, e.g. photographs
   1.4 Copy the existing current conservation priority of an object to be the previous conservation priority: update the current conservation priority
   1.5 Calculate the condition index figure for a collection from the analysis of condition reports for objects by conservation priority and damage factors
   1.6 Report a list of collections showing target condition indices and current condition index figures
   1.7 Report a list of objects by current conservation priority
   1.8 Report a list of objects showing the damage factors
   1.9 Report all condition records relating to an object
2. Set standards for, monitor and record conditions in the stores and display environment, and other factors affecting the condition of objects or collections

2.1 Record an environmental specification for an object or a place, consisting of environmental specification items for environmental factors, in units of measurement: i.e. temperature, relative humidity, gaseous and particulate pollution, lux level, lux-hours

2.2 Record an environmental measurement for an object or a place

2.3 Maintain an environmental record of environmental measurements for a place or an object over a time period

2.4 Record the 'use' of an object: demonstration, book loan, etc.

2.5 Report the environmental record for an object in a place and the environmental specification for that object

2.6 Report the environmental record for a place and the environmental specification for the place

2.7 Report the occurrences of 'use' of an object
3. Analyse and examine objects; record findings; communicate results

3.1 Maintain a record of observations or analysis of an object as a conservation job by a conservator / party / outside laboratory at a date: type (i.e. examination); time taken, job number

3.2 Record a procedure: sequence number, keyterm, results, as undertaken in a conservation job.

3.3 Record an object record occurrence of an object in a physical record, as created either in a conservation job or in a procedure which is part of a conservation job.

3.4 Maintain a list of physical records: type, i.d. number, dates created

3.5 Report a list of physical records of a type: i.d. numbers, objects occurring in them

3.6 Report a list of scientific examinations undertaken on an object, i.e. date, party, procedure, results

3.7 Report a list of physical records in which an object occurs
4. Record agreed treatment proposals; record treatments carried out on objects

4.1 Record a treatment proposal agreed by a conservator and a curator at a date for an object or for an object category, including a diagnosis of the cause of deterioration and details of the proposed treatment

4.2 Record a conservation job as undertaken on an object by a conservator / outside firm at a date, for a project / activity, of a type (i.e. treatment), and the total time taken on the job

4.3 Record a procedure carried out on an object part, within a conservation job: sequence number and details

4.4 Assign a new condition grade to an object which has been the subject of a conservation job (as in Function 1.4)
5. Plan, schedule and monitor conservation work, activities and projects

5.1 Maintain a list of projects / activities: start date, completion date, status, i.e. future, ongoing, terminated, completed

5.2 Maintain an object project list consisting of object project list inclusions of objects to be worked on for projects / activities

5.3 Make an object project list inclusion for an object needed for a project / activity: date, status: not needing treatment, not yet treated, treatment complete

5.4 Record a conservation job carried out on an object by a conservator at a date, and update the object project list inclusion status accordingly

5.5 Report a list and count of objects which have been the subject of conservation jobs during a time period, by collection
Paper 24.6: Information function model

6. Manage resources of time, money, equipment and people

6.1 Maintain a list of parties connected with conservation activities, i.e. conservators, curators, museum organisational units, outside laboratories, outside firms

6.2 Record the appointment of a conservator / person to a post, date, etc., and the existence of a post within a conservation section / unit

6.3 Monitor and report on the use of conservation time

6.4 Set a budget and monitor and report on expenditure and income

6.5 Maintain an inventory of equipment
7. Acquire, maintain, and use skills and expertise

7.1 Maintain a list of conservation events / courses / conferences: type, date, topic, cost

7.2 Record the attendance of a conservator at a conservation event / conference / course on a topic at a date

7.3 Maintain a record of publications references: title, date, details: subject of authorship by conservator(s)

7.4 Record a lecture / seminar / class given by a conservator at a conservation event on a date: topic, title, audience

7.5 Record a conservation event / conference as organised by a conservator: date, topic, title

7.6 Record the provision of a conservation service: date, type (enquiry or visit), consumer (e.g. other conservator, conservation or other course, member of the public), topic, time taken, as provided by a conservator / conservation section
1. CONDITION SURVEYS AND RECORDS

- **Object Record Occurrence**
  - Composed of
  - Physical Record
    - Type
    - i.d.
    - No.
    - Date

- **Condition Record**
  - Date
  - Made for
  - Recorded in

- **Conservation**
  - Name
  - Post
  - Kept for

- **Object**
  - i.d.
  - No.
  - Name
  - Details
  - Materials
  - Present condition
  - Previous cons. priority
  - Member of
  - Consisting of

- **Collection**
  - Name
  - Condition index
  - Target condition index
  - Subject of

- **Condition Survey**
  - i.d.
  - Subject of

**S. Keane**
16.12.90
2. ENVIRONMENTAL SPECIFICATION & MONITORING

Diagram showing an entity-relationship model with entities such as Environmental Measurement, Date Environmental Factor Value, Measured in, Recorded in, Environmental Record Time period, Collection Name, Description I.D. Code, Environmental Spec. Item, Environmental Factor Value, Unit of Measurement, and Place. Arrows indicate relationships and associations between these entities.
4. CONSERVATION TREATMENT

PROCEDURE
- No.
- Details
- Key Term

CONSERVATION
- Job
- Type
- Job No.
- Date
- Time Taken

TREATMENT PROPOSAL
- Date
- Text

OBJECT
- I.D. No.
- Name
- Details
- Materials
- Category

OBJECT CATEGORY
- Previous
- Cons. Priority
- Present
- Cons. Priority

PARTY
- OUTSIDE LAB.
  - Name
  - Designation
  - Post

CONSERVATION
- Name
- Post

S. KEENE
16.12.90
5. CONSERVATION WORK & ACTIVITIES

CONSERVATION

JOB

Type

Job no.

Date

Time taken

done by

undertaken on

subject of

OBJECT

i.d. no.

Name

Details

made up of

made up of

member of

COLLECTION

Name

PROJECT/ACTIVITY

Type

Status

Start/end date

generator of

OBJECT

PROJECT LIST

INCLUSION

Status

made up of

made up of

CONSERVATION SECTION

NAME:

CONSERVATOR

Name

Post

done of

S. Keene

29.12.30
Paper 25.7: Entity-relationship model: detail

Diagram:

- **PERSON/CURATOR NAME**
- **ORGANIZATION SECTION NAME**
- **DEPARTMENT ORGANIZATION NAME**
- **FUNCTION**
- **POST NAME**
- **MANAGE RESOURCES**

Relationships:
- **To**
- **Find by**
- **Contains**

Diagram details:
- Arrows indicating relationships between entities.
- Specific relationships labeled with **To**, **Find by**, and **Contains**.
7. ACQUISITION & USE OF EXPERTISE

[Diagram of entity-relationship model with entities such as ATTENDANCE, AUTHORSHIP, and CONSERVATION EVENT, along with relationships and attributes.]
B. MAINTAIN INFORMATION ON OBJECTS &c.
Museum of London CONSO1: ENTER/EDIT CONSERVATION TREATMENT RECORDS

Job month: SEP-91  
For project: 3225  
Conservator: PAYTON, Robert; MOLCONDEC

Seq PROC: method; materials used; time

Page 1 of 1
No_changes_to_commit.
Char Mode: Replace  
Page 1  
Count: *1

340
Paper 26.2: 'Oracle' database: input screen for an object with two parts

PAYTON, Robert: SENIOR_CONSERVATOR: MOLCONDEC(1055) on ttyq2 at 17-SEP-91

Museum of London CONSO01: ENTER/EDIT CONSERVATION TREATMENT RECORDS

<table>
<thead>
<tr>
<th>job month</th>
<th>JUL-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>for project</td>
<td>3225</td>
</tr>
<tr>
<td>conservator</td>
<td>1055</td>
</tr>
<tr>
<td>time taken</td>
<td>3 _hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>mol accno/id</th>
<th>58.74/2</th>
<th>crown_fra</th>
<th>W SILV</th>
<th>note/comment</th>
<th>pri st dept</th>
<th>seq PROC</th>
<th>method; materials used; time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>58.74/2-*</td>
<td>box</td>
<td>LEAT;WOOD;FIBR</td>
<td></td>
<td></td>
<td>10_RMTA</td>
<td>immersion; GHSD; 30_secs</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20_RINS</td>
<td>immersion; running _tap_water; 15_mins</td>
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</tbody>
</table>

Page 1 of 1

No_changes_to_commit.

Char Mode: Replace Page 1 Count: #1

341
Paper 26.3: 'Oracle' database: example of report

CONSR02 : Item Conservation History Report

for PAYTON, Robert : Senior Decorative

MOLCONDEC (1055) on ttyq? at 22-JUL-92 #

Report on Project ............... :

Report for Conservation Section ... : dec
Report for Post .................... : consd
Report for Simple name ............ : badge
Report for Objects in Department .. : mod
Report from Month (as MON-YY) ...... : jun-91
until and including Month ........ : aug-91
Status type required (A,C,E) ...... : a

77.166/3

SILV;ENAM (C) Stat : AQ : MOLMOD

badge
Job 132911 CONEX-SUF91 JUL-91 1055 : PAYTO : MOLCONDEC : Archived on 23-SEP-91
(RMTA) removed tarnish Dura

91.153/1

SILV;ENAM (C) Stat : AQ : MOLMOD

badge
Job 132933 CONEX-SUF91 JUL-91 1055 : PAYTO : MOLCONDEC : Archived on 23-SEP-91
(RMTA) removed tarnish immersed; GHSD; 1 min
(RINS) rinsed immersed; running tapwater; 10 mins
(DRIA) air dried air

91.153/2

SILV;ENAM;IRON (C) Stat : AQ : MOLMOD

badge
Job 132934 CONEX-SUF91 JUL-91 1055 : PAYTO : MOLCONDEC : Archived on 23-SEP-91
(RMTA) removed tarnish immersed; GHSD; 1 min
(RINS) rinsed immersed; running tapwater; 10 mins
(DRIA) air dried air

91.153/5

IRON;PLAS;COPP (C) Stat : AQ : MOLMOD

badge
Job 133359 CONEX-SUF91 JUL-91 1055 : PAYTO : MOLCONDEC : Archived on 30-SEP-91
(RMDU) removed dust brushed
CONSRO1: Conservation Job Report

for PAYTON, Robert: Senior Decorative
MOLCONDEC (1055) on ttyq4 at 16-JUL-92

Report on Project

Report for Conservation Section ... : dec
Report for Post ..................... : consd
Report for Objects in Department ... : mod
Report from Month (as MON-YY) ..... : jan-92
until and including Month .......... : apr-92
Status type required (A,C,E) ...... : c

134753
JAN-92 1 hr
1055 : PAYTON, Robert : MOLCONDEC : Recorded on 24-JAN-92

WH
41.6/5
jug
(RMDU) removed dust brushed
(RMDI) removed dirt immersed and brushed; tapwater and Synp
(RINS) rinsed immersed; tapwater then distw
(RMDI) removed dirt swabbed; distw

134754
JAN-92 1 hr
1055 : PAYTON, Robert : MOLCONDEC : Recorded on 24-JAN-92

WH
C.559
flask
(RMDI) removed dirt immersed and brushed; distw and Synp
(RINS) rinsed distw
(RMDI) removed dirt swabbed; distw
(RENU) renumbered painted; Humbrol paint

343
Preventive conservation and environmental monitoring
<table>
<thead>
<tr>
<th></th>
<th>O STORE</th>
<th>M STORE</th>
<th>L STORE</th>
<th>L STORE (continued)</th>
<th>M STORE  etc.</th>
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<td>2</td>
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<td>5</td>
<td>0</td>
<td>53.33%</td>
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<td>6</td>
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<td>7</td>
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<td>146.67%</td>
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<tr>
<td>8</td>
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<td>51.67%</td>
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ROMAN GALLERY
January 1992

degrees C.

r.h. %

degC

02-Jan-92 08-Jan-92 14-Jan-92 20-Jan-92 26-Jan-92
Museum of London air conditioned galleries:
relative humidity, weekly maximum / minimum

Source: thermohygrograph records 1988-1992
ENVIRONMENTAL SPECIFICATIONS FOR MoL STORES

Historic Photographs Store

Relative humidity: 40% ± 2%

Temperature: 18°C.

Barry Mason's letter to Desmond Fellowes dated 27.1.89 refers.
Paper 29.2: Historic photographs store: summary charts (from thermohygrograph chart data)

PHOTOGRAPHIC STORE
Weekly maximum/minimum relative humidity

January - August 1991

PHOTOGRAPHIC STORE
Weekly maximum/minimum relative humidity

June - December 1991

PHOTOGRAPHIC STORE
Weekly maximum/minimum relative humidity

January - June 1992
Paper 30: 'Squirrel' data logger charts: normal (top) and expanded (bottom)

Simms car display case: temperature and relative humidity

Graph expanded to show diurnal variation

Specified range

Source: Squirrel data logger, readings at 15 min intervals
SPECIFICATION FOR A SYSTEM FOR PRODUCING MANAGEMENT INFORMATION FROM ENVIRONMENTAL DATA

Take available data of measurements of temperature, relative humidity, or lux, recorded at intervals set by the user, and of corresponding time/date records. Intervals will vary between 30 minutes to a few seconds.

Data may be in the form of output from a variety of loggers: Squirrels, made by Grant Instruments; MEACO; ACT; Hanwell; etc.

Add runs of measurements for the same location together if required.

Automation

To be able to record user's requirements and produce menu of standard default outputs and user's own recorded settings.

Users to be able to adjust standard, default settings and record as own.

Should automatically add together data from a series of logging runs for same place, as required, and produce standard, specified output.

Output - graphic

Line graph of temperature and/or relative humidity or lux for any selected period.

Max/min graph for any selected period and for any chosen interval (e.g. max/min relative humidity per day for 6 months)

- ideally, software will be "smart" enough to choose default scales for the vertical axis that will prevent RH and temperature traces overlapping

Area of graph to be selectable either by graphically selecting an area of a graph for expansion, as in Squirrelsoft and Hanwell, or by inputting dates or times.

User to be able to add lines to graph to show specified limits - e.g. 45 - 55% RH.

Scales and measurements on vertical (RH, temp., axis) to be adjustable by user, ideally on-screen (as in text rulers for word processing under Windows or the Macintosh).

User's chosen formats to be recordable and selectable for future use.

One screen operation (like Hanwell) rather than multiscreen (like Squirrel)

Graph labelling and text

User to be able to add own titles, footnotes, axis labels, or notes to graph, and select from different fonts or print sizes (depending on printer)

Labels for lines to be placed on the actual lines rather than in a separate key
Paper 31:

Analysis and analytical output

Text output to be adjustable by user, perhaps as a "form", e.g.:


Monitor: Hanwell no. 2 Last calibrated: 3.1.92

Measuring interval: 15 mins

Relative humidity: Maximum 75% date: 15.1.92
Minimum 42% date: 18.1.92

Specified limits: 45 - 55%

Total time over 55%: 16 hrs: 6 occasions; 0.7% of time
Total time below 45%: 200 hrs: 25 occasions; 9% of time

Within specifications: 6 weeks out of 13
Outside specifications: 7 weeks out of 13

Limits to be specifiable for each analysis - not only during logging, as is the case with Squirrel.

Calculate time outside specified limits, and output as examples above (and other analysis as specified by user)

Output and printing

Output on screen or on printer.

Option to see "page view" before printing.

Option to set or re-set page orientation and margins, scale graph up or down, and print onto more than one page if required.

Ideally, option to print more than one graph on a page.

Support wide range of printers.

Suzanne Keene
MAY 1992
Levels of nitrogen dioxide in air conditioned areas

Museum of London, 1984-91
Parts per billion by volume

<table>
<thead>
<tr>
<th>Outdoors</th>
<th>Entrance hall</th>
<th>Roman gallery</th>
<th>L.May.'s Bank display</th>
<th>Costume store</th>
<th>18th cent.</th>
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<td>36</td>
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<td>Sept '87</td>
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Ratio indoors/outdoors

| April '84 | 1 (1) 0.7 | 0.7 | 0.7 |
| June '84  | 1 (1) 0.7 | 0.8 | 0.7 |
| July '87  | (1) (1) (1) | (1) |
| Sept '87  | 0.5 0.5 0.5 | 0.5 |
| June '88  | 0.9 0.5 0.6 | 0.4 |
| July '91  | 0.5 0.2 | 0.3 | 1.3 |

Source: diffusion tubes analysed by AERE, Harwell

'(1) Outdoors diffusion tube stolen

The levels of nitrogen dioxide are measured at intervals, first, to record the concentration of this damaging pollutant, and second, to see whether the activated carbon filters in the air conditioning system are reducing the level of this gas significantly. As the Table shows, the NO\textsubscript{2} level is somewhat lower in areas away from the entrance: the Roman gallery and Lord Mayor's Coach area. In the Costume Store it is reduced to 0.4, less than half, of the outdoor level; this area is air conditioned and is well sealed from outside air. The measurements taken in July 1991 are noticeably low, although at this time the activated carbon filters were known to be almost exhausted. This suggests that they are not contributing greatly to the removal of nitrogen dioxide (unless the filters are clogged and have increased the dwell time); however, further measurement would be wise, as there has been a change of staff at Harwell.

The most surprising result is that for the levels inside and outside the 18th century gallery showcase. Inside the showcase the level is four times as high as outside it in the gallery, and a third higher than outdoors. This is presumably due to pollutants from the showcase materials, and needs further investigation.

1. The filters that are used are not designed for efficiency in removing nitrogen dioxide; nevertheless, they should reduce it somewhat.
Collections condition audits

and stores assessments
**Condition grades:**
1. **GOOD** Good conservation condition, stable
2. **FAIR** Disturbed or damaged, no immediate action
3. **POOR** Probably unstable, needs remedial work
4. **UNACCEPTABLE** Actively deteriorating

**Damage categories:**
- **MAJOR** structural damage
- **MINOR** structural damage - cracked, distorted, loose joints
- **SURFACE** damage - flaking, crazing, lifting, abraded
- **DISFIGUREMENT** - stained, scratched
- **CHEMICAL** deterioration - acid paper, corrosion, rubber
- and plastic breakdown
- **BIOLOGICAL** infestations - mould, insect, rodent
- **OLD** sub-standard repairs
- **ACCRETIONS** dirt, oil, deposits

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<th>Totals for cond. grades:</th>
<th>Totals for work:</th>
<th>Treat</th>
<th>Rem</th>
<th>Mount</th>
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COLLECTIONS CONDITION AUDIT

SOCIAL HISTORY / APPLIED ARTS COLLECTIONS

Instructions for pilot survey

Aim: To quantify the task, broadly describe the collections, finalise survey form design, and establish a survey rate of objects per hour or day.

From this can be calculated how the collection should be sampled, i.e. 1 in 5 objects; the whole of every 6th shelf; etc.

Time available for survey:
We have two person/months, i.e. 44 person/days.
Time for writing up: 3 person/days
Time for pilot survey: 6 person/days
(one person/day per store)

Total time for inspecting objects: 35 person/days

It is likely that the survey will be by store location. A store location is the smallest unit of storage within which objects are grouped, e.g.:

- a shelf within a rack
- a shelf within a cupboard
- a box on a shelf, where the arrangement is that boxes contain groups of objects
- a drawer within a cupboard or cabinet
- a floor area on which objects are standing.

Procedure: For each store, or floor or room within a store building:

1. Draw sketch plan showing the arrangement of racks, cupboards, etc., with key, showing existing rack / shelf numbers if there are any or numbers allocated for the purpose of the survey if not.

2. Count number of store locations per rack, cupboard, etc..

3. Note the kind of objects on each run of racks, etc..

4. Survey a representative sample of objects (decided on by you). This will
   a) help with survey form design;
   b) show the proportion of objects with various priority ratings / damage factors;
   c) show the variation of numbers of objects per store location.

5. Write up the results as tables, sketch plans, etc.
SOCIAL HISTORY / APPLIED ARTS COLLECTION

Pilot audit results

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<th>Store</th>
<th>Number of store locations</th>
<th>Number sampled</th>
<th>Conservation Person/ priorities</th>
<th>Total objects examined</th>
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<td>13</td>
<td>7</td>
<td>12 54 70 136</td>
</tr>
<tr>
<td>Toy store</td>
<td>183</td>
<td>5</td>
<td>1.5</td>
<td>5 18 120 143</td>
</tr>
<tr>
<td>Vehicle store</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>7 6 13</td>
</tr>
<tr>
<td>Museum site:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Store</td>
<td>658</td>
<td>5</td>
<td>2.5</td>
<td>9 37 34 80</td>
</tr>
<tr>
<td>Metal store</td>
<td>181</td>
<td>4</td>
<td>2.5</td>
<td>1 39 39 69</td>
</tr>
<tr>
<td>(??300 total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spitalfields</td>
<td>129</td>
<td>4</td>
<td>4.5</td>
<td>5 18 40 1 64</td>
</tr>
<tr>
<td>Totals:</td>
<td>2874</td>
<td>42</td>
<td>27</td>
<td>5 86 279 324 684</td>
</tr>
<tr>
<td>(2993)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean number of objects per store location: 16.55

Estimated total objects in these stores: 49,500
Condition Audit: Recommendations for Full Survey

APPENDIX 2: SURVEY DESIGN

Condition Survey of Social History/Applied Art Collection

Pilot Survey

The pilot survey examined 684 objects in 42 locations, from a total of 49,500 objects in 2993 locations. All the objects in each chosen location were examined, taking a total of 29$\frac{1}{2}$ person-hours. The survey provided evidence on condition and timing, on which the proposed design below is based.

Main Survey

The object is to estimate as precisely as possible, within a limit of 35 person-days' work, the proportion of objects falling into categories 1 and 2 (so few fell in 1 in the pilot survey that it does not seem to be sensible to base a design on it alone). The design is a 'two-stage' one, the first stage being locations (shelves, boxes, etc. as defined in the pilot survey) and the second stage being objects within a location. For simplicity, it is 'self-weighting' (i.e. the estimated proportion in the collection is just the overall proportion in the sample, with no need for weighting or other adjustments) and uses 'ratio-to-size' estimates. The theory is set out in detail by Cochran (1963, 300-314) and is summarised in background notes to this paper.

To achieve an 'optimal' design, we need to know the ratio between the time taken to examine a single object and the 'overhead' time per location. Calculations based on the pilot survey suggest that this ratio is of the order of 4% - practical considerations suggest a higher figure but formal ones a lower - but the design is not sensitive to small variations in this figure. The optimal design is to sample (on average) two objects per location, i.e. one object in every 8 of those at chosen locations.

We need to estimate how many locations can be sampled in this way in the time available. Ignoring overheads 'per location', almost all could be sampled, but allowing for overheads as formally calculated suggests that only 750 (1 in 4) could be sampled. This is likely to be an underestimate, but it is impossible to say by how much.

Proposals

The proposed design is therefore to sample one location in 4, and within them one object in 8, as the first stage of a sequential sample. If there is any time left, further samples can be taken in particularly variable areas, without upsetting the overall design, or a further sample could be taken 'across the board'.

I recommend that the 'one in 4' and 'one in 8' samples should be taken systematically. The locations are ordered, and a random number (e.g. 3) selected between 1 and 4 (inclusive). The sample then consists of the 3rd, 7th, 11th, etc. location, increasing by 4 each time. Similarly the objects in a selected location are ordered and a random number (e.g. 5) selected between 1 and 8; the sample consists of the 5th, 13th, 21st, etc. objects. A fresh starting number is chosen for each location. If the number of objects at a location is less than the random number selected, that location is omitted from the survey. Random numbers from 1 to 8 are attached (for a number between 1 and 4, select one and subtract 4 if necessary.

Clive Orton 1st February 1990

CONSERVATION DEPARTMENT
RESEARCH REPORT

CONDITION SURVEYS OF THE COLLECTIONS

Summary of results

by Suzanne Keene

Second edition September 1990

Project part-funded by the Office of Arts and Libraries, and undertaken with the assistance of Clive Orton, University College London
CONTENTS

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2. The survey project: aims and objectives
3. Summary of results
4. Implications for conservation resources
5. Conclusions
6. Other documents and statistics available

Appendix 1: Paper collections survey summary
Appendix 2: Applied Arts/Modern collections survey summary
Appendix 3: Costume collections survey summary
Appendix 4: Early collections survey summary
Appendix 5: Data on finds with Archaeology Departments
CONDITION SURVEYS OF THE COLLECTIONS IN THE MUSEUM OF LONDON

SUMMARY OF RESULTS

by Suzanne Keene

1. CONTEXT

1.1 In 1988 the National Audit Office published its report, Management of the collections of the English national museums and galleries. Its findings had five principal strands:

* The need to consider the rate of acquisition and the desirability for disposal in the light of resources needed to house and care for collections;

* The need to make public collections accessible, through display or otherwise;

* The effect that poor storage was having on the preservation of the collections;

* The enormous backlog of conservation work, and the need to quantify more exactly the scale and cost of this;

* Concerns over security, inventory control and stocktaking.

1.2 The Report was published more fully, and discussed, in a meeting of the House of Commons Committee of Public Accounts, on 23rd November 1988, which took evidence from the Head of the OAL, as well as Sir David Wilson, and Mrs Esteve Coll. The tenor of the Report and the PAC meeting is summed up in this quotation:

"... we regard the situation disclosed to us as a major breakdown over many years in the proper stewardship of major national assets. It must now be tackled urgently, on the basis of a clear and concerted national programme, planned over a number of years and targeted at priority areas, and supported by an appropriate allocation of resources. ...". (PAC First Report, para. 3.vii).

1.3 Both the Report and the Committee meeting attracted wide press attention. The National Audit Office has continued the original initiative, in a continuing investigation of local authority expenditure, which includes that on museums. The OAL has funded several research programmes, including that into The Cost of Collecting, and the MoL's project on surveys to establish collections condition.

1.4 The Museum had already committed itself to improving the care of its collections. Though there is much still to do, major stores improvements have already been achieved. Improving the state of the collections is a consistent theme through the 5 Year Plan and its reviews, under the following objectives (from the 1990 5 Year Plan review):

* Properly designed accommodation ... which will result in much better care of and access to the collections. (i.e., the
Collections Centre).

* Re-orientate conservation work to conserve and treat important parts of the [study] collections.

* Update and somewhat extend the conservation laboratories.

* Better accommodation for archives and records.

1.5 As well as this, there is a vast amount of work to be done on the basic documentation, cleaning and storage packaging of the collections. To make progress on this, we need information on what needs to be done, a clear policy on priorities, and detailed planning and monitoring of work. The Surveys provide the essential data for this planning stage.

2. THE SURVEY PROJECT: AIMS AND OBJECTIVES

2.1 Aim: To establish broadly the condition of the collections, overall and in comparison with each other, to form a basis for planning the better preventive and remedial care of the collections.

2.2 The survey results also provide a 'bench mark' for the condition of the collections now, which could be used as the first of regular audits of condition.

2.3 The surveys were thus not designed to compile lists of individual objects of top priority for conservation. Work itself can best be planned by identifying top priority groups in the collections, and surveying them object-by-object, and taking account of curatorial assessments.

2.4 Further statistical work needs to be done on the data, to give more reliable detailed figures on the results. However, the analysis presented here gives reliable broad brush information on the collections and their condition.

The project

2.5 Six person-months were grant aided by the Office of Arts and Libraries; additional time was taken to survey the archaeological study collections and in the project design and statistical analysis. I am grateful to all curators and keepers for co-operating, especially to those who have given time and assistance; to the conservators who did the surveying so quickly and well; and to Clive Orton, who gave his statistical expertise.

2.6 The survey (or earlier ones) included all the collections except for those, mainly Historic Photographs, Docklands, and excavated finds still with the Archaeology Departments, listed (Appendix 5). A spin-off is that we now have statistical estimates of the numbers of objects in each collection - invaluable for many aspects of collections management.

2.7 Not only were the collections surveyed; a methodology for undertaking, recording and analysing the results has been developed, in co-operation with Clive Orton, at the Institute of Archaeology. A separate Research Report is available.
ESTIMATES OF COLLECTIONS SIZE
All collections including historic photos

ESTIMATES OF COLLECTIONS SIZE
Collections surveyed

Surveys plus other estimates Total objects 560,000
Excludes: Hall, photos, Docklands, etc. Calculated total objects: 277,000

ALL COLLECTIONS
Percentage of objects in each priority rating

Priorities:

0 20 40 60 80 100 120
Per cent of collection

WHOLE Paper Cost Arch Appl A

371
3. SUMMARY OF RESULTS

The size of the collections

3.1 Altogether, the collections, excluding objects in the care of the Archaeology Departments, comprise some 580,000 objects (280,000 from statistical calculations based on the survey data; an estimated 300,000 in collections not surveyed).

3.2 It is immediately striking that paper items numerically compose over half the collections (159,000 objects; 57%). If the guess of 250,000 objects in historic photographs is accepted, then this rises to over 70%. Paper objects are much used: a large amount of paper-based material is displayed, loaned, etc.

3.3 The accessioned archaeology collections, conversely, are small by comparison, at 40,000 objects (12% or 6%). Within the Curatorial Departments, there is thus presently a truly enormous bias towards Later collections.

3.4 The material presently in the care of the Archaeology Departments should be seen in this context. There are approximately 130,500 numbered finds with the Departments. In addition are bulk pottery, building materials, etc. Information on this is presented separately, Appendix 5.

3.5 It is recommended that curators of the Historic Photographs collection undertake a survey to better estimate the number of objects in that collection. Most collections have turned out to be smaller than curators supposed.

The condition of the collections

3.6 Conservation priority for each object surveyed was assessed on a scale of 1-4:

Priority 1: Object actively deteriorating
Priority 2: Remedial work needed to arrest deterioration
Priority 3: Not deteriorating, but needs much work before display
Priority 4: Little or no work needed before display

3.7 Comparing the proportion of each collection falling into the different priorities gives a measure of its overall condition. The proportion in Priority 1, needing immediate attention, was about 8% for all collections, with Applied Arts having slightly fewer at 6%. Including Priority 2 objects, over 60% of Paper collections needs remedial work; a third of the Costume and Textile and Archaeology collections; and one fifth of Applied Arts.

3.8 Thus, the Paper collections, besides being much the most numerous, are also in the worst condition. This is in line with reports from the V. & A. (PAC Report).

3.9 Common sense predicts that robust objects such as machinery will be in better condition than fragile and complex objects such as costumes; generally the statistics confirm this.
Causes of deterioration

3.10 The damage (if any) afflicting each object was also recorded:

- MAJOR structural damage
- MINOR structural damage
- INFESTation: pests or mould
- INTERNAL chemical degradation
- OLD repairs now sub-standard
- OTHER, usually dirt.

3.11 Data on damage factors can throw much light on the causes of deterioration. They have to date been analysed in less detail than have conservation priorities, though they are potentially an extremely rich source of information. In particular, we cannot cross-tabulate conservation priority against damage type without the data being held on computer. However, some impressions have been gained.

Types of damage

3.12 Internal deterioration Considerable areas of the collections suffer from chemical decay inherent in their nature: for example, mechanical wood-pulp paper, some silk, and of course corroding metals. Although improved storage cannot halt deterioration it can greatly slow it, and treatment can often stabilize objects.

3.13 Chemical damage Large numbers of objects are being damaged by acid vapours emitted from storage containers or mounts. The most obvious example is the Prints and Drawings collection, where acid mounts are promoting active deterioration. Some metals are also in unsuitable containers, for example, parts of the wooden cupboards storing the Early Metals emit acid.

3.14 Pests It is reassuring that little active pest infestation was found; most objects detected have now been treated.

3.15 Mechanical damage Many objects were assigned to Priority 1 because of mechanical damage, sometimes due to handling, often to storage. For example, a large proportion of the costume collection has suffered from creasing and splitting because of being crushed into too confined a space.

Storage and collections environment

3.16 As usual in museums, poor storage is much the most prevalent reason for deterioration. In some areas of the collections, notably the object collections in Lever Street, the most urgent problems of dust and overcrowding have been overcome, but the environment is still subject to wide fluctuation, and we have the legacy of previous storage to remedy. In other areas, new stores still need a lot of work to get the environmental control equipment operating satisfactorily (Printed Ephemera and Historic Photographs). Some storage is still highly unsatisfactory: Spitalfields, of course, but also Early Dept. Metals, which badly need a desiccated store.

3.17 A programme of regular investment in storage equipment and materials is urgently needed, particularly for Paper based...
Paper 35 (contd.)

STATISTICAL ESTIMATES OF COLLECTIONS SIZE:

Included in surveys:  

<table>
<thead>
<tr>
<th>Collections</th>
<th>Numbers of objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total for paper collections:</td>
<td>159,852</td>
</tr>
<tr>
<td>Total for costume &amp; textiles:</td>
<td>12,735</td>
</tr>
<tr>
<td>Total for applied arts collections:</td>
<td>74,591</td>
</tr>
<tr>
<td>Total for archaeology collections:</td>
<td>27,826</td>
</tr>
</tbody>
</table>

Collections not surveyed:  

<table>
<thead>
<tr>
<th>Collections</th>
<th>Numbers of objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easel paintings</td>
<td>200</td>
</tr>
<tr>
<td>Guess for historic photographs:</td>
<td>250,000</td>
</tr>
<tr>
<td>Estimate for docklands 'W' &amp; 'K'</td>
<td></td>
</tr>
<tr>
<td>warehouses:</td>
<td>40,000</td>
</tr>
<tr>
<td>Roman, Med. + Tudor &amp; Stuart leather</td>
<td>1,000</td>
</tr>
<tr>
<td>Prehistoric flints</td>
<td>6,550</td>
</tr>
<tr>
<td>Coins - Med., Roman</td>
<td>3,897</td>
</tr>
<tr>
<td>Costume - Kibbo Kift, banners, etc.</td>
<td>3,000</td>
</tr>
<tr>
<td>Objects on display in galleries</td>
<td>7,500</td>
</tr>
</tbody>
</table>

312,147

TOTAL: 587,151

Numbered finds with Archaeology Departments:  

<table>
<thead>
<tr>
<th>Departments</th>
<th>Numbers of objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUA</td>
<td>85,500</td>
</tr>
<tr>
<td>DGLA</td>
<td>45,000</td>
</tr>
</tbody>
</table>

130,500

Not included: PLA Library/archive Museum library books
COMPARISON OF COLLECTIONS SIZE

Includes hist. photos. and archaeology finds

Hist. Phot.s.
Paper.
Arch. Deps.
Appl. A.
Dock I.
Early Deps.
Cost.

Numbers of objects
collections. This is both for the physical needs of the collections and for inventorying and use of the collections, which are almost impossible in the present arrangements.

The rate of collecting

3.18 The poor state of large proportions of the collections, and lack of money for improving storage, suggests that it is unwise to add objects to them on any scale. Certainly, decisions to acquire objects which need conservation should be carefully considered. Conservation input into collecting is minimal and sporadic at present; it should be strengthened, as it has in the procedure for loans. Some recent purchases have been found not to be as supposed; another strong reason for reviewing them.

4. IMPLICATIONS FOR CONSERVATION RESOURCES

4.1 Resources required naturally depend on establishing a Museum policy on what constitutes an acceptable condition for the collections. In an ideal world, every object would be rated Priority 4: needing little or no work. Even to eliminate Priority 1 damage would take substantial, though not impossible, resources: 87 conservator/years (calculated from the overall number of objects treated each year), or 6.5 years' work by the present established staff if they worked on no loan or exhibition projects. To treat Priority 2 objects as well would require 434 conservator/years, or 32 years for the present staff establishment.

4.2 First reaction is to view these figures as politically impossible, and so disregard them. But the PAC Report points to "... a crucial lack of reliable, quantified information on the full extent of the serious problems ... and the resource consequences" and continues "we expect [corporate planning] to provide a clear framework for the identification of priorities, and timescales ... leading on to firm plans for progressive improvement (Para. 3iii). The hard evidence we now have should be used in negotiations with funding bodies whenever possible, with the aim of increasing resources for the care of the collections. We need to proceed by identifying with curators the most important collections, or objects, and by setting targets for treating a proportion of these objects each year. This will at least enable us to see whether or not useful inroads can be made.

5. CONCLUSIONS

5.1 Collections management The collections surveys have been extremely useful, as much for quantifying and describing the collections as for assessing their condition.

5.2 A basis for planning The main objective of this work is to provide this. A strategy for collections care will be developed during the autumn, in consultation with interested parties. Meanwhile, some first detailed recommendations are made in the reports on individual collections.

5.3 Collections condition As we well knew, large proportions of objects are in poor condition: equally, about 50% are
acceptable. The vast majority of deterioration has been due to overcrowded, dirty, stores, with unsuitable environments; a large contributing factor is damage caused by inappropriate storage materials. As a high priority, an overall policy, plan and budget for improving stores and storage needs to be instituted, managed and monitored at a high level.

5.4 Rate of collecting Since the Museum's inception, collecting has been extremely rapid and should be more controlled.

5.5 Programmes of conservation need to be planned, instituted and monitored. However, in terms of numbers of objects improved, and accessibility for users, stores and storage improvements are the most cost effective way ahead. Curatorial staff time needs to be allocated to this; increasing the numbers of technical or other supporting staff (e.g. the Collections Assistants) should be considered.

6. OTHER DOCUMENTS AND STATISTICS AVAILABLE

1989/90 condition surveys: Population statistics A summary showing how estimates of numbers of objects have been calculated.

Assessing collections condition: sampling and surveying, Conservation Department Research Report on the methodology of the surveys.

Full reports on surveys:

Paper:

Prints, drawings and watercolours
Printed ephemera
Library and archives
Modern collections

Archaeology:

Prehistoric and Roman
Medieval
Tudor and Stuart

Costume and textiles

Applied Arts (Modern) collections
APPENDICES
PAPER COLLECTIONS

Statistical estimates of collections size


PAPER COLLECTIONS

Percentage of objects in each priority rating

Priorities:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priorities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Collections

- 10% Prints + dr.
- 25% Lib. & Arch.
- 26% Modern

Collections

- 380
APPENDIX 1: PAPER COLLECTIONS SURVEY SUMMARY

Size of collections

<table>
<thead>
<tr>
<th>Collection</th>
<th>Calculated no. of objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Historic Photographs (not surveyed because of their volume). Estimated 250,000</td>
<td></td>
</tr>
<tr>
<td>* Printed Ephemera</td>
<td>67,100</td>
</tr>
<tr>
<td>* The Modern Department, with archives such as Whitefriars and many ledgers, etc., acquired as workshop material</td>
<td>40,300</td>
</tr>
<tr>
<td>* Watercolours, prints and drawings</td>
<td>11,300</td>
</tr>
<tr>
<td>* Objects, such as toys and many fans</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Collections condition

Within the Paper Collections, the Modern Department material is by far the worst, with over 80% needing urgent treatment or substantial remedial treatment. Watercolours, prints and drawings are not far behind, with about 70% in these categories. Numerically this is far fewer objects than the Modern material. 60% of Printed Ephemera needs urgent or substantial work; and this collection has the highest proportion of objects urgently needing conservation.

Causes of deterioration

are first, internal deterioration. 19th/20th century paper becomes brittle and acid because of its chemical composition. This process is hastened by incorrect storage conditions. Acid mounts affect otherwise sound paper. Mechanical damage from handling is another potent source of damage to paper: largely preventable by proper mounting and storage. Apart from the new Printed Ephemera and Library/Archives stores (still being commissioned), none of the Paper stores is satisfactory; the Print Room has a widely fluctuating environment.

Recommendations

The paper-based collections would be much easier to care for if they were considered as a whole, or at least as sub-collections under a general administration. They require identical or very similar store environment, mounting and equipment, and supervision of use. Though some stores have been improved, the Modern and Prints, Drawings, etc. collections need environmental control.

On care and conservation, for each collection a strategy needs to be worked out, first, to improve storage, and sometimes use; and second, to plan programmes of remedial conservation treatment. The two tasks must of course be co-ordinated.

The Printed Ephemera collection urgently needs proper mounting, both for conservation and to allow proper use. In the Prints, Drawings, etc. collection, most mounts badly need replacing, and a programme should be instituted for this.

Actual treatment can with existing resources only be carried out on a tiny proportion of the collections annually. The major emphasis must be on re-mounting and control of use. However, parts of the collections of particular importance can usefully be identified, with curators, and plans made for their treatment, mounting, etc., in concert with storage improvements.
MODERN COLLECTIONS
Statistical estimates of collections size

<table>
<thead>
<tr>
<th>Stores</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceram/glass</td>
<td>5%</td>
</tr>
<tr>
<td>Spitfall</td>
<td>5%</td>
</tr>
<tr>
<td>Strong Rm.</td>
<td>17%</td>
</tr>
<tr>
<td>On-site</td>
<td>21%</td>
</tr>
<tr>
<td>Lever St.</td>
<td>52%</td>
</tr>
</tbody>
</table>

1989/1990 Surveys. Total objects: 74,600

PROPORTIONS IN EACH PRIORITY RATING

---

Percent of objects

<table>
<thead>
<tr>
<th>Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

---

ALL  Vehicles  Spitfire  Lever St. 1st  Metal Store  Lever St. Ground  General Store  Toy Shop  Lever St. 2nd  Strong Room
APPENDIX 2: APPLIED ARTS/ MODERN DEPARTMENT COLLECTIONS

SURVEY SUMMARY

The Modern, or Applied Arts, collections comprise about 13% of the collections if the Historic Photos estimate is included; 27% of those surveyed. However, they include many of the objects which are most central to the Museum's purpose, and probably occupy the largest proportion of storage space.

Collections condition

Overall, the Applied Arts/Modern collections are those with the fewest objects needing urgent conservation. The Vehicles, Spitalfields, and Lever St. furniture objects are those in the worst condition. However, as stated, these will include many of the most crucial importance to the Museum.

Causes of deterioration

Extremely poor storage conditions, past or present, are responsible for the condition of the worst collections. This includes mechanical damage due to overcrowding, as in the furniture; corrosion, in many metals; unsuitable foam padding, sticking to objects; and, in nearly all objects, heavy deposits of dirt. Infestation from insects or mould is low, however. Plastics and rubber are showing signs of internal chemical breakdown: recently published research suggests that these can be preserved, but only by very close control of their environment.

Recommendations

Spitalfields Store should be vacated (likely before long anyway). Both the Metals and General stores need better environmental control.

The Vehicle Store needs urgent attention. The environment fluctuates violently; humidification is needed. The vehicles themselves need cleaning, first aid, and in many cases better support.

Unsuitable plastic foam needs replacing; objects need better support and packing; they need distributing better within stores to remedy patches of overcrowding. Many objects ought to be crated or boxed for protection from mechanical damage and dirt.

The most urgent conservation is to re-attach loose components or broken parts; and to remove surface dirt and dust. A rough calculation suggests that to treat Priority 1 objects alone would take 24 conservator/years. If work on the stored collections were held to be a high priority, and work targeted towards the most important objects, progress could be make on this.

Pests and infestation should be monitored for.
COSTUME & TEXTILE COLLECTIONS

Statistical estimates of collections size

<table>
<thead>
<tr>
<th>Collection category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theatrical</td>
<td>5%</td>
</tr>
<tr>
<td>Children's</td>
<td>7%</td>
</tr>
<tr>
<td>Dolls</td>
<td>9%</td>
</tr>
<tr>
<td>Men's</td>
<td>10%</td>
</tr>
<tr>
<td>Domest/miscellaneous</td>
<td>11%</td>
</tr>
<tr>
<td>Access's</td>
<td>27%</td>
</tr>
<tr>
<td>Women's</td>
<td>30%</td>
</tr>
</tbody>
</table>

1989/1990 Surveys. Total objects: 12,700

COSTUME & TEXTILE COLLECTIONS

Priorities in collection groups

Priorities:
- 1
- 2
- 3
- 4
APPENDIX 3: COSTUME COLLECTIONS SURVEY SUMMARY

The Costume collections are numerically a small proportion of the Museum's generally. However, it is one of the largest collections in the country, and costume is one of the most evocative elements in display. Costume is also the most time-consuming material to conserve, making preventive measures and good storage of paramount importance.

Not all of the collections were surveyed: Kibbo Kift, trains on rollers, furniture upholstery (in the Modern collections) were omitted due to lack of time.

Collections condition

Generally, early objects are those most in need of treatment: most 17th/18th century objects are classified as Priority 1 or 2. It is modern costume that comprises most objects needing little or no work.

Parts of the collection in the worst condition are dolls, both bodies and clothes, which are very overcrowded; theatrical costume, both elaborate, and not made to last; and some accessories: women's hats and bags, which badly need proper support and more space. Banners, too, are in poor condition.

Causes of deterioration

These collections are some of the best looked after in the Museum. Even continuous and programmed effort to pad hangers and enclose garments in bags cannot obviate the main cause of damage, lack of space, and the fragile nature of the objects. A third of the collection was allocated to Priorities 1 and 2.

Overcrowding in store has led to many objects being crushed, leading to creasing and ultimately to splitting. Dirt and other damage often arises from wear during use. Pests (moth) were fortunately found not to be very prevalent.

Handling was not a major source of damage. However, it is essential that the strict conditions of access and use by both internal Museum personnel and outside workers are maintained. Access can be much assisted by better and more accessible documentation.

Recommendations

Increase storage space, and mount some particular objects (e.g. hats and bags) better. Decide on priorities for conservation - early objects, or theatrical, or dolls? - or select top priority objects from among these. Any spare conservation time will next year be occupied by changing the permanent displays, so more is needed.
EARLY COLLECTIONS
Statistical estimates of population

Collections

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Medieval</th>
<th>Tudor/Stu</th>
<th>Pre/Roman</th>
</tr>
</thead>
<tbody>
<tr>
<td>19%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Priorities by collection

Priorities by material

386
APPENDIX 4: EARLY COLLECTIONS SURVEY SUMMARY

The surveys excluded objects presently in the care of the Archaeology Departments. It is likely that the latter contain the bulk of the most important objects from early London. From systematic finds reviews, the state of these latter collections is also known. The statistical information is presented in Appendix 5.

Collections condition

Overall, the Early collections are in fairly good condition, with 25% in Priorities 1 & 2, but over 50% in Priority 4, needing little or no work. The slightly better condition of Tudor and Stuart is due to a rather lower proportion of excavated iron, and numbers of later, non-excavated objects.

Causes of deterioration

Corroding iron is by far the most common factor: over 50% of these objects need urgent or considerable treatment. The Prehistoric bone and antler has been splitting and flaking, once again due to unsuitable storage, first in Level 7 and now in the General Store.

White crystals have been observed on many objects. These are still being analysed, but may be due to vapours from the storage cupboards, which are not very suitable for these collections.

Certain copper alloy has inherently unstable corrosion products. This particularly occurs on otherwise well preserved waterfront objects.

Recommendations

One reason for surveying these collections was to assess the practicality of and need for the blanket treatment programme for copper alloy that had been under way. The results indeed indicate that former priorities should be re-assessed. On the whole it is iron that more urgently needs treatment. The relative priorities of these types of object need assessing with curators, and a policy decided on.

An urgent need is for a desiccated store for all archaeological metals. This would greatly slow corrosion, especially of iron.
NUMBERS OF ARCHAEOLGY OBJECTS

Curatorial and archaelogy Depts.

Excluding ceramics and bulk finds

388
APPENDIX 5: DATA ON FINDS WITH THE ARCHAEOLOGY DEPARTMENTS

The Departments estimate their numbered finds to date as:

- DUA  - 85,500
- DGLA - 45,000

130,500

The DGLA total may in fact be higher, since finds processing is not complete for all sites. These totals of course exclude bulk pottery, building materials, bone, etc.

Of this total, 17,200 (13%) of finds have been conserved. The backlog of objects selected for conservation is currently 5,500 - however, only 109 out of 380 sites have been fully reviewed. The conservation total may be nearer 10,000 finds.

"Curatorial value" assessment

A much higher proportion of objects (possibly 37,000, 29%) will in fact not survive unless treated, since they are of iron, which is mostly unstable after burial. The 10,000 objects, 8% of the total, have been (or will be) selected for conservation as a result of the finds review procedure: thus, they illustrate the result of applying a "curatorial value" assessment as well as a conservation one.

With the extra conservation staff, funded as part of the excavation programme, this is an almost manageable backlog compared to the museum's own collections.
CONDITION SURVEYS OF THE COLLECTIONS OF THE MUSEUM OF LONDON

1. Context

1.1 In 1988 the condition of the National Museums' collections was the subject of reports by the National Audit Office and the Commons Public Accounts Committee, with much press comment. The tenor of the CAP Report is summed up in this quotation:

"... we regard the situation disclosed to us as a major breakdown over many years in the proper stewardship of major national assets. It must now be tackled urgently, on the basis of a clear and concerted national programme, planned over a number of years and targeted at priority areas, and supported by an appropriate allocation of resources. ...". (PAC First Report, para. 3.vii).

The Museum of London too has a statutory duty to care for its collections. We were aware that their condition was, and is, unsatisfactory. But there was a crucial absence of facts and quantification of the problem.

1.2 This prompted the Conservation Department to prepare a discussion document, *Strategy for the Preservation of the MoL Collections*. This identified threats to the collections: unsatisfactory storage, poor display design, insufficient control over acquisition, and too few staff to treat objects.

It recommended the development of a strategy and plan for improvements, and quantification of what needs to be done.

1.3 Strategies for improvement of the stores were being developed as part of the Support Centre work. Quantification of the objects in the collections themselves, and the care they needed, was clearly essential, but this was potentially an immense task. An efficient method of surveying had to be devised. At this point the Office of Arts and Libraries agreed to fund a research project to develop such a method.

2. The survey project

2.1 The aim was: to establish broadly the condition of the collections, overall and in comparison with each other, to form a basis for planning the better preventive and remedial care of the collections.

The grant covered six person/months salaries for extra staff to do the surveying, plus the cost of consultancy with a statistician at the Institute of Archaeology. This stage of the work was completed with a summary report in July 1990.
2.2 The continuing project

The OAL have recognised the success of the project by providing a new £8,000 grant for this year. This is to develop data analysis, and to work with other museums to validate the methodology. If successful, the Museums and Galleries Commission wish to incorporate measurements of collections condition in their Museums Registration Scheme, specifying this method as the means of measurement. The project will in due course be fully published.

3. The methodology

The approach taken was to select a sample of each collection to survey, using statistically valid techniques. The data from the objects in the sample can then be used to predict what the condition of the collection as a whole might be. The limits of accuracy and the degree of confidence in the prediction can be calculated as long as the sample has been properly selected.

Using this approach, about 25% of the Museum's collections were surveyed. This included most of the main museum collections, but omitted Docklands, the PLA Library, archaeology division finds, and historic photographs. A preliminary analysis has been made of the data, and a detailed report written on each collection. More detailed analysis is planned.

4. Results

4.1 The size of the collections

There was previously only patchy information on this. In total, there are about one million objects in the collections, distributed as in the Figures below. As in many museum collections, paper and related items comprise over two-thirds of the collections numerically. The Early Department collections are very small, and even adding the Archaeology Division objects only brings them to 20% (ceramic and other bulk finds are omitted from these figures).

![Collections by Department](image1)

![Numbers of Objects by Type](image2)

Total objects estimated at 940,000
It is interesting to compare the size of other major museum collections. Approximate numbers of objects are:

- Museum of London: 1,000,000
- British Museum: 6,000,000
- Victoria & Albert: 1,500,000 (plus library)
- National Maritime: 1,400,000

4.2 Collections condition

Each surveyed object was assigned a conservation priority: urgent, remedial, restoration, or little/none. Comparing the proportions of each collection falling into the different priorities gives a measure of its condition. In all, about 50% of the collections was in acceptable condition. When averaged, about 8% of objects were assigned urgent, with Applied Arts having slightly fewer at 6%. Including remedial work, over 60% of Paper collections needs remedial work; a third of the Costume and Textile and Early Dept. collections; and one fifth of Applied Arts.

Thus, the Paper collections, besides being much the most numerous, are also in the worst condition. This is in line with reports from the V. & A. (PAC Report).

Conservation Priorities: proportions in different collections

4.3 Types of damage

Internal deterioration Considerable areas of the collections suffer from chemical decay inherent in their nature: for example, mechanical wood-pulp paper, some silk, and of course corroding metals. Although improved storage cannot halt
Chemical damage  Large numbers of objects are being damaged by acid vapours emitted from storage containers or mounts. The most obvious example is the Prints and Drawings collection, where acid mounts are promoting active deterioration. Some metals are also in unsuitable containers, for example, parts of the wooden cupboards storing the Early Metals emit acid.

Pests  It is reassuring that little active pest infestation was found; most objects detected have now been treated.

Mechanical damage  Many objects were assigned urgent because of mechanical damage, sometimes due to handling, often to storage. For example, a large proportion of the costume collection has suffered creases and splits because of being crushed into too confined a space.

4.4 Causes of damage  The vast majority of deterioration has been due to overcrowded, dirty, stores, with unsuitable environments. The extremely high rate of collecting since the 1970's has been both an achievement, and a threat to existing collections. An important further contributing factor is damage caused by inappropriate storage materials.

5. Action and resources needed

5.1 The PAC Report points to "... a crucial lack of reliable, quantified information on the full extent of the serious problems ... and the resource consequences" and continues "we expect [corporate planning] to provide a clear framework for the identification of priorities, and timescales ... leading on to firm plans for progressive improvement" (Para. 3111).
5.2 Stores Here, major improvements are already under way. The Lever Street store, the new Printed Ephemera and Library Archive stores are immense improvements on their predecessors. The Support Centre at Eagle Wharf is intended to continue this. However, important collections are still unsuitably stored; notably the Early Department, Archaeology Finds, and Prints and Drawings, and will not benefit from Eagle Wharf.

5.3 Displays The Galleries Refurbishment Programme is gradually rectifying the worst features of the original displays. New displays are now designed to conservation standards.

5.4 Store equipment The new stores all have satisfactory new racking, as do some existing ones. However, there needs to be a substantial and regular annual investment in cupboards, racks, etc. Mounting and packing materials are also expensive and presently insufficiently budgetted for.

5.5 Staff The high standard of stores care of some collections shows what can be done with few staff. More flexible deployment of staff towards high need collections should be possible. Although collections work is identified as high priority, there is currently considerable pressure to put on displays and exhibitions. This is a question of management priorities.

5.6 Conservation Preventive measures can prevent deterioration, but once it has happened objects needing urgent or remedial work have to be treated to reverse earlier or continuing damage.

Even to complete urgent work would take substantial, though not impossible, resources: 87 conservator/years (calculated from the overall number of objects treated each year), or 6.5 years' work by the present established staff if they worked on no loan or exhibition projects. To carry out remedial work as well would require 430 conservator/years, or 32 years for the present staff establishment. These figures are only for surveyed collections.

Even in the current situation, certain steps could be taken, for example, exhibitions could finance their own conservation, releasing staff for work on the main collections, and grants can be sought. The proportion of conservators to curatorial staff does seem to be lower in the MoL than in other museums of this size. As well as conservators, there is a need also for more technical level curatorial or conservation staff, for tasks which are essentially housekeeping.

6. Timescales

Planning depends largely on the timing of the move of collections from the Lever Street store to the Support Centre, on financial information becoming clearer, and on decisions on which collections remain stored at the London Wall site. If storage equipment and materials are available, then three years should see very substantial progress.
7. Recommendations summarised

7.1 The hard evidence we now have should be used in negotiations with funding bodies whenever possible, with the aim of still further increasing finance for the care of the collections. Grants are often obtainable for preventive and storage work.

7.2 There needs to be better planning for stores and storage improvements, to co-ordinate investment and detailed plans for each collection. Curators have made a start by summarising the priorities as they see them, with the help of the Surveys. Often, one stage of work cannot proceed without resources for a different task being available as well – e.g., staff for remounting or repacking are no use without the finance for materials.

7.3 Improvements to stores themselves need to continue, over and above the Eagle Wharf project.

7.4 Regular investment in stores equipment and materials needs to be increased.

7.5 Increasing staff for collections care should be a priority, by redeployment and prioritising work as well as by taking on more staff if at all possible. Both conservators and technical conservation/curatorial staff are needed.

31 October 1990

MAX HEBDITCH

SK/DF
STORE ASSESSMENT

Name of store: GLASS STORE

Assessment mth/yr: Jan 92 R.P. & L.M.

Collection(s) housed in it: Glass items; ceramics.

Approx. floor area (m²) (see Stores Register) 99

SUMMARY OF ASSESSMENT

Main deficiencies

- Store is open to light and dust.
- Store is used as a study area also.
- No soft handling areas.
- Store cupboards are unstable and hard shelving - limited access.

Recommended action

- Isolate store from study area.
- Provide padded tables with raised edges and some form of soft floor covering (e.g. carpet).
- Consider providing new, more stable cupboards and pad shelves. Spread glass objects to improve access.

1. Use of store and space

Store is used only for storing objects

Recommended action: Used for study also.

Is there enough space for objects? Y N
Is the mix of object types suitable? Y N
Space for access to objects and proper use of storage equipment? Y N

Deficiencies:
- In use for archaeological ceramics - within both office area and archaeological store.

Recommended action:
- Provision for separate glass store and study area.

2. Structure

The store is not in an area subject to flooding
The store has no drains running through it
No record of leaking drains in the past

Deficiency:
- Drains running through store.
- Pipes for sprinkler system.

Windows, fire shutters, etc. blocked, insulated, and dust-proof Y N
Paper 37.2: Stores assessment

Deficiency:
- Store open into office and ceramic store.

Recommended action:
- Isolate glass and seal store.

Store has no other structural problems (roof leaks, dusty concrete, condensation, etc.)

Deficiencies:
- Concrete girders not sealed.
- Evidence of leaking.

Recommended action:
- Seal concrete
- Isolate store.

3. Environment

Environmental specification sheet exists (see Stores Register)

Store has environmental control (state what):

RH and temperature have been monitored over what period:

Start Finish Duration

RH and temperature specifications are being met

If problem, for approximately what % of time is the environment outside specifications?

Temp RH By how much
Higher than spec.
Lower than spec.

Probable causes of problems:
- Openess to office space etc. - little environmental control.

Recommended action:
- Monitor store regularly.

Light

How is the amount of light objects are exposed to controlled?
- Objects enclosed
- Windows blacked out
- Lights on for minimum time

Control of exposure to visible or u.v. light is satisfactory

Deficiencies:
- Lights on for all the time that office is in use.

Recommended action:

Pollutants: gaseous and particulate

Gaseous pollution (SO₂, NOₓ, O₃): if the collections in this store require this to be controlled, is it?
Dust: How is this controlled?

- Doors/windows sealed
- Objects covered
- Objects in cupboards
- Objects in boxes
- Objects unprotected

How much dust is there? A lot some a little none (e.g. Spitalfields)

Deficiencies:
- Open grille sides - no dust control apart from cupboards.

Recommended action:
- Provide a clean glass store - partition from offices and coarse ceramics.
- Install dust filtering system for store.

4. Storage racking, boxes, other equipment

If the following are used, are they suitable for their purpose:

<table>
<thead>
<tr>
<th></th>
<th>Present</th>
<th>Present but unsuitable</th>
<th>Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Racks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cupboards</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boxes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covers</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is padding or cushioning adequate for all parts of the collection (i.e. sufficient and the right type): Y N

Is storage equipment or object protection generally adequate: Y N

Deficiencies:
- Glass stored on hard shelves in wobbly cupboards.
- Little access - possibility of accidental damage.

Recommended action:
- Provide padding on shelves and soft handling areas.
- Increase space available - possible replacement with better shelving.

Fire protection:

Do detection and extinction measures appear to be present and adequate? If no, explain: Y N

5. Procedures, "use", handling

If the collection is "used", are procedures, etc. sufficient to prevent damage as far as possible? Y N

Deficiencies:
- Overcrowding of objects, obstacles on floor.

Recommended action:
- Clear soft study area needed.
- Possible installation of soft flooring (e.g. carpet etc.).
Performance indicators

for conservation
PERFORMANCE INDICATORS FOR CONSERVATION

Annual report for 1991

OBJECTIVE
To maintain and improve the physical condition of the collections.

Programme for condition audits

Measure: Schedule for auditing condition established and adhered to

Performance:

1990/91: The condition of all of the "core collections" except for Historic Photographs was audited.

1991: The methodology used was subjected to peer review and development in co-operation with other museums. A final report was published.

The means of data analysis was developed.

The Historic Photographs Collection was pilot surveyed.

Objectives for 1992:

(1) To form a policy on the standard for acceptable condition for the Museum collections.

(2) To undertake a Condition Audit of the "Interim Collections": Docklands and Historic Phototographs (including the PLA Library, if funding to support this can be obtained).

(3) To set a programme for regularly updating the Audit of Collections Condition.

Condition of collections

Measure: % of objects per collection in stable or good condition. Change in % over time for each collection.

Performance in 1991:

The results of the audits undertaken in 1990/91 are published in the Corporate Plan for 1991-96. These form the baseline for future audits.

Objectives for 1992:

To set targets and schedules for the improvement of the condition of objects in the collections, where this is necessary.
Objects needing treatment receiving it

Measure: Numbers of objects in worst condition treated vs. target.

Performance in 1991:

A project to treat all those objects on permanent display needing it has been under way since 1989. This programme was delayed in 1991 because of new commitments to temporary exhibitions ("What Is It"), and commitments of curatorial time to other activities.

In all, fewer objects were treated for preservation reasons than in 1990, due to:
(a) A heavy programme of temporary exhibitions
(b) A reduction in posts for archaeology conservation.

Numbers of objects treated for preservation reasons:

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galleries Refurbishment:</td>
<td>396</td>
<td>275</td>
</tr>
<tr>
<td>Study Collections:</td>
<td>390</td>
<td>185</td>
</tr>
<tr>
<td>Interim collections:</td>
<td>2017</td>
<td>1293</td>
</tr>
</tbody>
</table>

Objectives for 1992:

To preservation clean, support and protect the Social History Collections, as part of the move to the Support Centre.

To treat the objects that need it from the "Imperial Capital" gallery.

Improved treatments developed

Measure: Research and development projects completed vs. plan

Performance in 1991:

Research projects completed or reported: 2

Techniques in use for stabilising archaeological iron were assessed (project extended over an eight year period). The present phase was written up and has been accepted for publication.


Dating and techniques of 17th century panel paintings in the Museum's collection. Project designed.

Objectives for 1992:

Complete and publish Conservation treatments for metals from anaerobic deposits.
Paper 38.3: Example of report on performance indicators

Complete and publish *Tinsel Prints* second phase.

*Dating and techniques of 17th century panel paintings.* Complete and write up.
OBJECTIVE
To prevent deterioration by ensuring an appropriate environment.

Establish suitable environment: existing areas

Environmental control in stores and displays in the main building is provided by the landlord, the Corporation of London.

Measure: achievement of standards

Performance in 1991:

(1) Weeks (out of 52) during which specified environment maintained:

- Displays:
  - Main galleries: 10
  - Controllable stores:
    - Library: 26
    - Printed Ephemera: 10
    - Costume store: 34
    - Historic Photograph store: 8
    - Archaeology store: 12

(2) Management: regular meetings with the landlord's engineers were established, to review performance regularly.

(3) Plant recently installed was fully commissioned and is now functioning satisfactorily.

(4) An engineer's survey of all stand-alone control plant in the stores was commissioned, and necessary corrective works undertaken in:

- the Paintings Store,
- the Historic Photographs Store,
- the Archaeology Store,
- the General store.

Results are being monitored.

Objectives, 1992:

(1) Review the arrangements for operating the air conditioning plant which serves the galleries, and maintaining the stores systems.

(2) Install new control equipment in the Strong Room and the Metal Store.

General assessment, including space, packaging, storage equipment, etc.

Trend in proportion of stores meeting standard over time.
Establish suitable environment: new galleries or displays

Measure: Number of new displays or galleries vs. number in which conservation specifications were met.

New galleries, exhibitions, etc.:
- Simms Car Specifications not met
- Treasures and Trinkets Specifications met
- Tower Hill Pageant Conditions still being monitored
- What is it? Specifications met

Existing displays:
Display cases in the Early Nineteenth Century gallery completely refurbished to bring them up to conservation specifications: dust proofed, lighting improved, objects supported, actual and potentially infested felt replaced, etc.

Objectives for 1992:

Complete the conservation refurbishment of the "Imperial Capital" gallery.

Ensure that displays and exhibitions meet conservation standards:
- Tudor Theatres: Gallery display
- Suffragettes: Temporary exhibition
- Ceramics: Loan exhibition

Maintain good standards of storage

Measure: Total number of stores vs. number fully up to standard.

Performance, 1991:
At present, none of the museum's stores fully meets our standards. However, considerable progress has been made over the past year (see above). Unsatisfactory off-site stores will be vacated, and the Support Centre occupied, in 1992.

Objectives for 1992:

(1) Continue to work on environmental control for in-house stores as detailed above.

(2) Undertake a comprehensive review of the environment and preventive conservation in all stores except those to be vacated.

(3) Identify and schedule the necessary improvements, with due regard to priorities, costs and benefits.

(4) Move collections into and evaluate performance of Eagle Wharf Support Centre stores.
OBJECTIVE
To contribute effectively to museum activities

Deadlines met for exhibition preparation

Measure: Number of events vs. deadlines for preparation of objects for display, etc., met

Performance, 1991:

Number of events vs. number for which deadlines were met.

<table>
<thead>
<tr>
<th>1990</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>London's Pride</td>
<td>Treasures and Trinkets</td>
</tr>
<tr>
<td>London in the Blitz</td>
<td>Tower Hill Pageant</td>
</tr>
<tr>
<td>Cheapside Hoard re-display</td>
<td>What Is It?</td>
</tr>
<tr>
<td>Beatrix Potter</td>
<td>Displays for developers - numerous</td>
</tr>
<tr>
<td>Crystal Palace</td>
<td></td>
</tr>
<tr>
<td>Developer displays -</td>
<td></td>
</tr>
<tr>
<td>numerous</td>
<td></td>
</tr>
</tbody>
</table>

Events for which deadlines were not met: none.

Objectives for 1992:

The following major events are scheduled:

- Loan exhibition to Essen
- Tudor Theatres display
- Suffragettes exhibition
- Loan exhibition of ceramics
OBJECTIVE
To raise awareness of preservation needs, and of the concepts and methods of conservation, of other professionals and of the public.

Lectures given

Measure: Number of lectures given by conservation staff.

Performance, 1991:  
<table>
<thead>
<tr>
<th>Measure</th>
<th>1990</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conferences or courses organised</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Lectures for university courses</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Other lectures and seminars</td>
<td>9</td>
<td>12</td>
</tr>
</tbody>
</table>

Objectives for 1992: The general objective is for each member of staff to give a lecture at least once every two years.

Visits to the laboratory

Measure: Number of visits by individuals or groups to the laboratory or workshop.


Objectives for 1992: Maintain this level of interest within 10%

Students taken on

Data not available.
OBJECTIVE
To make the most effective use of resources for preservation.

Control use of time.

Measure: Planned use of time vs. outcome

Performance, 1991:

<table>
<thead>
<tr>
<th>Conservation activity</th>
<th>Planned use of time</th>
<th>Actual use of time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work on Study Collections</td>
<td>16%</td>
<td>7%</td>
</tr>
<tr>
<td>Work on permanent galleries</td>
<td>14%</td>
<td>10%</td>
</tr>
<tr>
<td>Work on temporary exhibitions</td>
<td>8%</td>
<td>19%</td>
</tr>
<tr>
<td>Loans and off-site displays</td>
<td>7%</td>
<td>16%</td>
</tr>
<tr>
<td>Management, liaison, core activities, posts vacant</td>
<td>54%</td>
<td>55%</td>
</tr>
</tbody>
</table>

Objectives for 1992:

Objectives for the use of time were set for the two years, 1991-1992. It is intended to redress the balance of time for the Study Collections in 1992, in work on the move to the Support Centre.

Work on top priority objects.

Measure: Of objects treated, % which were top priority for importance and need for treatment.

Performance, 1991:

Data not available.

Objectives for 1992:

Complete the conservation records system so as to allow for the production of this data.
OBJECTIVE
To acquire and maintain the necessary skills

Attend relevant courses, conferences, etc.

Measures: number of courses, etc., attended: total, and per person.

Performance, 1991: Data not available

Objective, 1992: Each conservator to attend two courses.

Articles published

Measure: Number of articles published: number of staff publishing articles.

Performance, 1991: 12 articles published over 2 years, authored by 11 out of 16 staff members.

9 of these were subject to peer review before acceptance for publication.


Objective, 1992:

The Conservation Department's aim is for each member of staff to author or co-author an article at least once every three years. As well as meeting objectives for scholarship, this subjects the practices of the Department to a degree of outside scrutiny.

Outside view of quality

Measure: Number of competitive grants obtained; source.

Performance, 1991:

(1) Science-Based Archaeology Committee grant for research project on treatment of metals from anaerobic deposits.

(2) Fully funded intern from the Museums and Galleries Commission Conservation Unit.

Measure: Enquiries from outside professionals

Data not available

Measure: Requests to take students: source

Data not available
BIBLIOGRAPHY

AATA: *Art and Archaeology Technical Abstracts*. Santa Monica, Calif.: GCI/IIC.

*The art of problem solving*. Chichester: John Wiley.


Allden, Alison, and Ellis, Adrian, 1990 (Dec.)

Allden, Alison, and Ellis, Adrian, 1990 (Nov.)

Allden, Alison, and Ellis, Adrian, 1991 (Feb.)

Allden, Alison, and Ellis, Adrian, 1991 (Jan.)


Bibliography

Anon, 1992.

Ashley-Smith, Jonathan, 1982.
The ethics of conservation. The Conservator, 6: 1-5.

Ashley-Smith, J., 1990.

Museum Assessment Program: MAP I and MAP II questionnaires. Washington DC: AAM.

Audit Commission, 1986.
Performance review in local government: a handbook for auditors and local authorities. London: HMSO.


Audit Commission, forthcoming.
Audit Guide for museums and the arts.

Australia International Committee on Sites and Monuments, undated.
The Charter for the conservation of places of cultural significance (The Burra Charter). Australia: Australia ICOMOS.


Ayres, J. Marx; Druzik, James; Carlos Haiad, J.; Lâu, Henry; Weintraub, Steven; 1989.
Bibliography

Bee, Roland and Frances, 1990.  


The heart of enterprise. Chichester: John Wiley.

Diagnosing the system for organizations. Chichester: John Wiley.

Beishon, John, 1980.  


Benarie, Michel, 1989.  


Bowman, Cliff, 1990.  

Strategic management. Basingstoke: Macmillan.

Bradley, Susan, 1983.  
Bibliography

Brawne, Michael, 1990.


What can psychrometric data tell us? Paper given at the UKIC meeting, Environmental Monitoring, Cardiff (unpublished).

BS 1006: 1978


BS 5750: 1991 (various parts).
Quality systems. Milton Keynes: British Standards Institution.

What is condition in a work of art? Bulletin of the American Group-IIC, 12, No.1.


Cassar, May, forthcoming. 


Chapman, Myra, 1986. 
*Plain Figures*. London: HMSO.
Bibliography

Checkland, Peter, 1981.

Checkland, Peter, and Scholes, Jim, 1990.

From thinking to tinkering: the grassroots of strategic information systems. In:

Clutterbuck, David, and Crainer, Stuart, 1990.

Cochran, G.W.G., 1963 (2nd ed.).


Management of the collections of the English National Museums and Galleries.

Comptroller and Auditor General, forthcoming.
Department of National Heritage, National Museums, and Galleries: Quality of service to the public. London: HMSO.

Corfield, M., 1983.
Conservation records in the Wiltshire library and museum service. The Conservator, 7: 5-8.

Corfield, M., Keene, S., and Hackney, S., (eds.) 1989.
The Survey. London: UKIC.


Bibliography


Drucker, Peter F., 1954. 


Ernst & Whinney, 1989. 


Collections research: local, national and international perspectives.  ICOM U.K. Newsletter: 28, June.

Fletcher, Martin, 1988.  
V. & A. admits 'disastrous failure'.  The Times, 15 December, p.5.

Methodology used in insect pest surveys in museum buildings - a case history.  
Preprints, ICOM Committee for Conservation, 8th Trienniel Meeting, Sydney.  
Marina del Rey, Ca.: ICOM: 1169-1174.


Rational analysis for a problematic world. Chichester: Wiley.


Greene, Patrick, 1990.  

Greenhill, B., 1983.  


Bibliography


Handy, Charles, 1981.  

Handy, Charles, 1984.  


Harrison, L.S., 1953.  

Introduction to systems analysis and design. London: Prentice Hall.

Hebditch, Max, 1990.


MPs berate health chiefs over queues. *The Guardian*, 12 December.

London: HMSO.

The heritage industry. London: Methuen.

Hughes, John, 1984.


*Statutes*. Paris: ICOM.


*Recommendations for regulating the access to musical instruments in public collections*. ICOM News, 39, 3: 5-8.
Bibliography

Imai, Masaaki, 1986.
**Kaizen: the key to Japan's competitive success.** New York: Random House.


**Exploring corporate strategy.** Hemel Hempstead: Prentice Hall.


Keene, Suzanne, ed., 1990.
**Managing conservation.** Conference preprints. London: UKIC.

Keene, Suzanne, 1990 (1).

Keene, Suzanne, 1990 (2).

Keene, Suzanne, 1990 (3).

Keene, Suzanne, 1991 (1).
Keene, Suzanne, 1991 (2).

Keene, Suzanne, 1992 (1).

Keene, Suzanne, 1992 (2).

Keene, Suzanne, forthcoming (1).

Keene, Suzanne, forthcoming (2).

Keene, Suzanne, and Orton, Clive, 1992.

Kenjo, Toshiko, 1986.
Certain deterioration factors for works of art and simple devices to measure them. *International journal of museum management and curatorship*, 5: 295-300.

Bibliography


Klemm, Mary, Sanderson, Stuart, and Luffman, George, 1991. 
Mission statements: selling corporate values to employees. Long Range Planning, 24, no.3: 73-78.

Kovach, Carol, 1989. 


Evaluation of systems goals in determining a design strategy for a computer based information system. The Computer Journal: 19, 4.


Systems analysis and development. Bromley: Chartwell-Bratt (2nd ed.).


Lewis, Jane, 1990. 
Operations research in management. Hemel Hempstead: Prentice Hall.

Effectiveness: definitions and approaches. In: Long, Andrew, and 
Harrison, Stephen (eds.). Health services performance: efficiency and 

Victims of injury at work forced to give up millions. The Observer, 23 February: 6.

Lord, Barry, Dexter Lord, Gail, and Nicks, 1989. 
The Cost of Collecting. London: HMSO.

Management information systems. Eastleigh: DP Publications (first published 
1976).

The museum as information utility. Museum management and curatorship, 10: 
305-311.

Museums for their own sake. The Guardian, 11th October.

Mann, P. R., 1989. 
Working exhibits and the destruction of evidence in the Science Museum. Journal of 
museum Management and Curatorship, 8: 369-387.

Planning and managing change. London: Harper & Row, in association with the Open 
University.

Conservation Information Network: the Getty Institution's evolving role. In: 
Grimstad, K. (ed.) Preprints, ICOM Committee for Conservation, 9th Triennial 
Bibliography


McLeod, Ian, 1989.

Mecklenberg, Marion F., and Tumosa, Charles S., 1991 (1).

Mecklenberg, Marion F., and Tumosa, Charles S., 1991 (2).


Beyond the glass case. Leicester: Leicester University Press.

Michalski, S., 1990 (1).
Michalski, S., 1990 (2).


Mintzberg, Henry, 1983.

Möller, Roland, 1990.

Moore, Peter G., 1968.


Mumford, Enid, 1983.

Mundy, Julia, 1989.

Bibliography


London: HMSO.

Eligibility criteria for the grant-aided storage of excavation archives. London: MGC.

Museum professional training and career structure. London: HMSO.

Guidelines for a registration scheme for museums in the U.K. London: MGC.

Museums and Galleries Commission, 1992 (1).
Museums matter. London: MGC.

Museums and Galleries Commission, 1991 (2).
Local authorities and museums in the 90s: facts, reports and guidelines. London: MGC.

Museums Training Institute, 1991.

The economic importance of the arts in Britain. London: Policy Studies Institute.

A national strategic framework for information. London: HMSO.

Naughton, J., 1983.

Office of Arts & Libraries, 1991. (In fact written by Coopers Lybrand Delloitte, although they are not credited.)

Ohmae, Kenichi, 1982.


Open University Course Team, 1983.

Oracle U.K., undated.


Bibliography


*In search of excellence.* London: Harper and Row.


Pretzel, Boris, 1990.
Colour changes occurring in photographs by Lady Hawarden. *Victoria & Albert Museum Conservation Department Science Section Internal Report No. 71/90/BCP.*


Cut down to skeleton staff. The Guardian, 16th May.

Ramer, Brian, 1989.

Collections condition surveys for leather and skin products, Leather Conservation News, 3: 2.


Chief executives define their own information needs. Harvard Business Review 57, 2 (March/April), 81-93.

Rational analysis for a problematic world. Chichester: Wiley.

Bibliography

Rowntree, Derek, 1981.

A manager's guide to operational research. London: Wiley.

Executive support systems: the emergence of top management computer use.
Illinois, USA: Dow Jones - Irwin.


Scharf, Alan, 1990.

Scott, Carol, 1991.

A case of arts for oblivion. The Times, 1 April.


SPNHCC-CC Assessment Sub-Committee, 1990.

Staniforth, Sarah, 1990 (1).

Staniforth, Sarah, 1990 (2).

Natural air-conditioning in storage areas: experiences with the new building for the historical archives of the City of Koln (translation of German title). Der Archivar, 26, 3, Cols. 449-462.

SOSOPING or Sophistical Obfuscation of Self-interest and Prejudice, Operational Research Quarterly, 27, 4ii: 915-928.

Storer, J.D., 1989.

Story, Keith, 1985.

Stromberg, E., 1950.

Bibliography

Tennant, Norman H., Townsend, Joyce H., and Davis, Anthony, 1982.
A simple integrating dosimeter for ultraviolet light. In: Science and technology in
the service of conservation, Preprints of the Washington conference. London: IIC:
32-38.

Thomas, Ray, 1990 (1).

Thomas, Ray, 1990 (2).

Planning the conservation of our cultural heritage. Museum, 25, 1/2: 15-25.

Thomson, Garry, 1986.
The museum environment. London: Butterworth (2nd ed.)


Trustees of the Western Australian Museum, 1989.

The visual display of quantitative information. Cheshire, Ct., USA: Graphics Press.


Consider the potential liability of failing to conserve collections. Museum News,
January/February.

United Kingdom Institute for Conservation, 1974.
Conservation in museums and galleries. London: UKIC.
United Kingdom Institute for Conservation, 1981.  
Guidance for conservation practice. London: UKIC.


Walshe, Grahame, and Daffern, Peter, 1990.  


Weil, S. E., 1983 (1).

Weil, S. E., 1983 (2).


Computerising work. London: Paradigm.

Wilson, Sir David, 1989.

A journey through ruins. London: Radius.

Wright, Philip, 1989.


A METHOD FOR AUDITING THE CONDITION OF COLLECTIONS

Suzanne Keene

Abstract

A new type of collections survey is required to answer, not the question, “which objects need conservation?”, but the even more important question, “is the institution succeeding in its basic duty to preserve the collections?” This could be seen as an audit, based on clear definitions, which allows the condition of different collections to be compared one with another, between different institutions, or over time. Such audits should take as little valuable conservation time as possible, and the results will be analysed and expressed numerically. The condition of an object can be described in terms of a broad condition grading system (Grades 1 - 4), together with a selection from eight terms to describe damage. It is not necessary to examine every object in a large collection: statistical techniques can be used to design sample audits, as they are for sociological research, marketing, etc.. Results can be calculated for the whole collection, and presented in simple and understandable ways.
1 INTRODUCTION

There is much interest in measuring the performance of museums at present, in the U.K. and in other countries /1/2/. The most obvious measurement is the crude exhibitionled one of visitor numbers. A counterwefgit IS needed which will measure performance in the equally important function, to preserve the collections. Conservators are familiar with condition reports on individual objects, and they often undertake condition surveys of whole collections, as the basis for planning work programmes. But a different type of survey is required to answer, not the question, “which objects need conservation?”, but the even more important question, “is the institution succeeding in its basic duty to preserve the collections?” This could be seen as an audit, based on clear definitions, which allows the condition of different collections to be compared one with another, between different institutions, or over time. Ideally, such audits will take as little valuable conservation time as possible, and the results will be be analysed and expressed numerically.

The research reported here was undertaken on the collections of the Museum of London. It was funded by the U.K. government, and completed with the aid of a working party of British conservators. In summary, we agreed that the condition of an object could be described in terms of a broad condition grading system (Grades I - 4), together with a selection from eight terms to describe damage. It is not necessary to examine every object in a large collection; statistical techniques can be used to design sample audits, as they are for sociological research, marketing, etc.. Results can be calculated for the whole collection, and presented in simple and understandable ways.

1.1 Uses of audits

The results of such audits will have other uses, too: to produce concrete evidence as to the major causes of deterioration of a collection; to assess whether the collection is stable or deteriorating; to state convincingly what needs to be done; to assess the resources needed (numbers of mounts or boxes; conservation time); and to decide priorities.

1.2 Existing work on surveys

We found over twenty examples of collections surveys (e.g. /3/), and the terms we chose to describe condition were derived from these. There have been a few surveys based on samples of the collection: for instance, on the condition of books in the Library of Congress, which holds twenty million volumes.

2 DATA AND TERMINOLOGY

There is a great temptation to collect all possible information about the objects being audited. It will be seen below (Section 4) that the analysis of the data is quite complex. Therefore, it is advisable to collect only the minimum data necessary, as described below.

2.1 Administrative data

These represent the main groupings used in the analysis of the data and reporting on it: Collection, sub-collection, object identification number, store, location.

2.2 Descriptive of object

These data may include: simple name, materials, type, manufacturing processes (e.g. photographic process); and data which might relate to condition: fragility (the object may be fragile but in perfectly good condition); completeness; working or not (these terms do not necessarily mean that the object is damaged).

2.3 Damage

It was found that damage to objects could be described by eight general terms. For a particular collection, it is useful to list all the terms which could describe damage to it under these headings, for reference during auditing. Table I lists some commonly used terms.

<table>
<thead>
<tr>
<th>Major structural damage</th>
<th>Minor structural damage</th>
<th>Surface damage</th>
<th>Disfigurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical deterioration</td>
<td>Biological attack</td>
<td>Bad old repairs</td>
<td>Accretions</td>
</tr>
</tbody>
</table>

2.4 Condition

Condition can be categorised as follows:

* Condition Grade 1  GOOD
  Object in the context of its collection is in good conservation condition, or is stable.

* Condition Grade 2  FAIR
  Fair condition, disfigured or damaged but stable, needs no immediate action.
Condition Grade 3  POOR
Poor condition, and/or restricted use, and/or probably unstable, action desirable

Condition Grade 4  UNACCEPTABLE
Completely unacceptable condition, and/or severely weakened, and/or highly unstable and actively deteriorating, and/or affecting other objects: immediate action should be taken.

A summary grading of each object's condition was agreed to be essential, as the main means of assessing and quantifying preservation. A number of different aspects of condition have been identified by previous authors and surveyors:

- Insecurity: (/4/, and the Victoria and Albert Museum): mechanical stresses, stability, or vulnerability.
- Conservation priority: (Horniman Museum, Museum of London and others): how urgently is conservation needed?

We concluded that the condition of an object needed to be defined in the context of its particular collection. For example, a pot which is in separate sherds may be in GOOD condition as part of an archaeological collection, while in an applied arts ceramic collection it might be completely UNACCEPTABLE.

We decided on four grades. Allowing a fifth grade means that the majority of objects are assigned the middle, indeterminate grade, which does not give very useful information. Three grades are too few.

3 THE AUDIT METHOD

The basis for this is statistical method, by which we can learn what we want to know about the population (the whole collection) from statistics gathered about a sample /5/,/6/. If the sample is correctly chosen, i.e. selected randomly from the population, then it is possible to know how accurate the estimate about the population is, and how much confidence we can place on the results.

If a formal statistical design is used, then audits take much less time. This is important, because auditing itself does nothing to directly improve the condition of the collection. Fewer objects, examined more carefully, will give more reliable results than many objects examined briefly. If huge quantities of data are collected, it is very difficult to make sense of them, whether they are analysed by hand or by computer.

The sampling method is known as systematic sampling /6/,/7/. This is an alternative to true random sampling, in which items are selected from a list. In most museums this would be impossible - often, there is no list; and if there were, it would take far too long to find the objects. Systematic sampling is based on sampling geographical locations of objects: i.e., their store location.

The statistical method for designing audits has been initially reported /7/,/8/, but is still being developed. It is based on selecting every nth "store location", and within that every nth object - as one might select every nth house, and within houses, every nth person to interview. For audit purposes, a store location is the smallest physical grouping of objects - a tray, a shelf, a box of objects on a shelf, or a group of objects on the floor. If a shelf has some freestanding objects, and others contained in a box, then each group counts as a separate store location, and so on.

3.1 Sample size

It seems paradoxical, but it needs to be appreciated that it is not the size of the collection that determines the size of the sample needed, but its variability /5/. In practice, this means that one can never say that a proportion, say 10 per cent., of objects will be enough. This may seem to fly in the face of common sense, but it is so. But what is meant by "variability" in condition audit terms? For audit purposes, this is simplified to mean numbers of objects per location, and the proportions of objects in the different grades of condition.

Sample size depends on several factors, discussed below. School texts on statistics are also very helpful.

Time allowed. It is actually helpful to set a limit on the time to be spent on the audit, as this is then a known quantity. We gave ourselves six person-months to audit part of the Museum of London collections: they turned out to contain about 250,000 objects. The six months included all the audit stages, including analysis and reporting.

Confidence limit and accuracy (range). These statistical factors are the others that determine sample size. There is a payoff between confidence limits and range: the wider the range settled for, the more confident we can be in the result, and vice versa /5/.

3.2 Designing a sampling procedure

Before an audit can be designed, therefore, we have to find ou
quite a lot about the collection. This is done by means of a pilot survey (see below). The data from this are used in a complex formula to calculate a sampling design. An example of the design might be: every 8th object from every 4th store location. Work on this is not yet complete, but results to date are summarised in [7], and can be used by statisticians. A copy of these and other condition audit formulae can be obtained by writing to the author.

3.3 Audit stages

An audit consists of several stages, and each needs to be carefully planned. They are:
- Agree the purpose of the audit and the time to be spent on it with managers or curators;
- Define the collection(s) and the terms to be used;
- Undertake a pilot audit to quantify the task and obtain data on variability, and analyse the pilot audit results;
- Design the sampling procedure;
- Collect the data (the audit itself);
- Analyse the data;
- Draw conclusions and write report.

The pilot audit: This is a mini-audit, to approximately quantify the task, find out how many objects can be audited in the time available, test the method of collecting data, and refine the definitions of “Condition Grade” and “damage”. The idea is to allocate a certain amount of time, to include meal breaks, getting to the store, etc., and see how many objects are examined during it. About 20% of the total audit time should be allocated to the pilot audit and its analysis. The data to be collected and their analysis are summarised in (tab. II). The store locations and objects audited should be evenly chosen from the collection, simply using common sense.

Designing the sample: The pilot audit gives an estimate of how many objects can be examined in the time available. Essentially, the sampling design calculates how the most effective way (in statistical terms) of selecting them.m.

It is hoped to develop a computer package, to take pilot audit results and design a sampling procedure. At present it is necessary for a statistician to design this. The basis of the method is set out in detail in [7].

Collecting the data: the audit itself: Data can be collected on paper forms, but it is better to use a computer. Fig. I shows an example of a form for collecting data on paper, and (fig. 2) an example of audit data collected using a simple computer database (Microsoft Works). Although it may seem easier to collect audit data on paper forms, it is very timeconsuming to analyse these, and impractical to do some kinds of analysis - for instance, crosstabulation of condition grade by type of damage - by hand.

4 ANALYSING THE AUDIT DATA

4.1 Descriptive information

Simple lists can be produced of collections, sub-collections, object types; and other descriptive information analysed (fragility broken, etc.). The output will be lists of object types, stores, collections, etc., Often, these will not have been previously available.

4.2 Quantitative information

This will use the audit results to calculate numbers of objects in groupings of interest, for instance objects in different collection (fig. 3b), sub-collections, object types (fig. 3a) or in different stores. Other quantitative information will be obtained on the number of objects in different condition grades (i.e. needing or not needing conservation) (fig. 3c), which have suffered different types of damage, or which need re-mounting or other work (fig. 3d).

To do this, it is necessary to use a computer to apply some quite complex statistical formulae. Work to produce such a program is now being planned. A copy of the formulae can be obtained from the author. The statistics generated will include the standard deviation, maximum number, minimum number, cross-tabulations and percentages. Quantitative results will be in the form, “we can be 95% certain that between 575 and 760 objects are in Condition Grade 4: UNACCEPTABLE”. Output will be in the form of lists, tables and charts such as pie diagrams, histograms, and bar graphs.

4.3 Condition of collections

The main measure here is proportional, i.e. percentages. This enables comparisons between different collections of objects in different condition grades (fig. 3b) and with types of damage, and the correlation between type of damage and condition grade. This is analysed by cross-tabulating object type (or other category of interest: e.g. store) by priority, or by damage type, with percentages. More sophisticated analytical methods are possible, such as log-linear or contingency analysis to assess the significance of differences (tab. III). The output will be tables and statistical charts, such as percentage and other bar graphs.
4.4 Amount of work, and other resources required

From the quantitative data, accurate estimates can be calculated of the resources required to properly care for the collections: conservator or other person/years (months, etc.) needed to undertake necessary work; materials such as acid-free boxes or shelving. The analysis will combine the calculation of quantitative information as above with data on resources: price of material, number of object conserved per year, etc. The output will be quantified statements, and numerical tables, bar charts, etc. (fig.3d)

4.5 Conclusions on audit data analysis

This information is mostly very simple. But it is obvious even from this brief description that it is quite difficult to take in and understand the implications of it. It is characteristic of condition audit data and information that it can be analysed, contrasted and compared in the same way at many different hierarchical levels, from object type (hats, gloves) to sub-collection (accessories, men’s costume) to collection (costume, archaeology), and even to museum (Museum of London, Victoria and Albert Museum). This means that many separate, though similar, tables, diagrams, etc. are produced. It takes a lot of work and thought to make full use of the information, to draw conclusions, and to quantify and plan work, and to extract a general management view. This is why only really essential data should be collected.

5 Audit Reports

Collecting and analysing the data is by no means the end of the task. It must be presented and used so as to realise its full potential as valuable management information.

5.1 The form of reports

The Museum of London collections condition audit reports were typical, in that the objective was to assess the collections of the institution as a whole, in order to recommend any necessary improvements, and how these should be achieved. There were no less than fifteen separate reports on different sub-collections, summarised under four main object types.

5.2 Complementary information

Audits of collections condition are just one facet of the information that is needed to manage the preservation of collections. The general conditions of preservation also need to be surveyed, in a process such as that devised in America in the Conservation Assessments /9/, or in England by the Museums and Galleries Commission /10/. To prioritise work, the broad audits have to be supplemented by detailed condition surveys of particular parts of the collections, with a separate assessment of the curatorial importance of the objects.

6 Conclusions

Audits of collections condition are becoming increasingly important as institutions are compelled to be more accountable for the condition of their collections. At present, condition surveys take too much valuable conservation time, collect far too much data, and place insufficient emphasis on the processes of analysing and reporting the results. The framework presented here addresses these issues. Further work is planned in the U.K., by the Conservation Unit of the Museums and Galleries Commission, to test and develop the methodology described above.
ACKNOWLEDGEMENTS

I thank the members of the Working Party and their institutions for their time and support. Clive Orton, my advisor on statistics, has again contributed invaluable tuition, guidance, work, and ideas. I thank the Office of Arts and Libraries for grants, and the Museums and Galleries Commission for their interest and support. Finally, I am most grateful to Valerie Cumming, Deputy Director, and my colleagues in the Museum of London for support, work, and openness in allowing audit results to be published.

Table 1: Classification of types of damage by broad heading and object type.
Quantification:

1. Time spent on pilot audit (pre-determined):
2. Number of storage locations audited in the time:
3. Number of objects audited in the time:
4. Total number of storage locations (as counted in pilot audit):
5. Mean number of objects per location:
   (total of col. (b) from table below, / number of locations audited)
6. Approximate total number of objects in collection:
   (mean number per location x total number of locations)
7. Number of objects that could be audited in the time allocated for
   the audit: (number of objects audited per person/day x
   person/days for audit)
   • Add at least 3 person-days for analysis and report writing.

Variability:

For each of the locations audited:

<table>
<thead>
<tr>
<th>Location code</th>
<th>Total number of objects</th>
<th>Number of objects audited</th>
<th>Number and percent of objects in each condition grade: C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
</tr>
</thead>
</table>

Table II - Information to be derived from pilot audits

Table III - Contingency analysis of Museum of London survey data.
Example of the condition audit form used in the Museum of London.

### Table of Condition Grades by Damage Types

<table>
<thead>
<tr>
<th>Condition Grade</th>
<th>MAJ</th>
<th>MIN</th>
<th>SURF</th>
<th>BIOL</th>
<th>CHEM</th>
<th>DISP</th>
<th>OLD</th>
<th>ACCR</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>0.0%</td>
<td>0.0%</td>
<td>3.4%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>24.1%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.1%</td>
<td>13.6%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>50.0%</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2.5%</td>
<td>25.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>20.0%</td>
<td>60.0%</td>
<td></td>
</tr>
</tbody>
</table>

**Totals:** 11.7% 15.0% 18.3% 0.0% 6.7% 5.0% 1.7% 36.7%

Fig 1 - Example of the condition audit form used in the Museum of London.

Fig 2 - Examples of output from the Microsoft WorksTM computer program.
Number in condition grades: 29 27 4 5  
Per cent.: 48.3% 36.7% 6.7% 8.3%

Locs. sampled: 19
Locs. with too few objects: 3

Number of objects examined: 60
Tot. objects: 471 in all locs. in survey: 471

Average objects per location: 23.55
Maximum num. objects per location: 108
Minimum num. objects per location: 3
SD for counts of objects / location: 27.467

STATISTICS BY SUB-COLLECTION

<table>
<thead>
<tr>
<th>Sub-colle</th>
<th>Count</th>
<th>Cond1</th>
<th>Cond2</th>
<th>Cond3</th>
<th>Cond4</th>
<th>MA</th>
<th>ML</th>
<th>SL</th>
<th>MR</th>
<th>CL</th>
<th>AL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doll fur</td>
<td>85</td>
<td>10</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dolls</td>
<td>12</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Games</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Models</td>
<td>238</td>
<td>32</td>
<td>17</td>
<td>10</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Toys</td>
<td>136</td>
<td>15</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Totals</td>
<td>471</td>
<td>60</td>
<td>29</td>
<td>22</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>9</td>
<td>11</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig. 2 - Examples of output from the Microsoft WorksTM computer program.

Fig. 3 - Diagrams and figures typically used to present condition audit results.
This paper introduces the use of management and information systems analysis for conservation. General root definitions and conceptual models are suggested for museums and conservation. Further management concepts are employed to draw up mission statements and aims, and finally to arrive at some general performance measures for conservation. The analytical techniques and generalised models described may be used to design management information systems for different types of museum and other conservation organisation.

KEYWORDS
Management, information system, systems analysis, performance indicator, critical success factor, objective, mission statement, conservation record.

Introduction
The conservation of collections means in a broad sense their preservation and maintenance in good condition. Conservators themselves are interpreting their role more widely; no-one working primarily on interventive treatment can be unaware of what brought about the need for treatment. Museums, certainly those in America and the U.K., are at the same time being made more accountable for the upkeep of their primary resource, often a publicly owned asset, and for the effective use of resources.

But how do we measure whether we are succeeding in preserving the collections effectively? Conservation managers are well aware of the difficulty of gauging productivity - one object may take an efficient conservator a year to treat; the next, half an hour. Perhaps we treated a thousand objects last year, but were they the ones most in need? Are the ones in the worst physical condition in fact those of the highest priority? In fashionable management terms, what should we use as PERFORMANCE INDICATORS: how do we measure success?

We share this need for information on success with managers of many other kinds of organisation and organisational affairs (1). The spirit of the times brings the need, the increasing use of computerised records systems, indeed any systematic recording system, the opportunity, to generate quite sophisticated management information.

Tools for Analysing Information
Management studies often include a consideration of information for managing (2). Allied to this field of research is information SYSTEMS ANALYSIS, the orderly analysis of an organisation's use of and need for information, often undertaken in order to design computerised information systems of all kinds.

The Systems Approach
This rather general term covers a variety of related methodologies (1). They have in common a view of organisations and their functioning as groupings of inter-related and inter-dependent components or sub-systems, having some common, overarching purpose. So-called 'open' systems, such as museums, respond to pressures and influences from outside their boundaries. The systems approach to management, used wisely, can be "a means of understanding situations" (3).
Collections condition: Percentages compared

Person/years to treat objects needing conservation

Conservator/years to treat objects

<table>
<thead>
<tr>
<th>Objects treated per person/year</th>
<th>Person/years needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper</td>
<td>380</td>
</tr>
<tr>
<td>Social history</td>
<td>108</td>
</tr>
<tr>
<td>Text + costume</td>
<td>72</td>
</tr>
<tr>
<td>Archaeology</td>
<td>307</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Statistics show the number of people/year needed to treat objects of different types, with percentages compared.
The systems approach is related to, but not exclusively concerned with, information systems analysis. A particular branch known as SOFT SYSTEMS ANALYSIS takes the approach of learning, in partnership with the organisation, what are its aims and fundamental views. Originated by Checkland (4) and well explained by Naughton (5), it is especially helpful in elucidating how exactly an organisation needs to use information. Management information systems are found to be difficult to design successfully (6), because the more commonly used techniques of HARD SYSTEMS ANALYSIS concentrate on the mechanical procedures of the organisation, and so miss the real point of what constitutes success.

Some Tools from Soft Systems Analysis

Museums can be defined as systems, and described in systems terms; and the preservation of the collections will be found to be carried out by one or more sub-systems of the system. In contrast, the main system in a private conservation firm would be the firm itself. Both systems and sub-systems may in turn have constituent sub-systems.

There is a systems law which states, in general terms:

The purpose of a sub-system cannot be defined without first defining the purpose and objectives of its parent system (1).

It is common sense (and common experience) that objectives for conservation cannot be defined in isolation from the objectives of the main organisation. A first step in designing management information is to define objectives, but this cannot be done for conservation until we have examined the purpose of the museum or parent body itself, to determine its preservation objectives.

This gives rise to another point, that soft systems techniques, indeed any successful systems analysis, can only be fully carried out with the help and co-operation of those involved, and those in charge of them. That is, the people who own the system must help to do the work of designing it. This ensures that the analyst's ideas are in fact relevant and useful; that the point has not been missed; and also teaches the users about the system, and even about the organisation (6).

The first technique to be introduced is the ROOT DEFINITION: a precise description of the processes which are fundamental to the organisation, or part of the organisation, in question. One possible root definition of a publicly owned museum might be:

ROOT DEFINITION OF A MUSEUM SYSTEM

A publicly-owned system in which professionals are employed to collect, preserve and research objects which are of value to people because of their historic, ethnic, or aesthetic qualities, and to use these in the transmission of ideas, concepts and insights through display, publishing, lecturing, or other public events.

Next, what would be a RELEVANT SYSTEM for a museum? A relevant system is a meta-system, an abstract view of the essence of the relevant part of the operation. If the preservation of the collections is what we are leading to, then this must be a focal point.

For example, the basic processes of a factory making shoes or any other commodity for sale might be diagrammatically shown thus:
A relevant system for a museum might be:

**RELEVANT SYSTEM FOR A MUSEUM**

A system in which a non-renewable, intrinsically valuable resource is acquired, maintained and enhanced for the future, and used and re-used without deterioration, in conjunction with knowledge and ideas, to transmit ideas, concepts and insights about culture or history to the general public.

Fig.3 A relevant system for a museum

Though they are very broad approximations to reality, the contrast between the production company and the museum is clear. In the former, goods are fabricated and pass out of the system to be sold. In the latter, the basic resource is non-renewable, and its maintenance is part of the central operation of the system. Furthermore, both a physical resource and knowledge and information about it are necessary to make the 'product', which is in fact ideas, concepts, information and entertainment.

**The Conservation Sub-System**

The everyday view from a conservation department suggests many relevant systems for the conservation sub-system, for example:

... to keep the collections in good condition
... to treat and restore objects
... to minimise the number of objects that need to be treated (because they are all in good condition)
... to make sure that the care of objects gets enough resources
... to set and apply standards for the care of objects.

However, the abstraction of the museum relevant system helps to define the relevant system that is needed for the care of the collections (which we may call the conservation sub-system):

**A RELEVANT SYSTEM FOR CONSERVATION**

A sub-system to maintain a non-renewable and intrinsically valuable resource, and to prepare it for use and re-use as the medium for transmitting ideas, concepts and information....

**Missions and Objectives**

We now move on to the field of management studies. The following concepts are well explained by Kovach (7). First is the MISSION STATEMENT. This is a concise statement which expresses the primary and basic objective of the organisation. Mission statements will vary from museum to museum: a static collection of pictures will need very different objectives from a working museum of rural life. However, nearly all museums will have collections and their preservation at the centre of their activities, as international definitions of museums make clear; i.e., they will need a conservation sub-system of some kind. A generalised mission statement for a conservation sub-system might be:

**A MISSION STATEMENT FOR CONSERVATION**

To maintain and enhance the historical and physical integrity and visual quality of the collections through the effective use of staff and other resources to set standards, provide advice, and treat and examine objects.
The next question in moving towards defining the management information we need must be, what do we intend to aim at in order to succeed in our mission? The museum might have some general aims such as these for its conservation sub-system:

1. To maintain and improve the physical condition of the collections so that standards set by the museum for their condition are met.
   
   Note: It may not be an effective use of resources to maintain every item in the collections in top exhibitable condition. Indeed, sometimes untreated objects may constitute a better source of evidence than treated ones. It may be better to set a basic standard below which no object should fall.

2. To maintain the historical integrity of objects in the collections.
   
   Note: Unless the objects are the 'real thing' they cannot play their proper part in transmitting ideas, etc. The kind and degree of restoration required need to be known separately from maintaining physical condition.

3. To prevent damage to and deterioration of the collections in storage, on display, in transit, or during handling or use.
   
   Note: By far the most effective use of resources to maintain condition is to prevent deterioration. Even if all objects are not brought to peak condition they must not deteriorate.

4. To ensure the excellent visual quality of objects when they are displayed.

   Note: This is needed to ensure that objects can effectively transmit their 'message' of information, concepts, etc. 'Excellent visual quality' will mean tactful conservation of what is genuine, together with sufficient restoration to ensure physical safety and to clarify the nature of the object, without interfering with the transmission of the object's messages about being genuine and old.

5. To provide a source of expert and accurate technical advice on all matters relating to the care and physical nature of the collections.

   Note: As the causes of deterioration become better understood, and the possibilities of sophisticated techniques of scientific examination more available, the museum needs accurate scientific advice on how to apply technical advances. Advice will also be needed for the purposes of authenticating prospective acquisitions.

6. To contribute to the analysis, understanding, authentication and accurate recording of objects.

   Note: Conservation involves an intimate and detailed understanding and observation of objects, and often scientific examination as well. This must be added to the general pool of information about objects.

7. To make the most effective use of resources for the care of the collections, and to promote this in other areas of the museum's operations.

8. To ensure high quality and professionalism in all activities.

   Note: General objectives such as the last two might well be set for each of the operational divisions of a museum.

To make progress towards these general aims, they must form the basis for more specific objectives set for a year, or a few years, ahead, and be regularly reviewed and revised. For example, in pursuit of maintaining and improving the condition of the collections the immediate objective might be to treat all the highest priority objects in the prints and drawings collection within the next two years. Here, there is not only an objective but also a target: to hit the bullseye we need to complete a particular task within a specified time. However, just as a production company might need to measure ongoing progress for a major general aim, to operate profitably, so it will be useful to devise measures for these general conservation aims.

It needs to be stressed again that, just as the users of the system need to take part in the analysis, aims and objectives need to be designed with the help of the people who will be undertaking the work, and of course with managers. It will be little use devising a mission statement that is at odds with the rest of the organisation.
Measures of Success

It is now possible to start to devise PERFORMANCE INDICATORS, the measures we want. To do this, we need to take each objective, and ask the question, “How do we measure progress?” (6). For the purposes of management information, the answers must only concern things that can actually be measured; some aims may not be measurable. It will often be helpful to ask a preparatory question first: “What must we do in order to succeed?” - sometimes known as the CRITICAL SUCCESS FACTOR.

**CRITICAL SUCCESS FACTORS AND PERFORMANCE INDICATORS FOR CONSERVATION**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Critical success factors: What must we do?</th>
<th>Performance indicators: How do we measure progress?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maintain and improve the physical condition of the collections</td>
<td>Know the current and past condition of the collections</td>
<td>* Ascribe grades for the condition of objects, and survey to establish how many in each at intervals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Analyse numbers of objects treated by condition grading</td>
</tr>
<tr>
<td>2. Maintain the historical integrity of objects in the collections</td>
<td>Know what constitutes ‘historical integrity’ for each object</td>
<td>* Record curatorial judgements on whether treatment achieved desired results</td>
</tr>
<tr>
<td>3. Prevent damage to the collections</td>
<td>Know what damage and deterioration is occurring. Set environmental standards that will not cause deterioration</td>
<td>* Numbers of objects damaged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Monitor environment, pests, etc. to determine if standards are met</td>
</tr>
<tr>
<td>4. Ensure excellent visual quality of objects in displays or photographs</td>
<td>Clean, repair, conserve all objects needing it</td>
<td>* Did all objects needing treatment get it in time?</td>
</tr>
<tr>
<td>5. Provide a source of expert technical advice</td>
<td>Keep abreast of current work</td>
<td>* Enquiries from other institutions</td>
</tr>
<tr>
<td>6. Contribute to the analysis etc. of objects</td>
<td>Record and make available the results of analysis and observations</td>
<td>* Published observations (catalogues, etc.)</td>
</tr>
<tr>
<td>7. Make the most effective use of resources</td>
<td>Plan work effectively</td>
<td>* Objects worked on for an even vs. objects used.</td>
</tr>
<tr>
<td></td>
<td>Direct work to top priority objects. Monitor productivity</td>
<td>* Overtime worked.</td>
</tr>
<tr>
<td></td>
<td>Monitor costs</td>
<td>* Numbers of objects worked on by priority rating.</td>
</tr>
<tr>
<td>8. Ensure high quality and professionalism</td>
<td>Acquire and maintain necessary skills. Develop effective treatments. Meet other measures, targets and objectives.</td>
<td>* Numbers of objects worked vs. target, or average over a period.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Use of time, e.g., by %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Cost of projects and activities</td>
</tr>
</tbody>
</table>

This list is neither inclusive nor proscriptive. There is other management information that might be useful, too - for instance, about staff turnover and amounts of sick leave. It gives an indication of the sort of information that would prove useful in managing the preservation of collections, but every museum will need to draw up its own objectives, which might differ widely from these.

Bare statistics on numbers of objects treated, though they have their place in work management, are shown to have severe limitations in the context of success in preserving the collections. To quote a journalist writing recently about the English health and social services, "what matters is not the level of activity of these agencies, numbers of letters written or patients seen, but the standard of health and the level of poverty". It would actually
be more useful for measuring performance in preservation to count numbers of objects that did not need treatment! Much of the information for these measures will be collected during the normal recording of objects worked on, or in other conservation activities. For some measures, all that is needed is a more sophisticated analysis of the data, or sometimes a small additional piece of information. For example, most condition surveys of collections include a conservation priority rating. To know if we are working on the objects that need it most, we need to know what was the priority rating for the object as well as that it was treated last month. If, in effect, we crossed it off the list of objects needing urgent treatment, this can definitely be counted as progress.

Sometimes a more sophisticated view needs to be taken. To arrive at a true priority for work on an object, that is, to be sure that conservation resources are are being used most effectively, a curatorial assessment of importance needs to be overlaid on its conservation priority. We ought to be working on those objects which have the highest priority in both conservation and curatorial views. Every museum will have its particular treasures.

Measuring performance in the context of objectives can lead to unexpected insights. For example, many conservators feel that work is too much directed towards the display of objects, not the remedial work that the majority of the collections requires. But an object worked on can count towards several different objectives:

- To prepare it for exhibition
- To add to knowledge about it (learnt in the course of treatment)
- To maintain its historical integrity (misleading restoration removed)
- To contribute to its accurate recording (it was also photographed)

If the organisation is serious about the effective use of resources, it will take advantage of the possibility of ‘gearing up’ the effects of its work. An exhibition could, for instance, be built around a part of the collections which needs better conservation. Curators often select the objects in best condition, trying to make the least demands on conservation, but sometimes it would be better to select those needing the opportunity to work on them.

Reviewing and Adapting

Systems are dynamic, and must respond to outside change. Management information systems serve the purposes of the larger system. To remain effective, a further step must be to review and revise them at intervals. Is the information being provided really what is needed? Was the information system correctly designed? The team approach needs to be continued, to maintain and improve it.

Conclusion

Few conservators feel that every piece of work they do counts towards a known objective. We often feel torn by conflicting priorities - to spend time on preventive conservation in stores; or on contributing to exhibition design; or on treating objects: to treat an object due to go out on loan; or one which we know to be falling apart. Conservation managers, too, are asked to supply figures on work done which seem to them somehow to miss the point of what they are trying to do. To counter these problems, we do indeed need to measure what we are doing - but in the light of an understanding of how the system works, and within a clear framework of aims and objectives which set out why the work is being done.

ACKNOWLEDGEMENTS

Within the Museum of London my thanks go to Dave Evans, Records Officer, for long and fruitful discussions about conservation information; to Max Hebditch, Director and Valerie Cumming, Deputy Director, for encouraging work in the Museum on information and systems analysis. I also thank Alf Hatton, at the Institute of Archaeology for supervision and encouragement, and the Office of Arts and Libraries, for supporting part of this research.

5. John Naughton, Soft systems analysis: an introductory guide'', in Complexity, management and change: applying a systems approach, Course T301 Block 4 (Open University, 1983).

The nature of the problem

The stabilisation of archaeological sites presents difficult problems for the current generation. In the past, much archaeological evidence for life in the capital has been lost through the active stripping of buildings, the demolition of those now owned by the Department of the Environment, and by the use of modern materials such as concrete and metal. In the years immediately following World War II, many sites were destroyed or damaged by military action. The recent re-discovery of sites in central London is due in part to the efforts of archaeologists and to the cooperation of local authorities. However, the stabilization of archaeological sites presents difficulties for the current generation.

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"I there behelde the bones of a man ... and round about him ... such nailes were found, wherefore I coniectured them to be the nailes of his coffin... I caused some of the nayles to bee reached vp to mee, and found under the broad heads of them, the olde wood, skant turned into earth ... I reserued one ... but the nayle lying drie, is by scaling greatly wasted."


**Background: archaeology in London**

Since the 70's, a series of excavations in London has uncovered a mass of archaeological evidence for life in the capital from pre-Roman times onwards. During the short-lived property boom of the mid '90s, there was an exponential increase in new building and redevelopment in the City of London. The Museum was fortunate in persuading many developers to fund excavation on these developments. It was found that progressive land reclamation and revetment along the north bank of the Thames, the main trade route, had resulted in large stratified dumps of rubbish from the Roman and medieval city. The waterlogged and anaerobic conditions in these sites ensured the survival of the objects contained in them, including many of iron, in number and to an extent unparalleled elsewhere.

**The nature of the problem**

The stabilization of archaeological iron presents difficult problems. Iron is a relatively reactive metal, and in the presence of an electrolyte such as ground water it mineralizes to a greater or lesser extent. The minerals formed will vary depending on burial conditions (Turgoose 1982 (1)). In aerobic conditions, objects often corrode out entirely, although their form can remain embodied within the corrosion products (and can sometimes be recovered by skilled conservators). In anaerobic conditions, corrosion may proceed to a much lesser extent. Such objects often appear extremely well preserved, and are sometimes assumed to be stable. We have found that such is not the case.

Whatever the apparent condition of the objects when excavated, they consist in fact of a highly complex metal/mineral system. Many of the minerals are only stable within the particular burial environment - redox potential, pH, etc. When brought above ground, these conditions no longer exist, and different minerals begin to form, due either to changes to the original minerals, or to fresh corrosion at the metal/corrosion interface (Turgoose 1982 (2)).

Because they are so well preserved, these objects are an excellent source of evidence for their manufacture and use. London iron is often decorated by tooling or shaping; it can be tinned or inlaid; toolmarks from manufacture or sharpening are preserved in surfaces. But unfortunately for us, most of this detail is contained in the mineral layers, as John Stowe observed
nearly 400 years ago. If objects re-corrode, fresh mineralization at the metal surface pushes off these delicate surfaces, leaving only the familiar powdery red rust.

Existing knowledge

The work of Turgoose (1982 (1); 1982 (2); 1983; and others (for example, Gilberg and Seeley 1982) has done much to explain the corrosion mechanisms undergone by archaeological iron after excavation. However, developments in treatments to stabilize this material have to an extent lagged behind theoretical understanding.

The Holy Grail of conservators of iron has been removal of every trace of chloride from the corrosion/metal. Until the '70s, there was a meagre choice of treatments for iron: boiling, reduction using electrolysis, or soaking in sodium carbonate. These methods were widely found to be "unsuccessful": objects treated thus frequently re-corroded within a few years. Other methods have been introduced more recently: hydrogen reduction, chemical reduction, and gas plasma reduction. These are very aggressive treatments, however, and all of them place at risk the delicate corrosion surface of the objects, or the metallurgical evidence which they embody - prime reasons for keeping the objects. Some of them rely on heat, which compromises the metallurgical evidence the objects embody (Tylecote and Black 1980).

Other measures, not dependent on chloride removal, are desiccated storage, storage in an atmosphere of vapour phase inhibitor, and storage in atmospheres of nitrogen or with an oxygen scavenger. However, treatments not involving chloride removal, such as corrosion inhibitors, have scarcely been seriously explored.

In the U.K. at least, there is a strong body of opinion that treatments for iron are no more effective than simply storing objects at a low relative humidity. Turgoose (1982 (2)) identified 15% RH as the level at which all water will be removed from iron minerals, thus preventing alteration. Therefore, many conservators in the U.K. have adopted storage at, or as close as possible to, 15% RH as their preferred procedure for stabilizing this material.

Reason for the study

In London, therefore, we were faced with an influx of beautifully preserved but unstable objects (e.g. Fig. 1), but no clear professional concensus on what was the most effective treatment. Excavation funding included an element for conservation, but this was project-based and only available for a fixed time. Decisions could not be deferred.

In order to gather some objective evidence, in 1983/4 a study of iron previously treated by the author was undertaken and published (Keene and Orton, 1985). The results from this suggested that all the treatments which were assessed had improved the stability of the objects. Since then, it has been policy to actively treat iron destined for the Museum of London collections.
However, it was felt desirable to keep this policy under review. Anticipating an eventual formal assessment, in 1983 finds from a particular site (Swan Lane, site code SWA 81) were divided into four batches, and each batch was treated using a different procedure. The objects have since been stored and handled in exactly the same way as are other objects.

**Assessment design and procedures**

The present study is based on empirical observations of the stability of excavated iron, treated in various ways and untreated. The aim was to establish whether any of the treatments used confer greater stability than no treatment, or than storage at RH lower than 15% (desiccated storage).

The sample in the assessment is described in Table 2:

a) four batches of iron from the Swan Lane site, treated at one time;

b) iron from the same excavation not treated, and stored in desiccated and ambient conditions;

c) iron from other Museum of London sites, some batches stored in desiccated conditions, some in ambient;

c) iron from completely different areas and types of sites (excavated by the Passmore Edwards Museum) stored using the best practicable means to maintain a low RH.

**The treatment procedures**

These are given in detail in Appendix 1. Objects were allocated to the four treatments in rotation by their accession number, except that those heavily corroded, very delicate, or with tinned or decorated surfaces were not treated with alkaline sulphite nor with sodium hydroxide. Electrolytic reduction was used not in its original procedure, to strip away all corrosion to the metal, but to loosen corrosion layers in order to make it easier to expose fine detail. In this, it was very successful. The selection for treatment was therefore similar to that used in real life, and was not fully random. A higher proportion of delicate and heavily corroded objects will have been allocated to the WATER/VPI and ELECTROLYSIS treatments, although there is no reason to assume that such objects are inherently more prone to corrosion.

The treatments are summarized in Table 1.

After treatment, the objects were stored at 15% RH, in sealed boxes containing silica gel, according to normal practice. Their condition was reviewed in 1985, 1988, and 1991; two, five, and eight years after treatment.

The most recent review included untreated objects from the same site stored in the ambient environment, and a similar sample which had been stored at 15% RH.

To provide further data, objects both from other Museum of London sites and from a completely different context were also examined.
A neighbouring museum, the Passmore Edwards, has a climate controlled chamber run at 18-20% RH. Thermohygraph records confirm that these conditions were maintained throughout the period. Excavated iron has been stored in sealed boxes containing completely desiccated silica gel, monitored with indicator strips, within this chamber, since 1982. The objects have thus been doubly protected. Prior to that, silica gel in sealed boxes alone was used to create desiccated conditions. The museum is therefore an excellent exponent of the technique of desiccated storage.

Assessment of instability

As in the earlier study, an object was graded "unstable" if there was the slightest sign of fresh corrosion or of lifting mineral layers. In the current review of MoL iron, microscopic examination was used to settle doubtful cases, and this resulted in a few objects previously judged "unstable" being re-graded "stable".

In most cases of treated iron, instability consists of one or two very small flakes or cracks (e.g. Fig. 2). Untreated iron, however, has often almost disintegrated (Fig. 3).

Data and analysis

588 objects were examined in total. The data from the assessments is summarised in Table 2. Table 3 shows an example of the data for one batch, that treated using water / VPI. For each object, then, the following data were available:

- Year of excavation;
- Year treated or began storage;
- Stable, unstable, or not present on one or more occasions after treatment;
- Years elapsed from start date to examination.

In the precursor to this study (Keene and Orton 1985) the probability of re-corrosion and the related parameter, the half-life, were also calculated. It was not necessary to use this sophisticated technique this time, since the data are considerably simpler.

However, they had their complications. Indeed, on first sight, it was difficult to see how to extract all the information these data obviously contained. Batches of objects had been examined at different points in time, and some had not been present for assessment, but were found on subsequent occasions, when different ones were missing.

A closely parallel situation exists in medicine, when clinical trials are undertaken to compare survival rates for different treatments. Patients may survive, they may die of the disease being treated, or from another cause. They may miss checks and turn up subsequently. It was found that the techniques used to assess these results could indeed be applied to the "survival" of archaeological iron. The techniques are described fully in Mould (1981: 65-69). Data similar to that available for the iron objects are used to construct "Life tables". A "Life Table" for the batch treated using water / VPI is shown in Table 4: the headings summarise the method. What is calculated is the probability that an object will "survive", i.e. be found to be
stable, at any given year after it was treated or stored. The probabilities for different batches of objects can then be compared (Table 5).

These survival probabilities are in fact familiar figures, often quoted in press reports for treatments. A probability of 0.33 can be expressed as "one in three will survive beyond "x" years", or as "a thirty per cent. chance of survival" (as in Fig. 6).

Results

The question being examined is, does treatment confer greater stability than no treatment, or than desiccated storage? This can be expressed as a null hypothesis: at a given year "T" there is no difference between the probability of survival for an iron object, whether it is treated, stored in desiccated conditions, or simply stored in the ambient environment. We are now in a position to examine this question.

The comparative survival probabilities at the different assessments of the Swan Lane batches are compared in Fig. 4. Survival probabilities at the end date (Year 8) are compared in Fig. 6, which shows a very considerable difference between the best treatments (soaking in sodium hydroxide and alkaline sulphite), which more than doubled the probability of survival over storage at ambient RH, and electrolysis followed by soaking, which in this study gave the worst survival rate of all. Soaking in deionised water with VPI doubled the survival chance over that of untreated iron. The interpretation of these results is discussed below.

But are these differences only apparent? The chi-squared test of significance was applied to a table of numbers of objects stable/unstable for the treatment batches vs. the untreated iron (all for the Swan Lane site, to reduce variables); it was significant at the 0.5% level, and so the "null hypothesis" can be rejected: there is a real difference between active treatment and storage alone. Further tests of significance (binomial tests) show that electrolysis is significantly worse than the average of the other three treatments, and that water/VPI is probably worse than sodium hydroxide and alkaline sulphate.

The results for the batches which were not treated, but stored in different ways, are equally interesting. In order to compare results with those for the treated batches, the simple percentage of objects stable at the year of inspection were calculated (Fig. 5). The result for the batch longest in store (also the largest batch by far), from which the percentage of objects surviving is very small, has been used to plot the line in Fig. 5, which gives a notional "average". If objects in desiccated storage survived longer than objects stored at ambient RH then the markers for these batches would be in the upper right hand part of the figure. But they are in fact randomly distributed, as are the markers for batches stored at ambient RH.

Because the batches were assessed at different numbers of years after storage, it was not possible to carry out a chi-squared test of significance for the untreated objects. Other possible tests do exist, but they are complex, and it is likely that the differences would not be "significant".
Interpretation

How can these results be interpreted?

Instability in iron has a number of contributing factors, as Turgoose and others has shown (Turgoose 1981 (1) and (2); Turgoose 1985). The chemical nature of its corrosion, particularly perhaps the chloride content; the physical nature (thickness and impermeability) of the mineral layers; the relative humidity and oxygen content of the storage environment; all these factors make it difficult to evaluate the success of treatments, and difficult to explain the causes of failure.

The nature of the object

Watkinson (1983) has shown that if an object is completely mineralised then it is likely not to re-corrode. The Museum of London anaerobic iron did not fall into this category; the objects all have a relatively thin corrosion layer, and all have a metal core. It seems that little of the dry site iron from the Passmore Edwards museum is protected by this factor either; but time will show whether, for example the few remaining objects from the batch longest in store (thirteen years) eventually break down.

Iron from the Museum of London was all from wet, anaerobic sites. Results for these batches are no different from those for the Passmore Edwards dry site iron (Tables 2 and 5) although the mineral layers on the objects themselves look very different. In this case, the burial context of the objects has not had a strong influence on their survival.

Concentration of chloride ions

There is a correlation between the amount of chloride ion removed during treatment and the probability of stability, illustrated in Fig. 7. The comparative chloride extraction rates for the different treatments have been confirmed in measurements made by other conservators in the Museum, in the course of treating other batches of objects, as well as by Rinuy and Schweizer (1982) and North and Pearson (1975 and 1978). In iron conservation, one questions the basis for any assumption, but it is widely assumed that if sufficient chloride can be removed from archaeological objects then the objects will be stable. An empirical test by Rinuy and Schweizer (1981) did indicate that iron does not corrode in the complete absence of chloride, even at elevated relative humidities.

It is quite surprising that sodium hydroxide alone produced such a good result. The treatment was tried as a result of North and Pearson's article discussing its use on marine iron (North and Pearson 1978). The ill effects subsequently predicted by Turgoose seem not to have occurred (Turgoose 1985: 14). It was tried because it prevented obvious corrosion, and was less disruptive than alkaline sulphite to mineral layers.

Other treatment effects

Pre-treatment using electrolysis had a markedly adverse effect on
the stability of the objects. This was done in order to make the corrosion layers separate more easily for cleaning delicate decorated surfaces, which it did very effectively. It was postulated that this would make the mineral layers more porous, and allow soluble chloride to escape more easily during the subsequent soaking. Perhaps it also allows oxygen and humidity to penetrate more easily during subsequent storage? It may be possible to prevent this effect by consolidating the corrosion layers.

The storage environment

The results from this study seem to indicate that the storage environment has much less influence on the stability of iron than has been supposed: a great deal less than do most treatments. There may be an explanation for this. Even if a desiccated environment is maintained (as it was for the Passmore Edwards material), the phenomenon of interstitial condensation may mean that pockets of high humidity formed in the plentiful pores and cracks in the mineral coatings of the objects (Schreir 1976: 2:31). Any free water will leach out soluble salts such as chlorides, and concentrate them in these small areas.

Should it be confirmed that desiccated storage has no real advantages over storage in ambient conditions, this will have far-reaching consequences for the techniques used to store archaeological iron. Many more samples need to be assessed, however.

Conclusions

These results reinforce the tentative conclusions from the first study, that in real-time assessments after long periods in store, active treatment improves the survival chances of iron. Treatment appears to have a much greater effect than does controlled storage at low relative humidity. The most effective treatments are those which remove the greatest quantity of chloride, but this study cannot demonstrate cause and effect here.

Following the first study, and the encouraging early results of the second, in the Museum of London we have continued to treat our archaeological iron, using the procedures outlined in Appendix 2. These include soaking in the corrosion inhibitor triethanolamine, as suggested by Argo (1985: 31). This method has not yet been formally assessed, although we have observed that it extracts quite a large amount of chloride. We will be revising our standard treatments again to take account of present findings, and considering whether to use sodium hydroxide rather than alkaline sulphite, should it be less disruptive to the mineral layers.

The effects of treatment on the surfaces we are trying to preserve are also being studied by Dana Goodburn Brown, using the scanning electron microscope to record surface detail before and after treatment.

Further work can be suggested. In parallel with current work by Turgoose on assessing the corrosion potential of archaeological iron, studies based on real-life assessments of actual objects
are clearly useful. Accelerated ageing tests in high relative humidity for mineralized iron are likely to introduce other complications arising from the nature of the mineral layers, and will not give convincing results. Some of the protocols set out for clinical trials in medicine, described by Mould (1981: Ch. 11), might be adopted.

Work on developing more effective treatments, including less aggressive ones, perhaps not involving chloride removal, should also be encouraged. It is tantalising to read abstracts of published work on the effects of silicates and corrosion inhibitors (AATA abstracts 27-815, 27-907), and discussions of the use of corrosion inhibitors (Turgoose 1985 (2)), but little research effort seems to be going into exploiting these possibilities for conservation.

ACKNOWLEDGEMENTS

I thank Ruth Waller, my research assistant for this project. Reg Davis, of the Royal Marsden Hospital, kindly drew my attention to the use of medical statistics for monitoring survival rates. Clive Orton, my co-author in the earlier study, has again provided invaluable advice and support with the statistical assessment. The conservators in the Museum of London have encouraged this renewed assessment of treatments, and I particularly thank Rose Johnson and Jill Barnard, who organised a stimulating Colloquium on the subject earlier this year.

REFERENCES


Turgoose, S.

Turgoose, S.

Turgoose, S.

Turgoose, S.


Watkinson, D.
APPENDIX 1

Treatment procedures used in the trial

Mineral layers overlying original surface were first removed using mechanical means: a scalpel or power pen.

For ease of comparison of treatments, each batch consisted of iron objects amounting to approximately the same weight, and all soak baths were of 1 litre of solution. The temperature of all the treatment baths was maintained at 50°C in a laboratory oven. Sealed polythene boxes, completely filled with liquid, were used, in order to keep oxygenation to a minimum.

**Alkaline sulphite** For general discussion of method, see North and Pearson (1975).

Only relatively robust objects with no tinning were selected for this treatment, since tin will dissolve in alkaline solutions.

1. **Chloride removal**: Objects immersed in four successive baths of 0.5M alkaline sulphite (Na₂SO₃ plus NaOH). Duration of each bath: 1 week.

2. **Removal of alkaline solution**: Objects immersed in changes of deionised water and Dichan VPI, until no more chloride could be detected. 15 solution changes: total time: 20 weeks.

**Note**: North and Pearson recommend neutralising the sodium sulphite using barium hydroxide. Simply soaking to remove it was judged preferable, since barium hydroxide can leave unsightly white deposits.

**Sodium hydroxide** For a discussion of the benefits of using washing solutions at raised pH, and especially sodium hydroxide, see North and Pearson (1978).

Only relatively robust objects with no tinning were selected for this treatment, since tin will dissolve in alkaline solutions.

1. **Chloride removal**: Objects immersed in five successive baths of 0.5M sodium hydroxide (NaOH).

2. **Removal of alkaline solution**: Objects immersed in changes of deionised water with 0.5% w/v Dichan VPI until no further chloride could be detected. 13 solution changes: total time: 19 weeks.

**Electrolysis followed by deionised water**

1. **Corrosion softening**: Electrolyte: sodium carbonate. A low density current was passed until the corrosion layers had softened and separated sufficiently for easy removal.

2. **Chloride removal**: The objects were soaked as a batch in changes of deionised water with 0.5% w/v Dichan VPI until no more chloride could be detected. 15 changes of solution: total time 20 weeks.
Deionised water / VPI soaking

1. Chloride removal. The objects were soaked in changes of deionised water with 0.5% w/v Dichan VPI until no more chloride could be detected. 15 changes of solution: total time 20 weeks.

Drying and protection

After treatment, objects were dewatered through two changes of industrial methylated spirits, and coated with two coats of Incralac lacquer.
APPENDIX 2

Desalination reatments for iron currently used as standard in the Museum of London

CHOICE OF METHOD

Alkaline sulphite

Chemical reduction, makes corrosion more porous, allows Cl⁻ to diffuse out. Extracts the most chloride. Appears not to damage silver or copper (black deposit on latter can be scraped off).


Soaking in triethanolamine (TEA) solution

TEA is thought to react with iron oxychlorides, freeing chloride ions. Has next best chloride extraction rate after alkaline sulphite. TEA is a corrosion inhibitor, so inhibits flash rusting.

Seems not to damage silver or copper (copper may stain). Does not damage fragile objects. Possibly suitable for organics such as bone.

Contra-indications: Damages tin. Less damaging to adhesives than alkaline sulphite.

Soaking in deionised water / corrosion inhibitor (VPI: Dichan)

The corrosion inhibitor prevents rusting during soak; this may enhance chloride removal. It is possible that traces remaining in the object will confer some corrosion protection.

Does not damage non-ferrous metals, adhesives, or leather.

Contra-indications: Do not use with wood/iron composites, as the VPI soaks into the wood and produces quantities of crystals on drying.

Tannic acid

Used as a spot treatment, or surface coating, for "maintenance" of surface unstable objects.

Contra-indications: Obscures find detail. Will not penetrate below mineralised layers.
### METHODS

<table>
<thead>
<tr>
<th>Solution</th>
<th>TEA Soak</th>
<th>VPI Soak</th>
</tr>
</thead>
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<td><strong>Soln</strong></td>
<td><strong>Alkaline Sulphite</strong></td>
<td><strong>TEA Soak</strong></td>
</tr>
<tr>
<td></td>
<td>0.5M NaOH/0.5M sodium</td>
<td>5% TEA in deion.</td>
</tr>
<tr>
<td></td>
<td>sulphite</td>
<td>water</td>
</tr>
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</table>

...... Immerse in solution: sealed container at 50°C ......

<table>
<thead>
<tr>
<th>Change</th>
<th>After 1 week, then every 3 weeks (3 changes)</th>
<th>After 1 week, then every 2 weeks</th>
<th>After 1 week, then every 2 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soak time</td>
<td>10 weeks</td>
<td>12 weeks</td>
<td>12 weeks</td>
</tr>
<tr>
<td>Rinse</td>
<td>Daily changes deionised water until pH paper reads 7 (1 week) (may need VPI when pH drops)</td>
<td>None - TEA inhibits corrosion, leave in object</td>
<td>None - leave corrosion inhibitor in object</td>
</tr>
</tbody>
</table>

NEVER COMBINE TEA TREATMENT WITH VPI TREATMENT: HEALTH HAZARD!

**Drying**

Solvent drying through anhydrous IMS is preferable; but if adhered, air dry only!

- Quick dip in IMS, then 24 hours in IMS/0.5% VPI
- Quick dip in IMS, then 24 hours in IMS/2% TEA
- Quick dip in IMS, then 24 hours in IMS/0.5% VPI

**Lacquer/consolidate**:

Paraloid B-72 10% in toluene with 0.5% VPI (dissolved in IMS) added. Consolidate under vacuum, dip or brush coat.
Table 1: Summary description of the treatments used in the study. For complete details, see Appendix 1.

WATER/VPI: Soaking in deionised water with dissolved vapour phase inhibitor (Dichan, dicyclohexyl ammonium carbamate, marketed as Shell VPI 260)

ALKALINE SULPHITE: Soaking in changes of alkaline sulphite, followed by changes of deionized water

SODIUM HYDROXIDE: Soaking in a dilute solution of sodium hydroxide

ELECTROLYSIS and soaking: A short period of electrolytic reduction followed by soaking in water/VPI as above.
Table 2. Summary of the data from the assessments of the batches of objects.

<table>
<thead>
<tr>
<th>Excavation code</th>
<th>Treatment type</th>
<th>Year treated</th>
<th>Number in batch</th>
<th>Years since treatment or start of storage</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Mis</td>
</tr>
<tr>
<td>code and date</td>
<td>or storage</td>
<td>date</td>
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<tr>
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<td></td>
<td></td>
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</tr>
<tr>
<td>b. Museum of London, Swan Lane site: batches stored without treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Ambient</td>
<td>1983</td>
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<td></td>
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<tr>
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<td>c. Museum of London, other sites: batches stored without treatment</td>
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<tr>
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<td>32</td>
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<td>1989</td>
<td>26</td>
<td>0</td>
</tr>
</tbody>
</table>

Notes:
1. An object is only counted "unstable" once, and is thereafter omitted from the table.
2. If an object was missing from an assessment, but is found at a later one to be "stable", then it is counted as "stable" in the earlier assessments.
3. In this table, an object may be "missing" at one assessment, but observed "unstable" at a subsequent one. See Table 3 for further details of these points.
Table 3. Observations for the batch treated using water / VPI.

Key: \( m \) = missing; \( o \) = observed stable; \([o]\) = inferred stable from later re-appearance; \( x \) = newly unstable.

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Registration number: SWA 81</td>
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<tr>
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<td>( x )</td>
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<tr>
<td>463 ( [o] )</td>
<td>( [o] )</td>
<td></td>
<td>( o )</td>
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<tr>
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<td>( [o] )</td>
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<tr>
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<td>( [o] )</td>
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<td>( o )</td>
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<td>( o )</td>
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<td>( o )</td>
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<tr>
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<td>( [o] )</td>
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<td>( o )</td>
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<td>656 ( o )</td>
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<td>( [o] )</td>
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<tr>
<td>1591 ( o )</td>
<td>( o )</td>
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<td>( o )</td>
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<td>1739 ( [o] )</td>
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<td>3951 ( m )</td>
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<td>out of trial</td>
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</tbody>
</table>

Totals:

| Number entering interval (=number from last interval minus number then unstable) | 31 | 29 | 22 |
| Missing                                                                       | 7  | 4  | 3  |
| Newly unstable                                                                | 2  | 7  | 3  |

Table 3
Table 4. Life table for the batch treated using water / VPI.

<table>
<thead>
<tr>
<th>Year</th>
<th>Interval</th>
<th>Years</th>
<th>Obsvd</th>
<th>Miss-</th>
<th>Number</th>
<th>No. at</th>
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<tr>
<td></td>
<td>number</td>
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<td>entering</td>
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<td>instability</td>
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<td></td>
<td>treated</td>
<td>since</td>
<td>unstable</td>
<td></td>
<td>interval</td>
<td>(li-1/2 wi)</td>
<td>at int(Y</td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>&quot;li&quot;</td>
<td>&quot;ni&quot;</td>
<td>Yt)</td>
<td>&quot;qi=&quot;di/ni</td>
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<td>t&quot;</td>
<td>&quot;T&quot;</td>
<td>&quot;di&quot;</td>
<td>&quot;wi&quot;</td>
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Table 4
Table 5. Per cent. survival probabilities at Year "T" for all the assessed batches.

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<th>Year since treatment /storage (Year &quot;T&quot;)</th>
<th>Treated iron: Swan Lane, SWA81</th>
<th>Stored at ambient RH</th>
<th>Stored at 15% RH</th>
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Stability of treated batches compared

Fig. 4
Untreated batches: stability compared

**KEY:**
- ◊ Desiccated RH
- ■ Ambient RH

- **Per cent. of objects stable**
- **Number of years in store**

- 0 10 20 30 40 50 60 70 80 90 100
- 0 2 4 6 8 10 12 14

Fig. 5
Probability of being stable at Year 8

Fig. 6
Stability of treated iron vs. chloride extracted

% survival probability

chloride (parts per million extracted in solution)
CAPTIONS TO FIGURES

Fig. 1. A medieval tinned iron spur, complete with straps and buckles, from Swan Lane. Treated by soaking in deionised water with Dichan VPI.

Fig. 2. An example of a treated iron object, slightly unstable.

Fig. 3. An untreated iron object, almost disintegrated.

Fig. 4. Survival probabilities compared for batches of objects treated in different ways, and batches stored untreated.

Lines for the stored batches are straight because they are calculated from one assessment in Year 9, while those for treatments are the result of three sequential assessments. See Table 5.

Fig. 5. The percentage of stable objects compared for batches of untreated stored objects.

Fig. 6. The probability of being stable at Year 8: outcome of treatments and storage compared.

Fig. 7. The probability of being stable at Year 8 plotted against the amount of chloride extracted during treatment.

TABLES

Table 1. Summary description of the treatments used in the study.

Table 2. Summary of the data from the assessments of the batches of objects.

Table 3. Observations for the batch treated using water / VPI.

Table 4. Life table for the batch treated using water / VPI.

Table 5. Survival probabilities from the Life Tables for all the assessed batches.