



Efficiency and Effectiveness of Government-sponsored Museums and Galleries

Measurement and Improvement

Information Technology Excellence Study

September 1999

DCMS Review of the Efficiency and Effectiveness of the Government-sponsored Museums and Galleries

Appendix C: Excellence Studies – Information Technology

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Deloitte & Touche
Stonecutter Court
1 Stonecutter Street
London
EC4A 4TR

LORD Cultural Resources and Planning (LORD)
26 Bloomsbury Square
London
WC1A 2PJ

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Section 1: Executive Summary

Deloitte & Touche have been retained by the Department of Culture Media & Sport to establish a mechanism for improving efficiency and effectiveness within the government funded museum and gallery sector. As part of that exercise 8 excellence studies have been produced, one of which looks at the use of technology.

Producing the study has involved the following tasks:

- an analysis of the wider trends in the deployment of information technology;
- a comparative analysis of performance across the sector – measuring performance against a Deloitte & Touche best practice model;
- a comparison of performance on the deployment of web technology – using the Smithsonian Institute as a basis for comparison;
- three best practice case studies;
- a workshop to develop the ideas contained in the first draft of this report.

It is recommended that each National reviews this study and develops an Action Plan paying particular attention to the following key findings:

- growing recognition that the technologies being deployed under the banner “the Information Society” present radical new opportunities for museums and galleries to provide new services to new users;
- awareness of the opportunity that the museum and gallery sector could act as information providers in the Information Society;
- demonstration, from the contrast with the Smithsonian, that there is substantial unrealised potential to deliver additional services via the Internet;
- recognition, with initiatives such as the 24 Hour Museum and SCRAN (the Scottish Cultural Resources Access Network), that the sector should work together to exploit these opportunities; but also some concern that the sector wide initiatives are not being integrated in the most effective way;
- evidence that, despite high aspirations, features of the current approach to overall IT management within the sector is an obstacle to the realisation of the IT opportunity. Specific issues include:
 - poor integration between corporate, business and IT planning;
 - failure to adequately fund the support implications of new IT investment;
 - piece-meal approach to funding, often leading to complex and difficult-to-support technical environments;
 - difficulties in recruiting and retaining staff – seen as a consequence of poor remuneration and lack of training and other career development opportunities.
- evidence from the case studies that there are examples of excellence within the sector and that these could be used as beacons for other organisations to follow.

The “Information Society” presents particular threats and opportunities to the museum and gallery sector. The opportunity is the wealth of information within the sector and the abundance of specific skills associated with interpretation and display. The threat is the small size of the individual museums and the constraint this imposes on realising this opportunity in what will rapidly become a competitive global information market.

Working more effectively together was seen by the workshop as an important means whereby the sector as a whole could improve performance. From this we recommend that a forum for IT managers is established to provide a means of:

- sharing experience and providing impartial advice;
- developing best practice – possibly developing the self assessment approach presented in this report;
- providing a basis for co-ordinating the IT response to such sector wide developments such as the 24 Hour Museum;
- potentially providing the means to initiate joint procurements (although previous attempts to do this have produced mixed results).

Section 2: Introduction

2.1. Background and Status of this Study

Deloitte & Touche prepared this Excellence Study as part of the Efficiency & Effectiveness Review of the Government Sponsored Museums & Galleries commissioned by the Department for Culture, Media & Sport (DCMS). The study topic – Information Technology – was chosen by the Review’s Working Group as a key museum activity for which the wider adoption of best practice was thought likely to yield significant benefits in efficiency and effectiveness. The study aims:

“to identify best and innovative practice in the management and exploitation of information technology”.

This Study (Version 4) has been developed through iterative consultation with the National Museums and Galleries and through discussion at a seminar. Version 1 was reviewed by the Study Sponsor. This document should be seen as a position statement contributing to the debate on Excellence within this area. It does not purport to be a guide, or manual, on excellence.

2.2. Approach

In developing the report we carried out the following tasks:

- identified the wider trends in the use of technology distinguishing, in broad terms, the impact these trends might have on the museum and gallery sector;
- distributed an IT management “self assessment” questionnaire using the responses as a basis for bilateral comparison;
- examined the Internet services and information provided by the web site of the Smithsonian Institution of the United States as an example of ‘Best Practice’ and used this as a benchmark for comparison against the services and information provided by the government funded museums and galleries web sites;
- undertook three best practice case studies, two on the deployment of IT in general and one on the deployment of web technology in particular;
- developed the findings, which had been circulated in the form of a draft report, at a workshop with staff involved in IT management.

2.3. Structure of the Report

The report is structured as follows:

Section 2 presents an analysis of some of the wider trends impacting the museum gallery sector;

Section 3 presents the analysis of the IT management “self assessment” questionnaire;

Section 4 presents the web site comparison between the Smithsonian Institution and the government funded museums and galleries of the United Kingdom;

Section 5 presents the three case studies.

2.4. Scope

The consultants have not explored the application of technology in connection with presentation and display within museums and galleries. While accepting that these are important developments within this area the consultants have, given the time and resource constraints, had to adopt a restricted definition of information technology.

Section 3: Context

3.1. Introduction

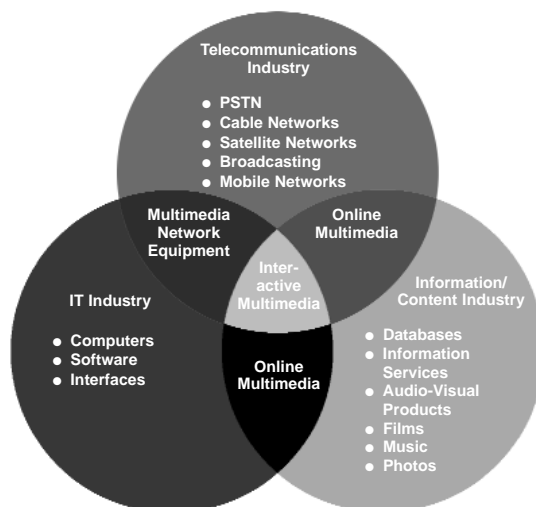
This section is designed to place the developing use of Information Technology within the government funded UK museums and galleries in the wider context. It looks at the:

- concept of the “Information Society” and the technologies that underpin it;
- government response to these technologies as discussed in “Modernising Government”;
- “People’s Library” proposal as an example of what could be developed for the museum and gallery sector;
- proposal for a 24 hour museum;
- Scottish initiative: Scottish Cultural Resources Access Network (SCRAN) project.

3.2. The Information Society

The European Commission has adopted the term “Information Society” to emphasise the fact that the applications and development of information infrastructures will have a significant social, as well as economic, impact. It is based on the view that information technology will be increasingly used as a medium for relationships within and between organisations, within and between individuals, and between organisations and individuals. Underpinning the emergence of the Information Society is the convergence of the previously distinct development paths associated with three business sectors – the information technology (IT) sector, the telecommunications sector and the information and entertainment sector. The impact of this convergence is described in the diagram below.

Convergence and the Information Society



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Devotech “Developpement d’un environnement multimedia en Europe”

The convergence and integration of the three business sectors delivers the ability to access immense quantities of information and entertainment on demand, to interact with and manipulate large quantities of data, to transact remotely and to communicate while on the move.

The potential impact of the Information Society on business processes, business patterns and structures, and the creation of new business opportunities is described in the tables below.

Impact of the Information Society on Business Efficiency

1. Timeliness

- Ability to access products and services according to own schedules (e.g. Just In Time manufacturing).
- Access to real time information on demand (e.g. Internet and on-line databases).

2. Control

- Increased ability to control not just time and choice but also content (e.g. multimedia PCs with on-line access).
- Ability to interact and manipulate data and information (e.g. access to electronic information).
- Ability to transact from office (e.g. EDI to suppliers, Internet sales).
- Increased mobility of communications and information (e.g. mobile telephony, PDAs).

3. Choice & Quality

- Ability to choose from an immense amount of information (e.g. global on-line databases, government information on-line).
- Access to choose an appropriate payment mechanism (e.g. tiered on-line services).

Source: Spectrum Analysis

Examples of Changing Business Processes and Structures

1. Changing Business Process

- Use by supermarkets of customer purchasing databases has already led to the introduction of targeted direct mail as a key part of marketing and customer retention strategies.
- In the US increasing numbers of people now use the Internet to purchase tickets, forcing travel agents and ticket
- Offices to identify new ways to distinguish their retail services.
- In the UK, the increased use of home banking services is eroding the importance of local banking branches.

2. Changing Business Structures & Working Practices

- Desk-top access to key electronic information is likely to reduce the dependence on centralised service provision in larger companies.
- Low cost, high capacity communications will facilitate Teleworking, building up employment in remote areas and allowing companies to locate services more efficiently. The Bangemann Report set a target of ten million teleworkers in the EU by 2000.

Source: Spectrum Analysis

Examples of New Business Opportunities in the Home

1. Shopping

Digital broadcasting could increase electronic retailing along the lines of the satellite home shopping networks. With the launch of digital terrestrial, cable and satellite services, additional capacity will become available while costs of transmission will decline.

As the installed base of digital multichannel homes increases, the economic dynamics of home shopping will become increasingly attractive to certain retailers and could allow new electronic competitors to enter established markets.

2. Home Banking

Home banking and insurance services have developed rapidly using basic telecommunications. The launch of digital television services (cable, satellite and terrestrial) will lead to the spread of digital set top boxes capable of interactive data services. These could greatly expand the services that can be delivered direct to the home, giving consumers access to account data, enabling share monitoring services and allowing electronic transactions. In the UK most of the retail banks are looking to develop such services.

Source: Spectrum Analysis

Perhaps the most important application associated with the Information Society is E-Commerce (the public sector equivalent to E-Service/Government Direct). E-commerce involves conducting business or service transactions in cyberspace. It is the result of combining the broad reach and the vast resources of the Internet with information technology systems (e.g. Collection Management Systems, Finance Systems, Taxation Systems). E-commerce binds public and private networks; private intranets connecting individuals within companies; and extranets connecting companies to one another. E-commerce uses the web and its computer-based multimedia capabilities to bring together customers, vendors, suppliers, employees and other stakeholders in a way never before possible.

Although E-Commerce is associated in the public mind with retail it is more developed in transactions between businesses where the integration of different organisations purchasing, manufacturing, stock control and sales systems has facilitated radical changes to the management of the supply chain. The same approach applies, potentially, to the non-commercial sector with the application of Information Society technology underpinning much of the thinking behind the Government current push for better use of IT within the public sector (captured in the phrase "joined up government").

3.3. Modernising Government

Access to, and effective use of the technologies underpinning the Information Society are increasingly becoming determinants in the competitive success of countries, communities, organisations and individuals. In recognition of this, the Government has made IT planning a central feature of its policy framework.

"The UK government will use new technology to meet the needs of citizens and business, and will not trail behind technological developments", is the vision statement of the UK government regarding IT. The major aims of the UK government in making a start towards the information age are the following:

Create a corporate IT strategy

The Government is currently developing a corporate IT strategy. Through the strategy the Government will:

- set key objectives for managing, authenticating and identifying data, using commercial open standards wherever possible;
- establish frameworks for specific technologies where stronger co-ordination is needed;
- ensure that Government acts as a champion of electronic commerce;
- use the Government Secure Intranet (GSI) to boost cross-departmental working and to make the public sector work more coherently;
- strengthen the protection of privacy and human rights while providing a clear basis for sharing data between departments.

Provide electronic services for citizens and business

The Government is taking major steps in moulding itself to suit the Information Age. One of the Government's main initiatives is to allow public services to be delivered 24 hours a day, 7 days a week. Examples of some of these Government initiatives are:

- using NHS Direct for healthcare advice from experienced and qualified nurses (NHS Direct will achieve national coverage by the end of 2000). Using the NHSnet to deliver quicker test results, up-to-date specialist advice and even online booking of appointments;
- using the internet to make income tax returns to the Inland Revenue and register for VAT with Customs & Excise (available from 2000);
- using the National Grid for Learning to access information on a wide range of educational resources. The Grid is the national focal point for learning on the Internet.

Create partnerships

The UK Government is encouraging the various central and local service providers to converge and inter-connect in order to drive up the technology standards across the public sector.

The Government is also looking at how the public service can work in partnership with the private sector and voluntary organisations to deliver public services in innovative ways. Talks are being carried out with the banks, the Post Office, supermarkets, accountants, interactive broadcasting companies, the information technology industry and others about how they can be partners in service delivery.

Create framework policies across government

The Government will take forward its vision of "Information Age Government" further by publishing a range of new frameworks across Government to cover:

- data standards;
- digital signatures;

- call centres;
- smartcards;
- digital television;
- web sites;
- Government gateways;
- better online services for businesses.

Take measures regarding data protection

In order to prevent the misuse of technology through inadvertent disclosure of information and through inappropriate transfer of data, the Government intends to take serious measures towards data protection and privacy issues. Regarding privacy, the Government will:

- work closely with the Data Protection Registrar to ensure that privacy implications of electronic service delivery are fully addressed;
- carry through their commitment to openness, so that the citizen has relevant information about their initiatives as they are developed and implemented;
- promote specific codes of practice, on a departmental or inter-departmental basis, for information age government;
- benefit from the Data Protection Registrar's powers to conduct independent assessments of the processing of personal data;
- deploy privacy-enhancing technologies, so that data are disclosed, accessed or identified with an individual only to the extent necessary;
- provide a proper and lawful basis for data sharing where it is desirable.

3.4. The People's Library

The Library and Information Commission published *New Library: The People's Network* in 1997, presenting a strategy for a radical transformation in the character and importance of UK public libraries. It proposed that UK public libraries should be connected to a national digital network, giving them a new role as managers of electronic content and gateways to a vast wealth of online information. By delivering information and learning resources through 4,200 static library sites and other library outlets, the network will allow citizens to communicate interactively between libraries, with museums, galleries and the media, with local and national government, with public services, and with agencies in the voluntary and private sectors.

Thus, in exploiting new technologies the following principal strands of content and services will be provided by the networked public library:

- education and lifelong learning;
- citizens information and facilities for participation in society;
- business and the economy, training and employment;

- community history and community identity;
- the National Digital Library;
- electronic commercial publications;
- government and public information;
- new electronic library resources;
- Internet access.

3.5. The Scottish Cultural Resources Access Network (SCRAN)

A major goal for the museums and galleries is to use Information and Communication Technology (ICT) to provide new forms of access to their collections and to enhance their contribution to education. In the United Kingdom, ICT is being harnessed to provide technology-based learning through the National Grid for Learning, which will require network infrastructure, effective training and appropriate content to operate effectively.

One of the Content Providers for the National Grid of Learning will be the Scottish Cultural Resources Access Network or SCRAN. SCRAN, which is a £15m lottery supported project, aims by the end of 2001 to translate Scotland's material culture into a networked multimedia resource bank for appreciation and research. SCRAN's core will be 1 million text records of historic monuments and of artefacts held in museums, galleries and archives; 100,000 of the most important of these records will include online media resources: video or sound clips, animations, graphics, plans, virtual reality objects and, in particular, colour photographic images. Alongside these text and multimedia records, SCRAN is also commissioning the production of up to 100 extended multimedia essays.

SCRAN will be available at a wide range of community information points, including schools, libraries, museums, community centres and tourist information centres, as well as the home. SCRAN will be accessible via the web and its resources will also be available on CD-ROM and other multimedia formats.

The education community of Scotland is contributing towards SCRAN via various projects. Most major Scottish museums and many small ones are contributing to SCRAN. Scottish Television, through Delphic Interactive, have agreed to digitise a range of television items on Scotland's culture from their archive of programmes dating from the late '50s. A project to digitise archived photography from Dundee's Photopolis, Glasgow University's Early Scottish Photographers, NMS's Scottish Life Archive, John Hume's Archive with the National Monuments Record of Scotland and The Scotsman's photo archive is currently underway. The National Museums of Scotland are engaged in large-scale multimedia developments, which will enrich SCRAN.

SCRAN has concentrated on designing interfaces for the retrieval and presentation of its digitised cultural assets based on the needs of the user, rather than the possibilities presented by the latest technical innovations. SCRAN is the Scottish word for "food", and the SCRAN project is already viewed as a "feeder" into the National Grid for Learning.

3.6. The 24 Hour Museum

The 24 Hour Museum is the Internet gateway project for museums. It will provide Internet users at home and abroad easy access to the rich resources of all the UK museums and galleries. The 24 Hour Museum aims to:

- provide round the clock access to the collections and knowledge of the UK museums and galleries;
- reach audiences who do not take advantage of museums for a number of cultural, economic and physical reasons.

The 24 Hour Museum web site is targeted towards users from different age groups and with various different needs. It offers museum and gallery news, education and activity kit, a gazetteer of museums which can be searched regionally, by town, by postcode and by collections, a scrapbook where visitors keep their own materials and a discussion forum. Besides all these facilities, the web site will also have a search engine. It is the core of the site via which visitors to the 24 Hour Museum will be able to reach the objects and information they need wherever they are.

The 24 Hour Museum went live in May 1999.

Section 4: Museum Practice

4.1. Introduction

The aim of this section is to provide a basis for comparison between the museums and galleries and this sector and other public and private sector organisations in the United Kingdom.

An IT management 'self assessment' questionnaire was sent out to the 27 government funded museums and galleries in the study. The purpose of the questionnaire was to get the UK museums and galleries to measure their own performance both against each other, and other organisations.

The questionnaire had two parts. The first part relates to the scale of the operation and the second relates to how IT is delivered and managed.

The response rate was high with 23 out of the 27 museums and galleries returning the questionnaire, although the quality of the response was variable. In discussions at the workshop it was felt although the exercise itself was valuable, and perhaps could be repeated in the future, more time was needed to generate a consistent understanding of the terminology used. It would be a mistake therefore to put too much emphasis on the detailed findings.

4.2. Key Characteristics of IT Deployment

4.2.1. Number of IT Users

The number of in-house IT users ranged from 900 (Natural History Museum) to 8 (Sir John Soane's Museum). With 900 users the Natural History Museum compares to a medium sized District Council. The average number of IT users within the museums and galleries is 192. The relationship between the number of IT users and number of desktop devices within the organisations is close to 1:1.

4.2.2. Desktop Operating System (Microsoft 3.11, Windows 95 etc)

There was a range of desktop operating systems in use both between museums and within museums. It was found that the museums and galleries use a mixture of operating systems, from the relatively new Windows '95 to the old Windows 3.11. Mixed operating systems is usually a feature of a poorly managed IT operation (with IT being procured and managed in an unco-ordinated way) or, represents the inability of organisations to fund the replacement of equipment within a reasonable timeframe. Failure to upgrade in a co-ordinated and timely manner can act as a major constraint on the exploitation of IT. If funding is the issue then the museum and gallery sector faces similar problems to much of the public sector.

Funding and procurement controls were identified as major issues by the workshop where it was felt that lack of adequate controls often led to a more complex IT environment than would otherwise be the case.

The most common desktop operating system used within the museums and galleries is Windows '95 with Windows 3.11 and Windows NT trailing behind. Some of the other desktop operating systems used are Windows 3.1, '97 and '98, Unix, Solaris, DOS and Apple Mac.

4.2.3. Servers and Network Operation

An analysis of this category revealed the fact that small scale museums such as Sir John Soane's Museum and the Geffrye Museum do not have any servers. These museums are too small to support and finance servers, server operating systems or network environments.

The Natural History Museum deploys the highest number of servers, far out-weighting the other museums and galleries. They currently have 160 servers in use. The average number of servers used within the museums and galleries (excluding the Natural History Museum) was 6. Generally, the smaller museums and galleries deploy 1 to 4 servers whereas the bigger ones deploy 11 to 18 servers.

The most common server operating system used amongst the museums and galleries is Windows NT with Unix trailing behind.

The most common network environment among the museums and galleries is Novell with Windows NT trailing behind.

4.2.4. Office Automation System (Microsoft Office, Lotus Smartsuite)

Microsoft Office is the most common Office Automation System in use amongst the museums and galleries. This follows the current trend of Microsoft Office domination of the wider market arena. Corel Suite GroupWise and Lotus 1-2-3 are the other automation systems used.

4.2.5. Main Applications

The two main applications being deployed are software packages to support collections management and financial administration. Given the small and specialist nature of organisations within this sector none of the organisations have implemented the integrated resource management systems which are becoming increasingly common in the private sector, although there is evidence that some of the larger museums are moving in this direction. For example, the Tate Gallery is currently implementing 'Agresso,' one of the leading mid-range packages.

4.2.6. Number of Dedicated IT Staff

The number of dedicated staff working in the IT departments of the museums and galleries appears to be low in absolute and comparative terms. Benchmark ratios of support staff to IT users are changing as network management software improves but the industry norm for desktop support is around 1 per 100 (1st (helpdesk) and 2nd (call-out) level support combined). We would expect between one third and a half of the total number of IT staff to be involved in desk-top support. Given the number of users and the number of support staff, the average number of support staff ratio within the sector is likely to range from 1 per 100 to 1 per 150.

Although the sector appears only to be marginally worse than the industry norm the immediate comparison probably understates the problem as:

- the small average size means that organisations are unlikely to have invested in state-of-the-art support technologies;
- cover for sickness and training will be difficult to find;
- piece-meal funding will often have produced a difficult-to-support technical environment.

4.3. Management and Delivery of IT Services

This part of the questionnaire was designed to compare Management Practice in the delivery of IT within the sector with best practice.

The key points considered in the management and delivery of IT were:

- IT Management
- Business Processes and Applications
- Technology
- IT Services
- Change Readiness

(Please note that the terms 'performance rating' and 'performance indicator' referred to in the following are explained in detail in the IT Management Self Assessment Questionnaire provided in appendix A)

4.3.1. IT Management

The average IT management score was 3 which suggests that most of the organisations felt that IT management was reasonably good. Within this average figure however there are significant variations. For example, in response to 'Are the IT service requirements clearly understood?' there is a close split between museums and galleries who have almost fully defined their IT service requirements (performance rating 3) and who have just started defining their IT service requirements (performance rating 2). Similarly in response to 'Are the roles and responsibilities for the management and the delivery of IT defined?' most organisations felt that there was more work to do. Some organisations also expressed concerns about their approach to the procurement of goods and services, stating that it was difficult to sustain standards across the organisations.

Size of museum influenced the results but did not determine it. Some of the larger museums acknowledged deficiencies and some smaller museums claimed high scores.

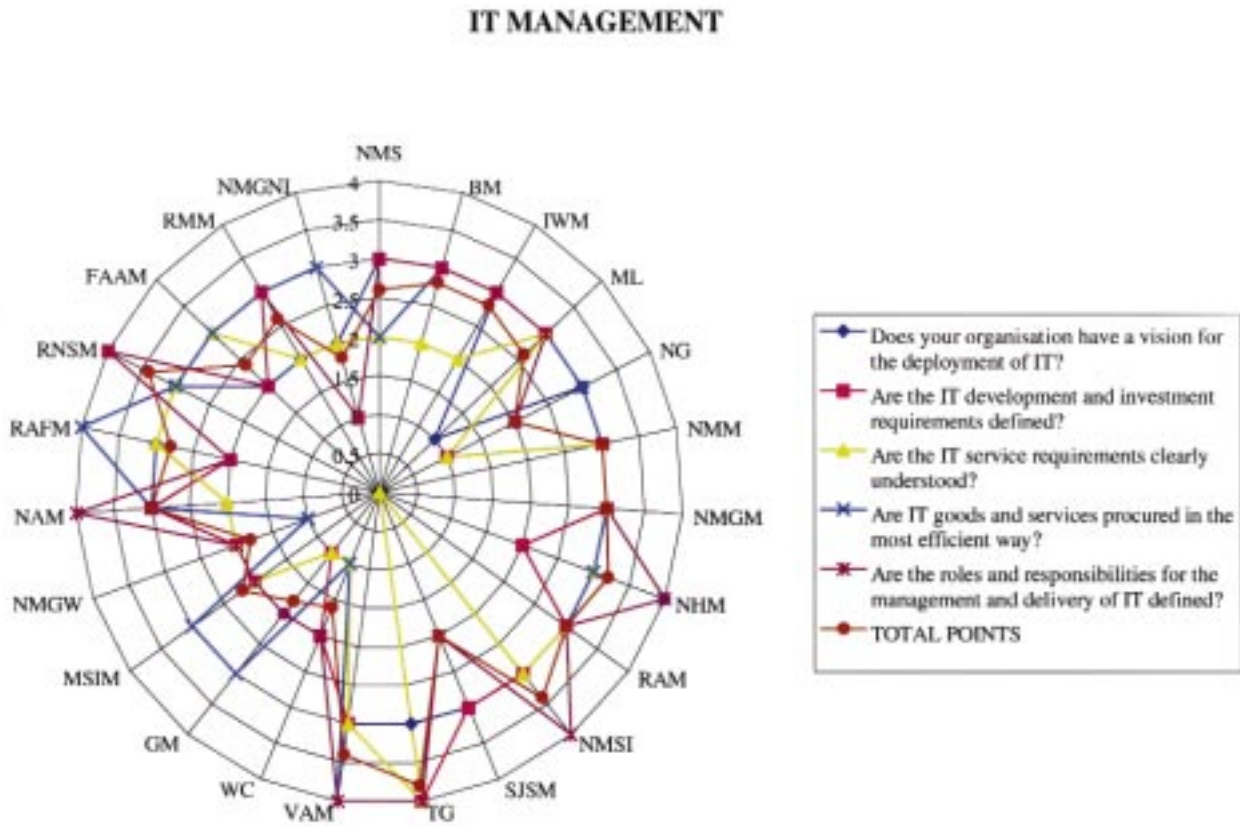
The Tate Gallery is the one organisation meeting and exceeding all the IT Management categories.

The workshop reinforced the message that more could be done to improve the approach to IT management. Specifically:

- the workshop felt that the relationship between IT management and overall management did not work as well as it could;
- that IT strategy was often not linked to overall corporate planning and business planning in particular;

- that the potential for IT to change existing working practices was not systematically being explored.

The following graph depicts the positions (regarding the 3 performance criteria of IT Management) of the 23 museums and galleries who responded to the IT Management 'self assessment' Questionnaire.



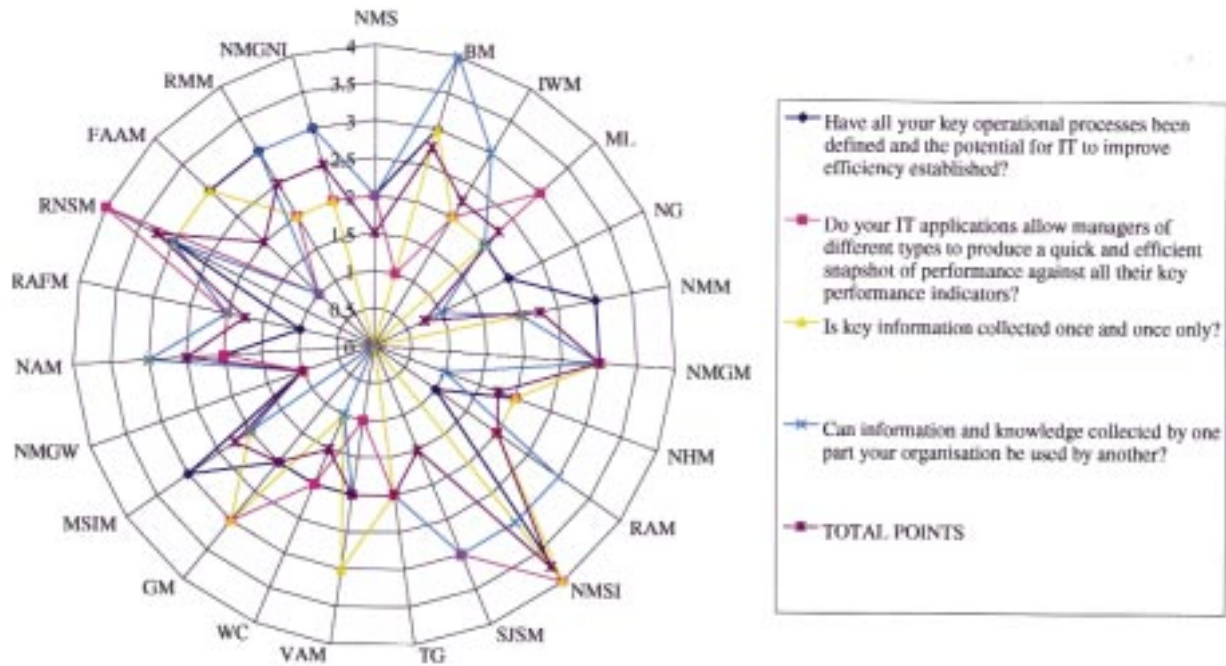
4.3.2. Business Processes and Applications

Despite the relatively good score on IT management, most museums acknowledged that they were only just beginning to define systematically their business processes and applications and produce an IT response to that definition. Ambitions however were generally high, with a number of organisations planning to overcome deficiencies in the near future. The National Museums & Galleries of Wales, for example, scored themselves as 1 on all the criteria, had a target of 4 and have identified the steps needed to achieve this target.

In general terms, organisations acknowledge that information management within their organisations is not highly developed. IT in most organisations could not automatically generate information and it was not felt that information was being collected in a particularly efficient way.

The following graph depicts the positions (regarding the 4 performance criteria of Business Processes and Applications) of the 23 museums and galleries who responded to the IT Management 'self assessment' Questionnaire.

BUSINESS PROCESSES & APPLICATIONS



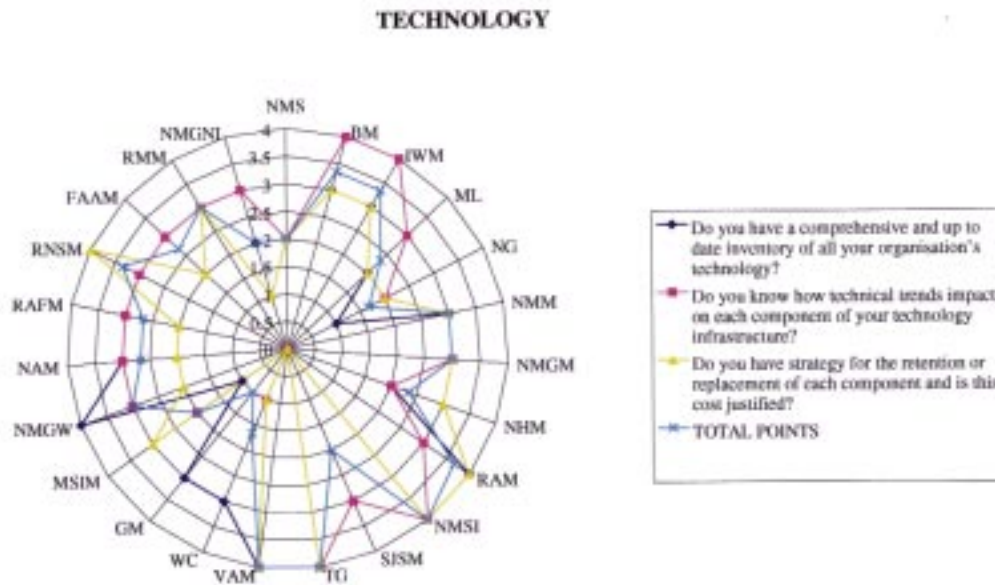
4.3.3. Technology

Most of the museums and galleries meet most of the performance criteria set out in the area of Technology (average performance rating 3), suggesting that IT managers feel that technology is being well used within their organisations. Experience elsewhere suggests that management of technology has improved recently as organisations have had to produce a thorough analysis of their infrastructure in preparation for Year2000.

In the last performance criterion, ‘Is there a strategy for the retention or replacement of each component and is this cost justified?’, many of the museums and galleries claim to have defined a strategy (performance rating 3), although many are still developing a strategy (performance rating 2) with some having implemented it (performance ratio 4). The size of the museums and galleries does not have any role in this observation.

The relatively good response to the questionnaire was at odds with the workshop views. Here it was acknowledged that, as a consequence of the problems associated with the availability and control of funding, the technology infrastructure was not being as efficiently managed as it could be. With the notable exception of the National Maritime Museum which had a strongly centralised approach to procurement, attendees felt that controlling the deployment of technology was a problem.

The following graph depicts the positions (regarding the 3 performance criteria of Technology) of the 23 museums and galleries who responded to the IT Management ‘self assessment’ Questionnaire.



4.3.4. IT Services

The responses to the IT services questions show that the requirement for IT services has not been fully defined in most organisations, with a number of organisations currently carrying out this exercise (mixture of performance ratings 2 and 3).

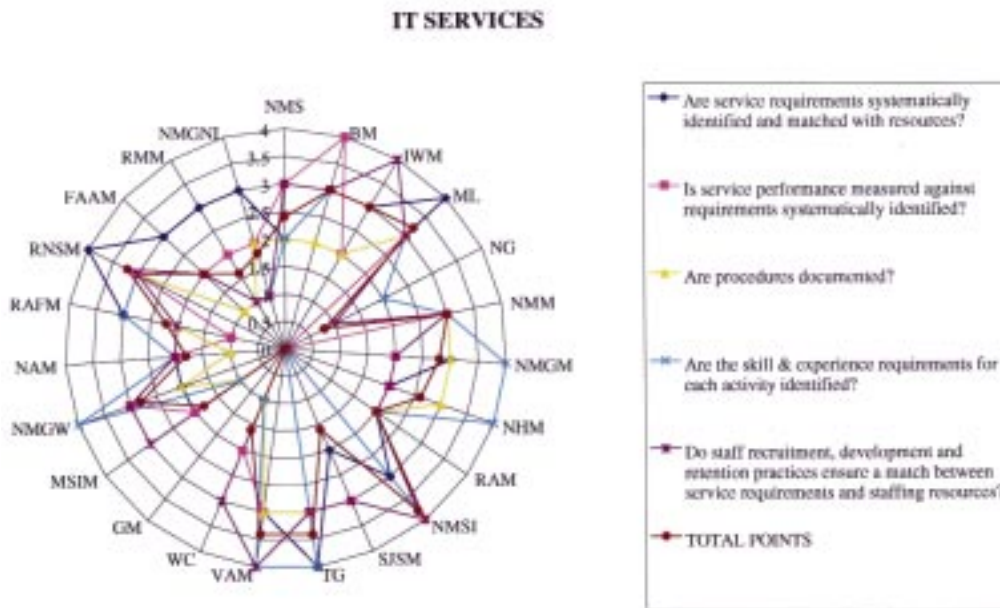
In the category, 'Are procedures documented?' half the museums and galleries have almost completed documentation procedures (these are mainly the large museums and galleries with the exception of the Royal Navy Submarine Museum) and the other half does not have any kind of documentation procedures in place (these are mainly the small scale museums and galleries with the exception of The National Gallery).

In the category, 'Are the skill & experience requirements for each activity identified?' there are almost equal splits in museums and galleries fulfilling none, at least one, most and exceeding the performance indicators. The size of the museums and galleries does not appear to have an impact.

The nature of the problems associated with service specification was explored in more detail at the workshop. Again, given the poor integration between business and IT planning and the poor control over procurement, workshop participants felt that it was difficult to sustain the relationship between expenditure on IT hardware and other IT related investment and IT services. This tended to result in IT services being underfunded.

The other issue to emerge at the workshop was the problem associated with staff recruitment and retention. There is currently an IT skills shortage in the wider labour market but the workshop felt that there were particular problems within the museum and gallery sector where overall levels of pay were felt to be lower than elsewhere. In addition, because of the small size of most museum IT functions, it is difficult to match the career development and training opportunities of other employers.

The following graph depicts the positions (regarding the 5 performance criteria of IT Services) of the 23 museums and galleries who responded to the IT Management 'self assessment' Questionnaire.

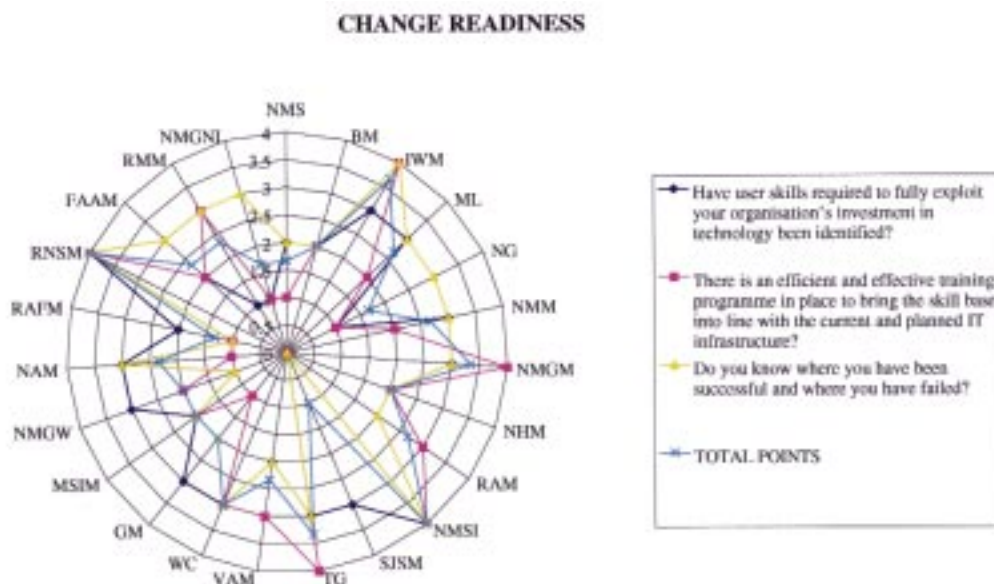


4.3.5. Change Readiness

Most of the museums and galleries claim to have deployed most of the Change Readiness procedures.

In the second category, ‘Is there an efficient and effective training programme in place to bring the skill base into line with the current and planned IT infrastructure?’ there are almost equal splits in museums and galleries fulfilling none, at least one, most and exceeding the performance indicators. The scale of the museums and galleries does not have any role in this observation.

The following graph depicts the positions (regarding the 3 performance criteria of Change Readiness) of the 23 museums and galleries who responded to the IT Management ‘self assessment’ Questionnaire.



Section 5: Web Comparison

Given its importance in the development of the Information Society, and the focus on the digital delivery of services within Government policy, we have focused on the Internet in the study of IT best practice.

The web site of the Smithsonian Institution of United States is the most highly developed museum gallery web site we could find. It has therefore been used as the benchmark for 'Best Practice'. The purpose of the comparison is to present both bilateral comparison within the UK sector and to demonstrate, through comparison with the Smithsonian, the scope for further development. It is not intended to establish what UK institutions should have achieved but to demonstrate where the Internet could be taking them in the future.

The Smithsonian Institution includes sixteen museums and galleries, the National Zoo and numerous research facilities in the United States and abroad. Nine Smithsonian museums are located on the National Mall between the Washington Monument and the Capitol. A three-level underground building houses two museums and the S. Dillon Ripley Centre, which includes the International Gallery, offices, and classrooms. Five other museums and the Zoo are elsewhere in Washington, D.C., and the Cooper-Hewitt, National Design Museum and the National Museum of the American Indian are in New York City.

The analysis makes the distinction between information and services. Information, such as visitor information, research information etc. are separated from services such as library, membership, online shopping etc. by the fact that service facilities involve some kind of transaction (online membership and ordering forms, online and interactive library) and are comparable to the E-commerce use of the Internet.

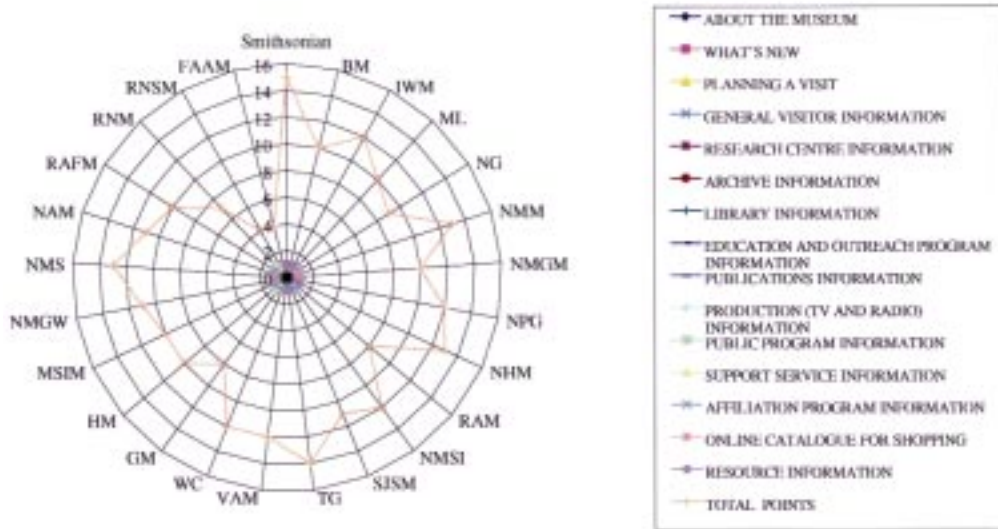
The distinction between information and "services" is significant in information management terms because services typically involve integration with other administrative systems (finance, booking systems etc) and a more integrated approach to IT management. It does not imply that services are more important than information for the achievement of museum objectives.

The following graphs are designed to provide a comparison of the positions of the UK museums and galleries in relation to the Smithsonian. Please note that the Smithsonian provides all of the 15 information types and the 13 services identified (description of the information and service categories are provided in appendix B). The positions of the UK museums and galleries in relation to the Smithsonian are depicted with dots in the respective graphs. For example, in the information graph, the Tate Gallery provided 14 out of the 15 key information types.

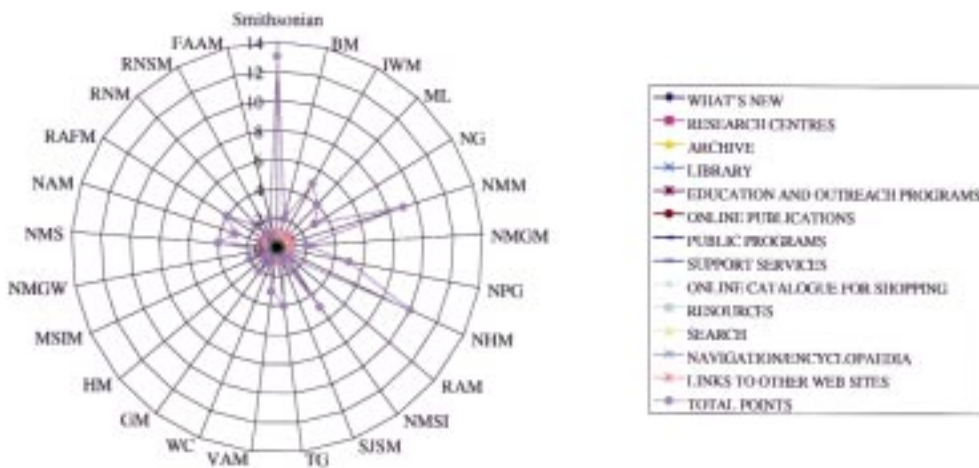
Web sites could not be located for three museums and these have not been included in the analysis.

The museum names abbreviated in the graphs below are provided in full in Appendix C.

INFORMATION PROVIDED BY THE SMITHSONIAN AND THE UK MUSEUM AND GALLERIES



SERVICES PROVIDED BY THE SMITHSONIAN AND THE UK MUSEUMS AND GALLERIES



The first graph shows that:

- the smaller museums and galleries are behind the larger museums and galleries in the UK;
- none of the museums and galleries match the performance of the Smithsonian Institution, although;
- some of the larger museums and galleries are not far behind.

Closest in performance is the Tate Gallery providing 14 out of the 15 key information types with the Natural History Museum, the National Maritime Museum and the National Museums of Scotland just behind providing 13 of the information types. The relatively small Royal Navy Submarine Museum and the Fleet Air Arm Museum provide the least information namely, 4 information types.

The second graph 'Services Provided by the Smithsonian and the UK Museums & Galleries' provides a comparison with the 13 major services on the Smithsonian web site. This graph suggests that:

- the overall performance is behind that of the Smithsonian with many of the larger museums and galleries still without a significant E-Service presence;
- two museums have started to develop E-Service capability.

Among the UK museums and galleries, the Natural History Museum and the National Maritime Museum are the closest rivals of the Smithsonian, providing 10 and 9 services respectively, out of the 14 key services.

The analysis of the above graphs shows that although many of the UK museums and galleries (mostly the large scale ones) do provide relevant information, they are a long way behind in providing services involving a transaction. Services, in IT terms, are more difficult to deliver and often require integration with administrative systems within the organisation. The capability, sophistication and size of the IT management function is likely to be a key constraint.

Section 6: Case Study

In the report three best practice case studies have been produced; two relate to the overall deployment of IT and one more specifically to the use of Web technology. The Tate Gallery and the Royal Air Force contrast best practice approaches in large and small organisations whereas the Natural History Museum, which has the most sophisticated web site, was chosen for the Web case study.

6.1. The Deployment of IT – Tate Gallery

The Tate Gallery, opened in 1897, is one of the largest galleries in the United Kingdom. The Gallery displays a large and varied selection of works from the Tate collection, complemented by temporary exhibitions and an active events programme.

The Gallery's organisational and operational structure is being reshaped as large projects such as the new Tate Gallery of Modern Art and the redevelopment of the Tate Gallery of British Art are nearing completion. Information Technology investment is seen as a way of enhancing services, generating new sources of income and maximising operational effectiveness.

The Gallery has recently developed a new IS strategy. The strategy, which has the support of senior managers, is closely linked to the business objectives and fifty members of staff were involved in its development.

New IT systems investment will be designed to:

- support the work of staff across the whole gallery, on all the sites;
- provide easy access to relevant and useful information to the visitors as well as the staff;
- generate cross-functional co-operation and produce a more integrated organisation.

In order to increase the flow of income, improve public services and to provide flexibility to accommodate the Gallery's ever changing needs, the IS strategy considered the following:

- operational needs;
- public service needs;
- income;
- management needs;
- communications;
- IT architecture;
- staff resources;
- statutory requirements.

Key developments include:

1. Implementing an Intranet – the Intranet site is aimed at facilitating gallery communications through news, bulletin boards, news groups and personal web pages. It will also be used to provide a repository of useful Gallery information, such as, telephone list, staff directory and information of general interest;
2. Implementing a Data Warehouse – the purpose of this warehouse is to act as a repository for common information resources, such as a unified mailing list;
3. Implementing new personnel, fund raising and membership and finance application packages;
4. Replacing the Collection Management System – the new system will be dedicated towards providing operational support to the staff involved in managing and exhibiting the collections and facilitating the delivery of information services to the public;
5. A new Visitor Information System – this system will provide ‘front-of-house’ information to the visitors through screens and kiosks located in the various galleries;
6. A Box Office System – this will be a pilot system for ticketing, booking and marketing;
7. British Art Information Project – this project is aimed at creating digitised images of the British collections;
8. Messaging System – an integrated Messaging System for the purpose of email, fax and voicemail will be developed;
9. Web Site – the existing web site of the Gallery will be developed to provide quality public information and increase revenue generating opportunities through e-commerce.

The anticipated benefits from the IS strategy implementation include:

- improved services to the public, measured by the greater number of visitors, improved visitor experience, greater public interest and better information services (via the web site);
- income generation through paths such as e-commerce, donations, corporate sponsorship and memberships;
- cost saving achieved by working in a more effective way.

The Tate Gallery is going through many changes. The new IS strategy is being implemented alongside new gallery developments and re-developments. One of the main constraints in achieving the strategy is the ability of the organisation to absorb change.

The Tate anticipates IT investment enabling two types of cultural change. First, it will help break down the rigid vertical structures present in the Gallery, facilitating cross-communication across the sectors both internally and externally. Second, it will improve access to the general public and to re-shape the museums and galleries into front-house public services. Museums and galleries are huge repositories of information. Technology can channel this information to the public through various services, such as, e-commerce, shops, memberships, sponsorships and many more.

6.2. The Deployment of IT – Royal Air Force Museum

The Royal Air Force Museum, Britain's National Museum of Aviation, tells the story of aviation from before the Wright Brothers to the Royal Air Force of the 21st Century. It has one of the world's finest collections of aircraft and represents the operational and social history of the RAF.

Information technology is seen as vital in shaping the Museum for the new millennium. The Museum's information technology strategy was developed to help it become more effective. The strategy is not solely about technology but is also a statement about the way the Museum will work in the future. The Museum has already seen radical changes in its operational structure as a result of the efficiencies flowing from the increased and improved application of IT.

In a short period the Museum has moved from a paper-based organisation to one that relies on IT. Key to the change has been investment in a new Collection Management System, a Wide Area Network link between the different sites, an electronic mail system, and a new accounting system.

The benefits generated from the investment include:

- extended online access to the critical systems through the Wide Area Network. The staff at the Royal Air Force Museum based in Cosford are using applications based at Hendon and are taking advantage of real time data entry and reporting. This ensures that information on financial systems is up to date and provides curators with the latest terminology on the Collection Management System;
- control of the documentation and movement of a gigantic repository holding almost one million artefacts through the new Collection Management System. The repository includes, books, documentary archives, photographs, film and sound and paintings and sculptures;
- enhanced communication both within and between the Museums and externally through the implementation of the new electronic mail. The email system has proven to be cost and time effective eliminating the need to photocopy stacks of documents for meetings and making communications more flexible;
- staff time savings in the collection of information for both the collection management and accountancy functions.

The Royal Air Force Museum has invested heavily in IT projects over the last year or so and has gone through significant technological changes. One of the main constraints identified is the ability of the organisation to adapt to radical technological changes. Replacing paper based systems with technology has not been an easy task. There is also the ever-present problem of resources and finance. To enable cultural changes, the Museum is carrying out a Training Needs Analysis and providing hands on training to the staff. In addressing the problem of finance and resource, the Museum has had to accept a slower pace of new implementation and concentrate on the consolidation of current systems.

The Museum so far has been concentrating mainly on using IT to enhance its internal effectiveness – the next stage will involve the deployment of IT to generate greater interest in

the collections. The Museum intends to improve its web site to provide digitised information from the Library and Archives.

6.3. Web Site Study – Natural History Museum

In the comparison of web site functionality the UK museum that was the closest rival of the Smithsonian was the Natural History Museum.

The Natural History Museum started its web site in 1994 with the objective of providing textual information to the academic community.

The decision to reshape the web site was driven by the recognition that the general public, as well as the academic community, were now starting to use the Internet. It was therefore decided to use the site as a vehicle for commerce, education and entertainment. The 1995 upgrade, which involved a specialist web designer, included more content ranging across academic projects, library, admission information and gallery information. Another upgrade was carried out in December 1996 improving site appearance and navigation. In the last year the site was further refined to enhance accessibility.

The web site development was driven by a number of considerations:

- User accessibility. The Museum does not want its site to be state of the art in terms of technology, as it wants users from across the globe to be able to enter the site, even with slow modems and old machines. The navigation facility of the web site is a key factor considered in providing greater user accessibility. The Museum wants its web site to have a logical navigation system where, any user from PhD. researchers to children wanting to see pictures of dinosaurs can find their desired page with ease;
- The Natural History Museum wants its web site to act as a gateway to its vast array of collections. Only about 10,000 of the Museum's specimens are displayed in the galleries out of the 68 million objects held. Progressively the Museum wants to improve access to the information relating to these 68 million objects and thus, these objects are going through a process of digitisation. 'Quest' is one of the navigation facilities in the Museum's web site providing interactive investigation on some of the digitised information;
- The Museum wants to develop technology to support different levels of interpretation (generating staff savings). For example, a palaeontologist might request research information on dinosaurs for himself at one point and at another for his seven year old child but this time at a different level of context. The Museum wants to automate the process of catering to these different levels of queries;
- The web site of the Natural History Museum is designed to target different audiences. Research professionals wanting to do research can use the research page which provides in-depth discussion on various topics, while the general public and education users can use the visitor page. For example the 'discovering Science' page designed for the general public provides easy to understand information on different topics. There are also interactive facilities provided through the site for users interested in online interaction.

The special highlights of the Natural History Museum web site are:

- dynamic news facility, providing new and regularly updated news;
- Quest, delivered in five languages and providing online interactive investigation on the various Museum galleries;
- Science Case Book, providing the facility to explore the Museum's ongoing scientific works. Users are able to join or initiate discussions on the areas covered in the various case books;
- a huge repository of reviewed set of links (reviewed and indexed by professional librarians) to the resources on the web providing information on natural history;
- the Picture Library in the Museum's web site will have the facility to sell digitised pictures via the Internet;
- the entire library catalogue can also be accessed online.

The Natural History Museum believes that the web will be one of the most important means of generating interest in its collections and facilities. By providing a global audience access to the Museum's vast array of information the Internet presents an opportunity to greatly enhance the value of the organisation's work.

Section 7: Appendix A – IT Management Self Assessment Questionnaire

Section 1 – Background Information

Name, Title & Organisation of respondent.	
Contact telephone number.	
No of IT users within organisation.	
No of desk top devices (PC, terminals).	
Desktop operating system (Microsoft 3.11, Windows 95 etc).	
No of servers.	
Server operating system (Unix, Windows NT).	
Network environment (Novell, Windows NT).	
Office automation system (Microsoft Office, Lotus Smartsuite).	
Main applications for which you are responsible (system name, function, no of users).	
No of dedicated IT Staff	

Section 2 – Self Assessment

The scoring system is described below. We score against five major headings – management, business processes and applications, technology, IT services and change management. Each heading has a number of performance criteria and there are indicators to provide guidance on how you stand against the criteria. The self marked performance rating establishes where you are now and where you aim to be.

The maximum rating, 4, is necessarily not relevant to every organisation (not everyone needs to be perfect) and is unlikely to be relevant to smaller IT operations. If there is a gap between where you are now and where you want to be then there is an action. The proposed action should be entered into the last column.

Performance Criteria	Performance Rating				Action	Proposed Action
	1	2	3	4		
	This is not relevant to the way we work	We meet none of the indicators	We meet only one of the indicators	We meet most of the indicators	We meet and exceed all of the indicators	We have plans to improve performance in this area

Performance Criteria	Performance Rating				Action	Proposed Action
	N/A	1	2	3		
IT Management (Please score against each criteria)						
Does your organisation have a vision for the deployment of IT?		X		✓	*	

↓
Current position

↓
Target position

↓
Action

Performance Criteria	Performance Rating				Action	Proposed Action
	N/A	1	2	3		
IT Management (Please score against each criteria)						
Are the IT development and investment requirements defined?						
Are the IT service requirements clearly understood?						
Are IT goods and services procured in the most efficient way?						
Are the roles and responsibilities for the management and delivery of IT defined?						

Performance Criteria	Indicators
<p>IT Management</p>	
<p>Does your organisation have a vision for the deployment of IT?</p>	<p>There is a coherent vision and approach as to how the organisation will develop IT over the next few years. The vision is endorsed by senior management. The impact of the vision has been identified in terms of operational and management processes.</p>
<p>Are the IT development and investment requirements defined?</p>	<p>The system and technology requirements for the organisation have been specified and endorsed at all levels. There is a plan with timescale and all resource implications are established. The benefits associated with investment have been identified.</p>
<p>Are the IT service requirements clearly understood?</p>	<p>Required service levels have been specified (systems, response times, availability). Costs are identified. Costs associated with different service levels are identified.</p>
<p>Are IT goods and services procured in the most efficient way?</p>	<p>Investment takes account of an overall strategy. The business case for IT components for developments is made. Agreed technical standards are in place and applied to all IT purchases. Economies of scale are realised where appropriate (e.g. single PC supplier agreements). Whole life costs are identified. Internal IT services are used only because they are demonstrably more effective than alternatives.</p>
<p>Are the roles and responsibilities for the management and delivery of IT defined?</p>	<p>Corporate IT management responsibilities have been identified. The requirement and responsibility for technical advice has been identified. User/manager responsibilities have been defined.</p>

Performance Criteria	Performance Rating					Action	Proposed Action
	N/A	1	2	3	4		
Business Process & Applications (Please score against each criteria)					4		
Have all your key operational processes been defined and the potential for IT to improve efficiency established?							
Do your IT applications allow managers of different types to produce a quick and efficient snapshot of performance against all their key performance indicators?							
Is key information collected once and once only?							
Can information and knowledge collected by one part of your organisation be used by another?							

Performance Criteria	Indicators
<p>Business Process and Applications</p>	
<p>Have all your key operational processes been defined and the potential for IT to improve efficiency established?</p>	<p>You have mapped all your key operational processes and understand the information management processes associated with each. You understand the relationships between the different operational processes and how IT does/could connect them. You understand how each of these processes are typically being addressed by the IT market place. You have identified scope for re-engineering processes through the application of IT.</p>
<p>Do your IT applications allow managers of different types to produce a quick and efficient snapshot of performance against all their key performance indicators?</p>	<p>You have systems in place which will generate all key management information requirements (in particular, financial information) in an efficient way. Information in these systems is easily accessible and can be readily manipulated by appropriate people. Managers at all levels are capable of using the systems and generating required management reports.</p>
<p>Is key information collected once and once only?</p>	<p>You have a clear view of your organisations information requirements This view has been translated into information systems architecture. Information is collected at the point at which it is generated (e.g. point of sale). Systems are integrated and common information is collected and held only once.</p>
<p>Can information and knowledge collected by one part your organisation be used by another?</p>	<p>You have a common means of accessing all your systems. You have a consistent approach to capturing and holding non-structured information (documents etc). All users who need to access non-structured information can get access to it.</p>

Performance Criteria	Performance Rating					Action	Proposed Action
	N/A	1	2	3	4		
Technology <i>(Please score against each criteria)</i>							
Do you have a comprehensive and up to date inventory of all your organisation's technology?							
Do you know how technical trends impact on each component of your technology infrastructure?							
Do you have a strategy for the retention or replacement of each component and is this cost justified?							

Performance Criteria	Indicators
<p>Technology</p>	
<p>Do you have a comprehensive and up to date inventory of all your organisation's technology?</p>	<p>You have an inventory defining item, make & model, age, location. You know which functions are supported. You know what the support arrangements are and the associated support costs. You record key levels of performance.</p>
<p>Do you know how technical trends impact on each component of your technology infrastructure?</p>	<p>You understand supplier/market proposals for each infrastructure component. You understand the likely impact of proposals on existing service levels and user satisfaction. You understand the impact of supplier proposals on support costs.</p>
<p>Do you have strategy for the retention or replacement of each component and is this cost justified?</p>	<p>You have a development strategy for your technical infrastructure. The development strategy includes timescales and development resource required. The development strategy is supported by a business case which identifies benefits and costs</p>

Performance Criteria	Performance Rating					Action	Proposed Action
	N/A	1	2	3	4		
IT Services <i>(Please score against each criteria)</i>							
Are service requirements systematically identified and matched with resources?							
Is service performance measured against requirements systematically identified?							
Are procedures documented?							
Are the skill and experience requirements for each activity identified?							
Do staff recruitment, development and retention practices ensure a match between service requirements and staffing resources?							

Performance Criteria	Indicators
<p>IT Services</p>	
<p>Are service requirements systematically identified and matched with resources?</p>	<p>The staffing resource implications of each IT service requirement has been identified. The budget for the resource implications has been identified. The means of resourcing the requirement has been identified (internal/external).</p>
<p>Is service performance measured against requirements systematically identified?</p>	<p>Performance indicators for key services have been defined. The means of collecting performance information has been established. The means of reporting on performance has been established. A mechanism for using past performance to improve future performance has been established.</p>
<p>Are procedures documented?</p>	<p>All the operational procedures associated with each key type of service have been identified. Operational procedures have been defined and are documented in accordance with risk. The requirements for technical and systems documentation have been identified. Documentation review and management procedures are documented and in place.</p>
<p>Are the skill & experience requirements for each activity identified?</p>	<p>The skills and competencies associated with each service activity have been identified. Job descriptions and responsibilities have been defined.</p>
<p>Do staff recruitment, development and retention practises ensure a match between service requirements and staffing resources?</p>	<p>Staff development or recruitment processes to fill skill gaps are in place Staff performance is systematically assessed Remuneration packages are matched against performance and the market</p>

Performance Criteria	Performance Rating					Action	Strengths – Weakness
	N/A	1	2	3	4		
<p>Change Readiness <i>(Please score against each criteria)</i></p> <p>Have user skills required to fully exploit your organisation's investment in technology been justified?</p> <p>Is there an efficient and effective training programme in place to bring the skill base into line with the current and planned IT infrastructure?</p> <p>Do you know where you have been successful and where you have failed?</p>					4		

Performance Criteria	Indicators
<p>Change Readiness</p> <p>Have user skills required to fully exploit your organisation's investment in technology been identified?</p>	<p>We have defined the skills needed to use the technology we have deployed. We understand the existing skills of our user community. We can assess with confidence the amount of training required to successfully implement any IT change.</p>
<p>There is an efficient and effective training programme in place to bring the skill base into line with the current and planned IT infrastructure?</p>	<p>We have established our current and future user training requirements. We have examined the alternative ways of delivering that requirement and have selected the most efficient and effective approach. We have an ongoing training programme that meets the needs of new users, skills refresh, and new developments.</p>
<p>Do you know where you have been successful and where you have failed?</p>	<p>We know who our most successful users are and have established why they are successful. We know which users are not exploiting the technological investment and have identified the constraints which are restricting take-up. We have included the lessons learnt from successes and failures in our training programme.</p>

Section 8: Appendix B – Explanation of the Key Information and Services Identified in the Web Comparison

Information Provided by the Smithsonian and the UK Museums and Galleries

Key Information Types	Explanations
1. About the Museum	Background and general history of the museums and galleries
2. What's New	These are recent press releases and information on upcoming events
3. Planning A Visit	General information on the new, permanent and temporary collections
4. General Visitor Information	Information on museum and gallery hours, fees, tours, disability access etc.
5. Research Centre Information	Information regarding research programs and opportunities, memberships to research centres, research publications etc.
6. Archive Information	Information regarding the present archive facilities
7. Library Information	Information regarding the present library facilities
8. Education and Outreach Program Information	Information regarding education programs, development programs for educators, events calendar, latest education and outreach news etc.
9. Publications Information	Publication information, such as name and author of publications, where available etc.
10. Production (TV & Radio) Information	Information on TV and radio broadcasting. For example, name and brief description of programs, when aired etc.
11. Public Program Information	Information on public programs such as, films, performances, lectures, shows, workshops, demonstrations etc.
12. Support Service Information	Information on the various support services such as, accessibility service information, museum studies information (grants, fellowships etc), membership information, public affairs information, development and licensing information etc.
13. Affiliation Program Information	Information regarding the different affiliations museums and galleries have all over the globe
14. Online Catalogue for Shopping	Information regarding the museum and gallery shops and their contents
15. Resource Information	Information regarding the museum and gallery resources. For example, education, research, accessibility, staff information etc.

Service Provided by the Smithsonian and the UK Museums and Galleries

Key Services	Explanations
1. What's New	The services provided in this section include new online and virtual exhibitions, new online publications, new web sites etc
2. Research Centres	The services here include facilities for online submission of research papers, online research resources (articles and papers) etc. The Smithsonian provides the Smithsonian Institution Research Information System (SIRIS) online. This is an interactive, integrated system dedicated to managing, describing, and providing access to research resources held primarily by the Institution's libraries, archives, and research units. SIRIS supports the Smithsonian research community by providing a gateway to and from other Institution information resources and to external information resources
3. Archive	The services here include online archived collections, online research service on archived collections, online manuscripts, online publications etc.
4. Library	The services here include online digital collections, electronic journals, internet reference tools, etc
5. Education and Outreach Programs	Services here include interactive educational resources, online forms etc.
6. Online Publications	These are, as the name suggests, online publication and also in some cases, subscriptions to online publications
7. Public Programs	Services are provided here via online entry forms to shows and online booking forms
8. Support Services	Services are provided here via online membership application forms, online job application forms (Human Resources) etc.
9. Online Catalogue for Shopping	Along with information on museum shop and their contents, this section provides services via online shopping facilities
10. Resources	The services here include online educational and general resources. For example, online staff phone directory, forms for grants, fellowships, researches etc.
11. Search	Online search facility (using words or phrases) of the web site
12. Navigation/Encyclopaedia	Online links to resources from A to Z
13. Links to Other Web Sites	

Section 9: Appendix C – List of the UK Museums & Galleries used in the Web Comparison with their Abbreviated Names

Number	Museum/Gallery Name	Abbreviation
1	British Museum	BM
2	Imperial War Museum	IWM
3	Museum of London	ML
4	National Gallery	NG
5	National Maritime Museum	NMM
6	National Museum & Galleries on Merseyside	NMGM
7	National Portrait Gallery	NPG
8	Natural History Museum	NHM
9	Royal Armouries Museum	RAM
10	National Museum of Science and Industry	NMSI
11	Sir John Soane's Museum	SJSM
12	Tate Gallery	TG
13	Victoria & Albert Museum	VAM
14	Wallace Collection	WC
15	Geffrye Museum	GM
16	Horniman Museum	HM
17	Museum of Science and Industry in Manchester	MSIM
18	National Museum and Galleries of Wales	NMGW
19	National Museums of Scotland	NMS
20	National Army Museum	NAM
21	Royal Air Force Museum	RAFM
22	Royal Naval Museum	RNM
23	Royal Navy Submarine Museum	RNSM
24	The Fleet Air Arm Museum	FAAM