F- M U. S. EU. M.
(From Multimedia System for a European Museum)

BUILDING A NEW CONCEPT OF VIRTUAL MUSEUM:
FOUR CASE-STUDIES ON BEST PRACTICES
The F- MU.S.EU.M Consortium:

1. EURO INNOVANET SRL, Rome, Italy
2. Cultura Animi Foundation, Sofia, Bulgaria
3. Regional History Museum “Academician Jordan Ivanov”, Kyustenil, Bulgaria
4. Musei Civici di Pitigliano (Museo Civico Archeologico Della Civiltà Etrusca, Museo Archeologico all’aperto “A. Manzi”), Italy
5. TRUST Tecnologie e Risorse Umane per Sviluppo e Trasferimento, Rome, Italy
6. City Of Rome - Dept. XIV for Local Development, Training and Employment Policies, Rome, Italy
7. Universitatea Lucian Blaga Sibiu- Ipcte, Sibiu, Romania
8. Banat Museum, Timisoara, Romania

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Executive summary

This Report analyses four cases of Virtual Museums and web sites – three European Institutions and one from Canada.

The aim of this report is to point out some best practices in building, running and maintaining a Virtual Museum; the data have been collected sending to the museums and Institutions wishing to participate in this survey a questionnaire.

The data collected have been organised in order to point out the basic characteristics of the virtual museums taken into consideration, the history of their realisation as well as some technical issues in building and maintaining a virtual product.

Particular focus was on strengths and weaknesses of the Virtual Museums as well as the human resources needed for building and managing the products realised.
INTRODUCTION

This Report is an output from work package number two of the F-MU.S.EU.M. project. The aim of this work is to identify some “best practices”, good working procedure and remarkable strategies and results in building a Virtual Museum, so as planning, together with other analyses and documents provided within the F-MU.S.EU.M. project, specific actions to build the European Virtual Museum to be realized within the mentioned F-MU.S.EU.M. Project.

The Report follows to documents already realized as outputs from work package number two of the F-MU.S.EU.M. project, which are:

- Research Report analyzing the available documentary sources and on field inquiries in Europe and in the countries involved in F-MUSEUM partnership aimed and documenting characteristics, consistence and profile of European Virtual Museum offer. This analysis aimed to picture the evolution of this sector in Europe from a quantitative/qualitative point of view.

- Research Report titled “New professional roles between actual and virtual museums”, concerning the definition of new and specific professional roles in connection to the European virtual museum offer, available on line.

Taking into consideration both the above mentioned studies, this Report aims to picture in depth four cases which are representative from the point of view of the evolution of the Virtual offer for European and world museums, also considering their human resources and the professional roles trained and involved in building their Virtual Museums. This work, in fact, aims also to point out, through an empirical survey, which are the most significant professional figures employed in the settlement, the managing and the maintenance of the Virtual Museums realized.

The four cases chosen for this study - two from Europe, and one from a non-EU country, are:

- The Canadian Museum of Civilization and Corporation
- The Marischal Museum
The Pitt Rivers Museum
The *Northumberland Rock Art* Project of the Newcastle University

The Museums have all a web site providing access to a Virtual Museum, while the *Northumberland Rock Art* Project provide access to an on-line archive of documents related to prehistoric sites and themes, with 360° pictures of several sites.

The choice of these specific cases has been done keeping into consideration several characteristics, like:

- Use of Virtual Reality (from Virtual environment to 3D pictures of the objects)
- Presence of a Database
- Services which represents added products and values to the actual Museum
- Good practices from the point of view of the human resources and staff
- High level of the product realized

Special attention was given to the professional roles employed by the four Institutions for designing, building and managing their virtual products: the four cases, from this point of view, represent some real excellences, having internally trained their human resources so as creating a competitive and easy sustainable resource.

A benchmarking of the products realized by the four Institutions taken into consideration in this work with the prototype of Virtual Museum realized within the previous project MU.S.EU.M., will follow the present study and will suggest some guidelines about the actions to be undertaken in order to create an innovative European Virtual Museum, together with the following documents:

- Analysis of the web sites of target museums of F-MU.S.EU.M. project (partners and beneficiaries);
- SWOT analysis:
  - construction of a check-list to be used for on field survey by the museum partners;
  - on field analysis through check-list, in order to find out the opportunity/weaknesses for the transfer activity with the purpose to increase the competitiveness of the enterprise-museums
Research report concerning the definition of the actions aimed to implement the transferability respect to the Museums target

A final consideration is related to the methodology used in this study, which based on a survey made by a questionnaire (see Appendix II of this Report). The needed data have been collected through open questions, focusing on Museums’ characteristics, history of the actual as well as the Virtual Museums; staff and financial resources employed for the creation of the Virtual museums; strengths and weaknesses of the products realized.
PART I
THREE CASE STUDIES ON BEST VIRTUAL MUSEUM

CASE I
THE CANADIAN MUSEUM OF CIVILIZATION CORPORATION

http://www.civilization.ca/

Figure 1 – Access page to the civilization.ca portal

1. Presentation of the Museum

The Canadian Museum of Civilization is a portal available in 2 languages (English and French), holding the websites of five different museums:

- The Canadian Museum of Civilization
The Canadian Children’s Museum
- The Canadian Postal Museum
- The Virtual Museum of New France
- The Canadian War Museum.

Figure 2– Homepage of Civilization.ca

The portal provides access to numerous permanent virtual exhibitions and a large database, available in English and French and tailored for scholars and researcher. Civilization.ca provides access to the following sections:

A - Archaeology

- Helluland Project: an ongoing research initiative at the Canadian Museum of Civilization. Helluland was the name given by the Norse to a barren land of rocks and glaciers to the west of Greenland and likely refers to Baffin Island and adjacent regions of the eastern Canadian Arctic. The project aims to investigate relationships between the aboriginal peoples and early Europeans who met in the eastern Arctic in the centuries around AD 1000.
Native People: This part is devoted to the history of the Native People in Canada.

Mothers of Time: it shows several Palaeolithic Figurines from the Louis Alexandre Jullien Collection.

Kichi Sibi: this part provides an overview of the ancient history of the Ottawa Valley using artefacts found in the region.

B - Arts and Craft

Puppets: a new Puppets Collection at the Museum.

The Sharpe House: the life’s work of a woman who dedicated herself to finding and preserving the material evidence of the traditions that Quebec inherited from New France.

Opus: the making of musical instruments in Canada – a study featuring over one hundred musical instruments - traditional and folk, symphony orchestra instruments and reproductions of early European instruments - made in Canada by some sixty artisans. The instruments are presented under four themes: the making of musical instruments, historical overview, aesthetics and symbolism. The description of each instrument is completed by a short biography of the instrument maker.

Bronfman Collection with a Virtual Gallery: created in 2000 to allow visitors to see more of the artistry for which the Awards were granted and to read about the artisans. For some of the artists, it will be possible to add images of more recent work and current biographical information.

C - Civilization

Mystery of the Maya.

Mysteries of Egypt.

India – The living Arts.

The Haida of the Queen Charlotte Islands (Haida Gwaii)

D - Cultures

Resonance: this exhibition presents instruments from Francophone countries and the musical traditions behind them. It is the contribution of the Canadian Museum
of Civilization to the cultural component of the Games of La Francophonie 2001 in the National Capital Region.

- India – The living Arts
- The Lands within Me: Expressions by Canadian Artists of Arab Origin features the works of 26 Canadian artists of Arab origin. The immigrant experience and métissage, or cultural intermixing, are explored through the works, experiences and commentary of the artists.
- Boat – People no longer: dedicated to Vietnamese Canadian People.

E- First Peoples

- Native People: cfr. Archaeology
- Emergence:
- The Haida: cfr. Civilization
- The Inuit 3D museum (http://www.civilization.ca/aborig/inuit3d/inuit_e.html)

It is a completely imaginary Museum, not existing in the reality, a real Virtual Museum offering visitors the possibility to interact with artefacts in three dimensions. Although the museum does not require any special equipment, it does use VRML (Virtual Reality Modelling Language), the standard for 3D on the Web. The visualization of the contents of Virtual Museum requests the installation of a plug in.
Visiting the Inuit 3D museum is a unique experience; built with an enchanting graphic, it allows the interactive visit of a section meant for non-expert people, who don’t know much about the Inuit culture and wish to learn about it. The museum has many section (e.g. Paleo-Eskimo exhibition, Inuit History exhibition, the Bear, Woman with child, available in this Virtual Museum, it is possible to explore specific environments in which typical items are displayed. The pictures of such items are very often in 3D, and they are accompanied by short but clear and complete texts, explaining an aspect of the Inuit culture. Audio-visual tools (like short films) complete this innovative Virtual Museum.
Figure 4 – Possibility to view short films about the Eskimo civilization
Figure 5 - “Woman with Child” section, showing 3D items and texts with complete explanations

F - History and Military History

- Northern People, Northern Knowledge: the story of the Canadian Arctic Expedition 1913-1918
- Playing through: Golf, the Canadian Story of a sport enjoyed by over five million Canadians
- The History of Pensions: the History of Canada’s Public Pensions
- Dogsled Mail: the origin of Dogsled Mail in the Yukon in the 1890s
- Collections storage
- Philatelic Treasures
- Canvas of War
- Treasures Gallery
2. Museum’s characteristics and history of the Virtual Museum

The Canadian Museum of Civilization is a federally-funded Crown Corporation, operating two national museums (the Canadian Museum of Civilization and the Canadian War Museum).

It has been one of the pioneers of a museum presence on the World Wide Web, and it has been realized without the help of any network. Civilization.ca was the first Canadian museum site on the Web; it was launched in 1994, with only a hundred or so pages. Over the last 14 years it has been built into one of the largest museum Web sites, with tens of thousands of pages (including well over 100 virtual exhibitions), many audio and video presentations and several large databases.

The initial challenge was to resource the project and to build, across the Corporation, interest and engagement in developing content for a medium that seemed (in the mid-1990s) relatively unimportant. As the Web site grew and the importance of the Web has become increasingly apparent, the challenges have been to keep the navigational
design serving the changing needs and preferences of users, and to provide for the governance of the Web project (in terms of positioning it within the organizational structure, integrating Web operations into existing corporate processes such as strategic planning and approvals, and adapting established organizational processes and resource allocations to meet the needs of Web site development).

Some highlights of the history of its development are:

- 1995, online shopping added (Cyberboutique, first generation);
- 1995/96, online auction held;
- 1996, launch of Virtual Museum section of the Web site, with 9 virtual exhibitions and a site search engine. 7 other virtual exhibitions added during the year. Access at first by registration and password; registration system later abandoned and free access for everyone was provided.
- 1996, launch of Cybermentor, an online distance education feature.
- 1997, launch of the Virtual Museum of New France, initially a Web site separately administered within the CMCC, but later amalgamated with Civilization.ca
- Launch of a virtual tour of the museum’s Canada Hall exhibition, using QuickTime VR.
- 1998, launch of a virtual tour of Tutankhamun’s tomb, using VRML technology.
- 1998, launch of an online catalogue of the collection of museum artefacts.
- 1999, Live Webcast of the opening ceremonies (with related musical and dance performances) of an exhibition.
- 1999, launch of an online catalogue of the Corporation’s library and archival collections.
- 2000, launch of a commercial service selling genealogical information online.
- 2001, redesign of the site interface, to enable the database-driven, dynamic generation of front-end pages and of media releases and job openings, and the introduction of special portals targeting children, teachers, and scholars.
- 2001, launch of an interactive educational game, played online, using Flash technology (the first of many).
- 2002, Civilization.ca wins AVICOM award as one of the world’s best museum Web sites.
- 2006, launch of a database-driven service to facilitate planning visits to the physical museums.
2007, launch of a service to enable online applications for employment in the Corporation.

3. Strengths and weakness of the product realized

The Canadian Museum of Civilization and Corporation has been chosen an example of best practices for the educational resources available on its Virtual Museum and because it provides access to innovative products, as its Virtual Museum, entirely realized with virtual reality. The museum, which is highly committed with the constant implementation of the products realized, provides access also to several virtual exhibitions realized with a very clear, complete and, at the same time, easy to understand texts and with an enchanting graphic.

The Virtual Museum has always been strongest in the presentation of substantial amounts of in-depth knowledge and educational resources. In recent years the focus has changed more towards using the Web site to promote visitation to the physical museums and to support corporate business processes via the introduction of online services.

The product realized is constantly being further implemented. A major Web site revitalization initiative is currently underway and will involve interface redesign, reviewing and updating existing content, and consideration of the introduction of new services or features using Web 2.0 technologies.

The success of this Virtual Museum could be, in the opinion of Stephen Alsford, attributed to two main factors:

- Being a pioneer museum site on the Web made it possible to capture an early audience share, while the continued addition of new content to the site over subsequent years allowed us to keep the early audience returning and to grow it by attracting niche audiences interested in specialized subjects for which we provided in-depth information in both of Canada’s official languages.

- The presentation of knowledge-rich and visually interesting information, in a variety of formats, but with emphasis on simple formats enabling ease of access (in terms of minimal software requirements of users and of short download times).

As Stephen Alsford says, broadband access, e-learning as well as growth of interest in Culture and Heritage are important. The principal driver, however, has been the growing
use of online resources in the educational system. The transition to broadband will likely become an increasingly important driver in the next few years. The duration of virtual exhibitions is, in most cases, indefinite.

4. Portal’s Target groups of users

As a national institution, the Canadian Museum of Civilization Corporation targets a geographically and demographically wide audience. Particular focus of the Web site is on:

- Persons researching aspects of the human history of Canada, including students, scholars, and members of the general public.
- Tourists interested in visiting the Canadian Museum of Civilization or the Canadian War Museum.
- Persons interested in working for, volunteering at, or making donations to, one of the museums.

5. Outcomes from the Virtual Museum

Statistical evidence has not demonstrated a significant direct impact. However, anecdotal evidence (from e-mails received) clearly indicates that the Web site has stimulated visiting, both in terms of:

- Creating awareness and generating tourist interest (particularly outside the regional tourist catchments area) in the physical museums and their products (e.g. exhibitions, public programs, IMAX theatre);
- Providing logistical information that facilitates advance planning and carrying out visits.

The Canadian Corporation has the mandate:
"to increase, throughout Canada and internationally, interest in, knowledge ... of and appreciation ... for human cultural achievements ..., with special but not exclusive reference to Canada"

For a national museum, it is a challenge and a heavy expense to fulfil this mandate for audiences across such a large country, not to mention beyond Canada. The Web provides a relatively cost-effective medium with which to address the outreach obligations of the Corporation.
6. Team and professional devoted to the Virtual Museum’s creation

In 1994, the level of technology of Web sites was very low and most early content was repurposed from existing printed materials. This made it possible for a relatively untrained individual to perform all the necessary roles. As the technological and other demands have grown, the Web team has required specialized designers, coders/programmers, database developers, content writers (also translators and editors), a public services officer (responsible for handling public enquiries via e-mail and for promotional activities), database managers, server administrators, and a Web site manager. Currently there is only a small Web team of five persons. Staff from other parts of the organization become involved in certain aspects of the operations of the site (e.g. server administration, content development), and some work (notably design of virtual exhibitions) is sometimes outsourced.

There are some staff within the museum’s Exhibitions and Programs Branch who prepare pedagogic materials, and have collaborated with the Web team on this aspect of virtual exhibitions. This work has also sometimes been outsourced. Professional development is considered fundamental in this institution, including increasing the computer literacy skills of staff. Web team staff have taken courses in new technologies (e.g. Flash) and periodically attend professional conferences (e.g. Museums and the Web).

At present time, the required roles are all available within the Corporation, with the exception of translation and editing, which is normally outsourced. However, in order to maintain a high level of output of online products and services, other outsourcing has taken place on occasion. This has primarily been in the area of Web design and development, and to a lesser extent content development. The major challenge with outsourcing is to ensure that the resultant products are compliant with institutional standards and guidelines, and function properly as components of a larger unit (i.e. the Web site) rather than simply as stand-alone products. To ensure this requires a heavy investment in supervision and communication on the part of the Web site manager. Additional challenges exist where a virtual exhibition has to be designed both for integration with the Web site and for presentation on kiosks within physical exhibitions.

The Corporation outsources much of its IT support to Computer Associates, who operate a network control centre set up within the museum. Those services include Web server
administration. Because of the modern complexity of Web technology and the risks from viruses, hacking etc., this kind of support infrastructure is essential. Maintenance and updating is undertaken mostly by Web team staff, with some undertaken in special cases by other staff of the Corporation; for these human resources, training is recommended by the Web Site Manager, as necessary: It involves either the normal Corporate training provisions, or courses offered by external organizations.

7. Economy of the Virtual Museum: capitals invested for the creation and maintenance of the Virtual Museum

There was no investment capital and no operating budget when the Web site was launched in 1994, and only a single human resource. No budget was allocated until 1996. Funding has increased slowly over the years. The first budget (1996) was $88,400. The most recent annual budget for 2007/2008 is $293,000. These are operating costs and do not include salaries. It has in the past proven to be relatively easily sustainable by available human resources, thanks in part to the introduction in 2001 to elements that are database-driven. A greater challenge is in updating the accuracy of the extensive knowledge-based virtual exhibitions; this will require substantial investment of time by in-house and/or external subject experts, and is an issue currently being explored.

The primary source of funding is the corporate budget, which comes from the federal government (i.e. taxpayers). Some virtual exhibitions have been made possible thanks to sponsorship by, or partnership with, external organizations (through the donation of money and/or content resources), and others through grants from federal funding programs (e.g. Canadian Culture Online, Virtual Museum of Canada)

8. Data about the museum

NAME OF THE MUSEUM:  
Canadian Museum of Civilization Corporation (CMCC)

COUNTRY AND ADDRESS:  
100 Laurier Street  
Gatineau, Quebec K1A 0M8  
Canada
NAME OF THE RESPONSIBLE OF THE VIRTUAL MUSEUM/WEB SITE:
Sandra Hammel, Web Site Manager

NAME OF THE DIRECTOR OF THE MUSEUM:
Dr. Victor Rabinovitch President and Chief Executive Officer
1. Presentation of the Museum

Founded in 1786, the Marischal Museum, which lies in the University of Aberdeen’s Marischal College, holds collections of high quality material.

Among the items forming the collection, there are:

- Scottish prehistory items
- Numismatics
- Egyptian and Classical antiquities
Non-Western ethnography

The museum has an excellent track record of ensuring that its collection is used to **inspire and educate a wide range of visitors** through: innovative exhibitions, evening lectures, an award-winning schools service, a young archaeologists club, resources for higher education and support for researchers.

The Museum web-site provide access to:

- General
- Collections
- Exhibitions
- Learning
- Home

The *Collection* provides access to the Virtual Museum and to the “Lemur Database”.

![Figure 8 – Entrance to the Marischal Virtual Museum](image-url)
The Marischal Virtual Museum is a full record of views, QTVR panoramas, captions and layout of the museum galleries.
It is underpinned by a rich database of thousands of objects, including all those on display, making it a rich resource for many purposes.
The Virtual Museum re-creates the displays of Marischal Museum, showing the layout of the museum, allowing visitors to explore views of the building and exhibitions, as well as all items on display.
It is therefore possible to explore Marischal Museum from a distance, whether as a virtual tourist or as a student wishing to write a critique of the displays.
The Virtual Museum requires Javascript and Quicktime VR (QTVR) to be installed for the full interactive experience.
The Virtual Museum is divides into 4 main sections:

- **Home**
  This section shows a short presentation of the Virtual Museum

- **Plan**
  This part hosts a map of the museum, divided by floors.
  By clicking on specific symbols, it is possible to explore the museum rooms and objects, viewable in 3D.
  It is possible to explore the museum's rooms starting from the main entrance, through the Entrance hall, up to the stairs and the rooms on the upper floors.

- **Index**
  The *Index* allows visitors to do searches in the Marischal collections and topics.

- **About**
  The *About* section gives useful information about the Marischal Virtual Museum and about the Lemur Project, within which the Virtual Museum has been realized.
  Many links in this section provide access to the Lemur Project Home page as well as to the Marischal Museum home page.

- **Search**
  This section allows visitors to discover the collection of the museum, and to do searches of specific items thanks to a very simple form, suitable also for a non-specialist audience.
Figure 9 - “Plan” Section of the Marischal Virtual Museum

Figure 10 - Virtual visit of the Marischal Museum:
The main entrance
Figure 11 - The Lemur Database search

Figure 12 - 3 D Picture of Kali
2. Museum’s characteristics and history of the Virtual Museum

The Marischal Museum is owned and run by the University of Aberdeen. The Museum is part of a network, one of the museum of the university; furthermore, it is a member of various organisations (e.g. North-East Museums partnership, Scottish Museums Council etc.).

As Neil Curtis, Senior Curator of the Museum, stated, “being part of the University enabled the Museums to apply to Joint Information Systems Committee (JISC) for funding, while all members of the project team were university staff”.

The Marischal Virtual Museum was realized within the LEMUR (Learning with Museum Resources) Project, a 3-year project funded by the JISC’s Learning and Teaching (5/99) Programme that aims to provide wider access to the University of Aberdeen's historical collections.

The Lemur project had three main aims:

- To create an on-line database of selected items from the museum’s collection, including everything on display
- To create an on-line representation of the museum’s exhibitions
- To devise ways of using these resources in specific courses within the University of Aberdeen and other higher education institutions

Funded by the Joint Information Systems Committee (JISC) to contribute to the Distributed National Electronic Resource, its specific goal was “the creation of a digital collection, a database of thousands of images and accompanying text, which will be put onto the World Wide Web and incorporated into undergraduate teaching at the University and elsewhere.”

What is remarkable of the LEMUR project is the way in which the digital collection have been put together, and how it can be used: academic staff from Physics, History of Art, Cultural History and History and Philosophy of Science have been working with IT specialists and museum curators right from the start; selecting objects, deciding how they will be photographed, updating catalogues, writing captions and developing new teaching packages.
The database was the first priority, providing a means of storing and providing access to the digital resources for the other elements of the project. Its data structure had to reflect that of the museum's own collections databases and it had to be searchable in various ways to enable staff and students to select appropriate resources for different purposes. It is a digital collection, a database currently of 3500 images and accompanying text, available through the Web.

The database brings together a wealth of material from the University's collections that can be used for teaching in the Arts, Social Sciences and Sciences not only at Aberdeen but also more widely throughout the Higher Education community.

High quality digital images and the basic computer catalogue are enhanced with contextualising material, such as early hand-written inventories and letters from the collectors, as well as a virtual re-creation of the displays at Marischal Museum.

The ability to provide multiple views of objects and to have captions written by a variety of people was an important aspect of the project, providing information to enable users to understand the history of collecting and display.

The final product is much more than a searchable database: the Virtual Museum's aim is to show the many meanings of objects by revealing their associations with other objects as a part of a collection and the history and rationale behind the collections and collectors.

As important as what an object's function was and where it was made are the reason why it has been collected and associated with the other objects with which it is displayed. This is something which is often overlooked in online collections, as the availability of keyword searching and the straightforward display of individual object records often result in the valuable contextualisation which museums provide being overlooked.

The concept of the realized product is that a museum is much more than a collection of individual objects, and the virtual equivalent must think carefully what it is trying to achieve in addition to this.

The Marischal Virtual Museum was also intended to reveal much more than a superficial view of the displays. It was to be a full record of views of the museum, all display cases, all objects on display, plans of the museum, texts of all captions and QTVR panoramas of selected areas. It would thus enable students to critique the display strategies of the museum by giving them a close approximation to the feel of an actual visit.

The virtual museum was also designed to illustrate aspects of the museum that are not normally visible to visitors, such as offices, conservation laboratory and reserve collection, to give users a richer appreciation of museum practices.
An interface to enable complex searching of the database on multiple criteria was
developed. This enables specific objects, or those with specific qualities to be identified by
keywords or phrases, including the ability to perform Boolean searches. The default format
for search results is the familiar rows-of-thumbnails with summary information, but output
can also be specified as a timeline which displays objects chronologically as a date range.
The database software is MySQL and the Web site itself was created in PHP, producing
HTML output with some JavaScript for non-critical applications, e.g. mouseovers.
Both MySQL and PHP are robust, leading open-source solutions. The web server is the
University's central web server, a UNIX platform running Apache.
Due to the size and number of object images, they are stored on a separate UNIX
machine and retrieved on demand by the web server.
The database has been augmented with the images of the objects photographed for the
project as these have become available.
Objects were photographed in a studio environment, where practical, on slide film using
the following equipment: Camera: Nikon F3; Lenses: Nikon 55mm F2.8 Micro Nikkor and
Nikon 105mm F2.8 Micro Nikkor; Film: Fuji Fujichrome Provia 100F
Transparencies were then scanned to approx. 5X7 inches at 300dpi.
Due to the large number of images required an external contractor was employed to make
most of the high resolution scanned images which were written to CD in batches of
100-150. These were then supplied to the site developer to be reduced to a suitable size
for Web use and added to the on-line collection. Images are reduced in size and stored in
JPEG format, affording a compression ratio of c90%, which typically reduced a c1MB
image file to c100K. Visual quality control procedures were exercised by museum staff
after scanning and after Web-mounting.

2.1. History of the Virtual Museum Design

There is an inevitable tension between objectives in the design of the Virtual Museum: on
the one hand, it aims to reflect the layout of the museum itself and to convey something of
the experience of visiting the museum; on the other, the intention of the Virtual Museum
creators was to maximise the benefits of a virtual environment, not reimposing the
constraints inherent to a physical museum.
Although initial discussions discussed the notion of a "virtual walk-through" and an entirely
immersive 3D Virtual Reality experience, it became clear that while this approach might
appear impressive it would be limited in its educational value. Instead, a floor plan based navigational structure was chosen which would allow users to browse areas (broad themes) of interest and then focus on individual displays for further information and access to individual objects. This provides a big-picture view from the museum as a whole, down successively to broad themes, individual collections, individual displays and finally to the objects themselves. In this way both the character and layout of the museum and the history and rationale of the collections can be understood.

Users are presented with a 3-dimensional floor plan of the museum building, with colours indicating different areas and themes. Each area can be clicked and navigated to, where further detail will be presented in the form of a detailed floor plan. These then link to individual displays where objects are shown as displayed in their museum setting with contextualising information, often in the form of the collector’s biography, and thumbnails linking to each individual object record. These records provide access to the larger sized images of the object.

A series of 3-dimensional QTVR (Quicktime Virtual Reality) sequences, accessed from the floor plans, give added spatial context to the museum, enabling users to see how the museum appears to the visitor and how the spaces inside are used. The QTVRs can be navigated independently of the floor plans, enabling users to “walk through” the museum, clicking between successive views.

Virtual reality sequences and views of objects as displayed in situ were photographed with the following: Camera: Nikon Coolpix 990 digital camera with WC-E63 wideangle converter to give the equivalent of a 24mm lens on a 35mm camera. Tripod: Manfrotto with Manfrotto 302 QTVR Panoramic Head. The head can be levelled and you can choose the angle of rotation between one shot and the next.

The interactive Virtual Reality panoramas and object movies were created using Apple QuickTime VR Authoring Studio (QTVRAS).

To build the VR sequences, a series of vertical images were taken at 20 degree intervals forming a series of eighteen images which were stitched together in QTVRAS to form the panorama, and the initial view and size defined.

URL hotspots are added to link to other panoramas and a fast start preview was added so on slower modem connections a blurred image is seen to be loading so the person online can see that something is happening. This was then exported as the final panorama.
An A-Z index of topics and collections was added to in order to make the site more accessible a) to visually impaired users and b) to those searching for a particular topic or collection, or an overview of the museum’s contents.

Combined with the database search facility, the Virtual Museum makes the collections explorable as well as searchable: the context in which the objects which make up the collections is as important as the individual objects themselves.

Object records located using the database search facility feature a cross-referencing link to the Virtual Museum.

The user can thus learn context having located an object using “search” as well as learning about an individual object which they have located through the context of the Virtual Museum.

3. Strengths and weakness of the product realized

The Marischal Museum is an excellent case of good practices in building a Virtual Museum for many reasons: fist of all, it is an example of virtual resource realized within a Project of high level.

Furthermore, it is remarkable that the Marischal Virtual Museum allows visitors to create associations among the objects, making them free to discover the available resources according to their needs and interest. Another important characteristic of this Virtual Museum is that users have concretely been involved in its design, also writing some of the captions. Two last things which make this Museum an example of best practices are the use of interactiv virtual reality panoramas of the rooms together with 3D pictures of the items displayed, as well as the use of the Museum internal staff to maintain the products realized.

Among the strengths of the Marischal Virtual Museum, the most remarkable elements are:

- Involvement of users in its design
- Large number of detailed records
- Good representation of the physical museum
- Quality appearance
- Reliable straightforward functionality
Among the potentials, the most remarkable are:

- 3D modelling of space
- More 3D images of objects
- More activities for users

According to Neil Curtis, the future work of improvement of the Virtual Museum will lies on the following points:

a) Include records of more items (only 3000 out of almost 100,000 are shown)
create more interfaces and activities for users (e.g. for schools)
b) Easier ways of updating from museum collection management database to ensure it is up-to-date

4. Portal's Target groups of users

Concerning the Virtual Museum Target groups, principal focus is on Higher Education teaching & learning; schools and the public are also among the Virtual Museum users. A special focus is on learning potentials of Virtual Museums: one of the most remarkable aim of the Marischal Virtual Museum is encouraging university to use the museum for teaching and research; furthermore, another relevant goal is widening access to the Museums collections.

According to the prime purpose of the project, which was higher education teaching and learning, the database and Virtual Museum were designed to be flexible resources, the teaching needs of individual members of staff meant that they were used in a variety of different ways. These ranged from very IT-intensive approaches whereby much of a course was delivered through a WebCT site to other courses in which students were directed to the virtual museum and expected to discuss it in tutorials.

5. Outcomes from the Virtual Museum

The realization of the Virtual Museum improved the services of the real museum. Among the most remarkable results of having built a Virtual Museum, it is possible to list the following outcomes:
Higher profile within the university and elsewhere
More teaching use of the museum and its collections
Improved response to enquiries (e.g. requests for images of objects)
More requests about the collection due to more awareness of the collection
Greater expertise in possibilities of ICT in museums
A general raising of profile and level of activity

6. Team and professional devoted to the Virtual Museum’s creation

About the creation of the Virtual Museum, the professionals needed in building it were, in some cases, part of the museum staff. Some other professionals came from university staff, whose time was bought out to enable their participation.

In the beginning of the Project, which led to the creation of the Virtual Museum, the team brought together many of the required skills; others were employed to bring requisites skills (IT, photography) and time.

In particular, three professionals were employed for the duration of the project. They were:

- Curatorial assistant
- Programmer
- Photographer

A key element of the project was the way that a small team, consisting of academic staff from Physics, History of Art, Cultural History and History and Philosophy of Science, worked with IT specialists and museum curators from the outset selecting objects, deciding how they would be photographed, updating catalogues, writing captions, and developing new teaching packages.

The design of the database was thus determined by the projected teaching uses of the resource as well as reflecting museum documentation.

The core project team undertaking development of the Web site comprised a Project Manager (the Senior Curator of the museum), a Curatorial Assistant, a Photographer and the Web site developer.
As part of the university there is a strong framework for staff development, training and appraisal. Staff are encouraged to conduct research, take part in workshops/conferences and undertake training. The museum also offers training for e.g. school teachers. No specific staff has been trained for the preparation of pedagogical materials. At present time, the Virtual Museum maintenance is carried out by existing IT and museum staff. The maintenance of such a structure faces some problems: one is that it is not easy to update the Virtual Museum, so the Marischal Museum is looking at other ways of maintaining online materials within normal work patterns. This will probably result in the use of an alternative database package to support an online database.

7. Economy of the Virtual Museum: capitals invested for the creation and maintenance of the Virtual Museum

The total cost of the Marischal Virtual Museum was £248,000. In order to start up the Marischal Virtual Museum no new investments capital was provided, but project funding to enable employment of staff, photography etc., for the duration of the project. A bid to Joint Information Systems Committee of the Higher Education Funding Councils in the UK was in charge of taking the decisions on the financial aspects of creating the Virtual Museum. The product realised is also easily sustainable, according to what Neil Curtis states: to maintain existing functionality is very easy, while more problems appear when talking about Virtual Museum developments (including updating or adding records). The financial resources needed to sustain and maintain the product realized came from different sources: most funding, £198,000, came from the Joint Information Systems Committee of the Higher Education Funding Councils in the UK. The remainder was funded from various sources forms within the university in recognition of its value in creating a teaching resource.
8. Data about the museum

NAME OF THE MUSEUM: Marischal Museum, University of Aberdeen
COUNTRY AND ADDRESS: Marischal College, Aberdeen AB10 1YS, Scotland
NAME OF THE RESPONSIBLE OF THE VIRTUAL MUSEUM/WEB SITE:
Neil Curtis, Senior Curator
Contacts: neil.curtis@abdn.ac.uk
1. Presentation of the Museum

Founded in 1884 by General Pitt Rivers who gave his collection to the University, the Pitt Rivers Museum holds one of the world's great collections; it is also famous for its celebrated displays and its leading role in contemporary research and museum curatorship. The Museum displays prehistoric, archaeological and ethnographic objects from all parts of the world. The General's founding gift contained more than 18,000 objects but there are now over half a million. The collection includes extensive photographic and sound archives which contain early records of great importance.
The Museum’s web site provides access to the following:

- Home
- Visit the Museum
- Explore the Collections
- What’s on

The Visit the Museum section allows visitors to make a Virtual tour of the museum (Figure 14). The Virtual Visit requires Apple’s Quick Time. The symbols shown in the picture 22 are clickable; by clicking on the symbols it is possible to view 360 degree panoramas of the rooms.

![Virtual Tour of the Pitt Rivers Museum](image)

**Figure 14 – Virtual Tour of the Pitt Rivers Museum**
“Explore the Collections” provides access to the following:

- History
- Information sheets
- Virtual Resources
- Collection databases
- Virtual Tour
- Resources for Researchers
- Resources for Teachers
- University Courses
- Publications
- Current Research
- Balfour Library
- General Services

A very important part of the Virtual Museum is the Database; the Collection database allows visitors and researchers to find information about the artefacts using 2 separate catalogues, one for all artefacts, and the other for historic field photograph collections. All
accessioned artefacts have an entry in the objects catalogue. Most historic field photographs are included in the photographic catalogue (and it is hoped that all will soon be included). The manuscript database is the least comprehensive but from 2008 it is hoped that a new and comprehensive manuscript collections database will come on stream.

The database has been realized mostly for experts (scholars, researchers): this is due to the nature of the museum itself, which is particularly devoted to research.

![Form to be used for searching in the collection database](image)

**Figure 16 – Form to be used for searching in the collection database**

### 2. Museum’s characteristics and history of the Virtual Museum

The Pitt Rivers Museum is part of Oxford University (exactly the museum is part of 6 Oxford University Museums and collections) and has Charitable Status.

The Museum is also part of the SE English Regional HUB network.

According to what Imogen Crowford–Mowday states, the first museum website was created in 1996. Since which it has had a major overhaul every five years, with updated and additions in between.

The main aim of creating the Virtual Museum was to make the museum collections and the museum itself as accessible as possible to the university, local community, schools,
researchers, local and internationally; to share knowledge about the collection and seek
further enlightenment through research and collaborations.
The Virtual Museum has been maintained and created by the museum’s resident IT
officer.
The “virtual tour” was created in 2003 by a member of staff within the University.
In regards to the design of the main web site, an external consultant was brought in to
work with the museum’s IT officer to design the templates to be utilised for a period of one
week. A web development group was formulated within the museum with representatives
from collections, education, marketing and IT to devise the navigation menus and grouping
within the site. Once the templates were generated, current site content was ported over
into the new site. Besides the main web site, there were eighteen other sites and soon to
be twenty, that were specific collections or exhibitions focussed. These were developed by
a part-time in house projects web developer.
Support is received from being part of the HUB to maintain work on the specific collections
websites.
Collectively, the museum received over a million virtual visitors in 2007.
The major problems appeared in building the Virtual Museum were the lack of human
resources, time and funding.
The museum is committed to professional development, and encourages staff to attain
new relevant skills. Being part of Oxford University also contributes a great deal to the
study opportunities available.

3. Strengths and weakness of the product realized

The Pitt Rivers Museum is an example of best practices in building a Virtual Museum
because it is a case of a good product realized with little funds and by a small team.
The Virtual Museum allows visitors to discover the rooms and the Museum floor with 360-
degree panoramas of the environments; it also remarkable that this Virtual Museum is able
to attract a huge number of virtual visitors, although it is a specialized museum. Its very
rich database allows visitors to make searches with many criteria and it can be taken as
reference for the development of the Virtual Museum databases.
About the strengths of this Museum, it is also remarkable that navigation and ease of use
are particular strengths; furthermore, the website and the virtual tour are simple to
navigate and aesthetically pleasing and uncluttered, whilst the specific collections research websites are thorough in detail. All online resources produced need to be maintained, monitored and updated with new research and content, so the Pitt Rivers Museum is constantly committed with continuous development from this point of view.

One weakness of this Virtual Museum lies in the fact that access to the museum’s catalogues though made available online could be improved in appearance and the inclusion of images of the objects listed.

4. Portal’s Target groups of users

The Pitt Rivers Virtual museum receives visitors from 129 countries. The web site is aimed towards researchers, members of the public, schools, university and museum staff.

5. Outcomes from the Virtual Museum

The Pitt Rivers Virtual Museum aimed to familiarised visitors, be they visiting researchers or members of the public, as to what they can find to maximise their experience when they actual visit.

The museum has almost 200,000 physical visitors a year, whilst receiving a million virtual visitors for the same period. Having a web presence enables those that can’t visit in person gain insight into and see the museum’s displays from the comfort of their own location.

6. Team and professional devoted to the Virtual Museum’s creation

For the creation of the Virtual Museum a team of IT officers and projects officers was necessary. Also members from other departments were involved: the museum’s education department consists of 4 members of staff, a number of contract researchers and collections management staff.

In conclusion, collections, education, marketing and IT professional were employed for creation of the Virtual Museum; all these human resources were internal. Ideally more IT support is required at present time, as IT permeates within the fabric of all the museum does.
IT staff seek training opportunities as new skills are required to undertake specific tasks.

7. Economy of the Virtual Museum: capitals invested for the creation and maintenance of the Virtual Museum

Realising the Virtual Museums requested £2.5k to assist in the design of templates, £0.5k to purchase a camera to undertake the virtual tour. Thanks to the fact that the Pitt Rivers Museum is part of the University, it is able to call upon the experience and support of the central services afforded. As with most things, its funding to maintain the Virtual Museum reliant; The museum continues in its effort to seek longer term funding to sustain its digital output.

8. Data about the museum

NAME OF THE MUSEUM: Pitt Rivers Museum
COUNTRY AND ADDRESS: Pitt Rivers Museum, Oxford University, South Parks Road, Oxford, OX1 3PP
PERSON FILLING THE QUESTIONNAIRE: Imogen Crawford-Mowday, Executive Assistant to the Director (Dr. Michael O’Hanlon)
NAME OF THE RESPONSIBLE OF THE VIRTUAL MUSEUM/WEB SITE: Haas Ezzet
NAME OF THE DIRECTOR OF THE MUSEUM: Dr. Michael O’Hanlon
Contacts: imogen.crawford-mowday@prm.ox.ac.uk ; Tel: 01865 613014
PART II

ICTs and Virtual Reality applied to archaeological sites

The Beckensall’s Northumberland rock art archive

http://rockart.ncl.ac.uk/

Figure 17 – The Homepage of the Northumberland Rock Art web archive
1. The *Northumberland Rock Art: Web Access to the Beckensall Archive* Project: description and aims

A remarkable case of web site devoted to rock carvings and realized with the use of VR as well as the most innovative ICTs is the *Northumberland Rock Art: Web Access to the Beckensall Archive*. The project, whose total expenses were £140.892, was managed by Dr Aron Mazel, Lecturer in Heritage Studies at the International Centre for Cultural and Heritage Studies of the New Castle University. The web site created within the project, realized with enchanting graphics and providing access to 3D pictures of rock art sites, represents a very important on-line resource for the knowledge of several rock carvings made by Neolithic and Early Bronze Age people in Northumberland in the north-east of England, between 6000 and 3500 years ago.

The web site provides access to the following sections:

- **Home**
- **Browse Panels**: several criteria are available (panels, parish, map, panel type, current location, access, image type, panel art motif, etc.)
- **Search Panels**: it is possible to do searches by name, grid reference, panel type, image type, location, archaeology and environment, or to do searches by a combination of criteria.
- **InterACTIVE Zone**: This is a very rich area, providing access to several educational tools like a *Learning Area and Games*, (learning journeys, gallery, art ideas, bibliography, spot the difference, which is which?); *Outreach* (video clip, audio clips, people behind the scenes, press coverage); *Out and About* (walking with Rock Art, caring for our rock art, photographic tips, report sheet); *Virtual Tour* (bubbleworlds, aerial photographs)
- **Help and FAQ**
- **Links**
- **About Us**
- **Site Map**
As stated by Aron Mazel and Horacio Ayestaran in their publication *Visiting Northumberland rock art virtually: the Beckensall archive analysed* (in press in 2009), “The primary aim of the project was to create a well-structured and user-friendly website, supported by a database, to provide the basis for future research, educational outreach, and the wider public access and understanding of rock art. Along with this there were a series of subsidiary aims and objectives. These included: (i) encouraging further recording and research; (ii) ensuring a comprehensive illustrative record (drawings and photographs); (iii) improving the understanding of the vulnerability of, and threats to the carvings by natural and artificial processes; and, (iv), developing an appreciation for future management and conservation requirements. Ultimately, however, the major challenge of the project was to create an attractive, academically sound, website with wide appeal that could be used as a platform for further research and management practises.

The project ran for two and a half years from July 2002 until December 2004. The primary activities during the project involved: (i) assessing, cataloguing, scanning and modifying thousands of Beckensall’s line drawings and photographs, some of which date back to the 1970s; (ii) creating a comprehensive inventory of Northumberland rock art panels; (iii) establishing an audience development plan; (iv) developing a metadata list for the database; (v) conceptualising the interactive database; (vi) inputting data relating to 1060 panels and about 6000 images into the database; (vii) planning and undertaking the fieldwork programme supported by a standardised fieldwork reporting form; and, (viii) creating and implementing the website”.

‘With Beckensall’s participation some 90% (n = 720) of the panels that are still located in the field were found and recorded. Five hundred and sixty of these were revisited to complete panel report forms, including information relating to environmental setting, surface of panel, panel type, art, and management and conservation. The photographic archive was grown by over 8000 images; these were mostly digital, but 1800 colour prints were taken. An unexpected outcome of the project was the increase in the number of panels from 790 to 1060, chiefly through field discoveries and information supplied by colleagues, farmers, and members of the public. Complementing the fieldwork programme, work in the office focused on updating the records; cataloguing and scanning thousands of Beckensall’s line drawings and photographs (some dating back to the mid-1970s); inputting information and images into the purpose-built interactive database created by Horacio Ayestaran, who was also responsible for implementing the website;
and developing an Interactive Zone and the graphic design of the website, done by Marc Johnstone and Jess Kemp.'

<table>
<thead>
<tr>
<th>Visits to the</th>
<th>3 days</th>
<th>5 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unique visitors</td>
<td>12,007</td>
<td>15,863</td>
</tr>
<tr>
<td>No. of visits</td>
<td>14,436</td>
<td>19,874</td>
</tr>
<tr>
<td>No. of pages viewed</td>
<td>288,305</td>
<td>369,007</td>
</tr>
<tr>
<td>Pages viewed per visit</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>No. of hits</td>
<td>1,595,430</td>
<td>2,058,686</td>
</tr>
</tbody>
</table>

Table 1 – Number of visits to the Northumberland rock art website and pages viewed

Aron Mazel was responsible for the overall running of the project, including the conceptualisation of the metadata and specification of the panel database and website; data collection and entry; scanning and processing of drawings; slides and negatives; all aspects of the fieldwork programme; the drafting of the text for Interactive Zone; and the project outreach programme. Member of the Project Management Team.

The primary difficulty surrounding the building of the website was that we only had 2.5 years for the entire project which, for the most part, involved archaeological fieldwork, categorisation and scanning of records, and the development and implementation of the website.

The content and structure of the project/website has formed the basis on a new website about England’s rock art which will go online later in 2008.

2. Main outputs of the Project

The widespread appeal of the Northumberland rock art website has been reflected in the visitor statistics and the feedback that has been received, as shown in table 2.
<table>
<thead>
<tr>
<th>Year 2004</th>
<th>Unique visitors</th>
<th>Number of visits</th>
<th>Pages visited</th>
<th>Pages/per visit</th>
<th>Hits</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>20,983</td>
<td>27,579</td>
<td>496,374</td>
<td>18</td>
<td>2,660,449</td>
</tr>
<tr>
<td>February</td>
<td>4,922</td>
<td>6,578</td>
<td>142,312</td>
<td>22</td>
<td>499,202</td>
</tr>
<tr>
<td>March</td>
<td>2,536</td>
<td>4,007</td>
<td>77,588</td>
<td>19</td>
<td>253,640</td>
</tr>
<tr>
<td>April</td>
<td>2,290</td>
<td>3,841</td>
<td>82,881</td>
<td>22</td>
<td>246,367</td>
</tr>
<tr>
<td>May</td>
<td>2,419</td>
<td>4,463</td>
<td>96,440</td>
<td>22</td>
<td>223,226</td>
</tr>
<tr>
<td>June</td>
<td>2,016</td>
<td>3,434</td>
<td>66,536</td>
<td>19</td>
<td>196,615</td>
</tr>
<tr>
<td>July</td>
<td>2,087</td>
<td>3,546</td>
<td>98,753</td>
<td>28</td>
<td>241,936</td>
</tr>
<tr>
<td>August</td>
<td>2,488</td>
<td>4,251</td>
<td>127,705</td>
<td>30</td>
<td>283,487</td>
</tr>
<tr>
<td>September</td>
<td>2,216</td>
<td>3,643</td>
<td>122,795</td>
<td>34</td>
<td>245,131</td>
</tr>
<tr>
<td>October</td>
<td>2,261</td>
<td>3,445</td>
<td>100,030</td>
<td>29</td>
<td>223,074</td>
</tr>
<tr>
<td>November</td>
<td>2,160</td>
<td>3,366</td>
<td>113,173</td>
<td>34</td>
<td>234,981</td>
</tr>
<tr>
<td>December</td>
<td>1,868</td>
<td>2,916</td>
<td>104,416</td>
<td>36</td>
<td>231,134</td>
</tr>
<tr>
<td>January</td>
<td>2,181</td>
<td>3,423</td>
<td>97,933</td>
<td>29</td>
<td>227,497</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>1,958</td>
<td>3,149</td>
<td>88,306</td>
<td>28</td>
<td>184,864</td>
</tr>
<tr>
<td>March (14)</td>
<td>1,116</td>
<td>1,869</td>
<td>54,561</td>
<td>29</td>
<td>115,769</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>53,501</strong></td>
<td><strong>79,510</strong></td>
<td><strong>1,869,803</strong></td>
<td><strong>24</strong></td>
<td><strong>6,067,372</strong></td>
</tr>
</tbody>
</table>

Table 2 - Number of visits for the year 2004

A factor contributing to the positive response to the website is the increasing interest in rock art by members of the public and amateur and professional archaeologists in the United Kingdom and other parts of the world (see, for example, Beckensall 2007 and Mazel 2007).

The audience development plan identified the user groups that the website aimed to reach (see table 3). While it is not possible, with the available data, to unequivocally conclude that the website has been used by all of these groups, indications are that most, if not all, have done so. Evidence for this include feedback from visitors to the website, links (and recommendations) from other websites, along with the visitor statistics, which show that all the sections of website have been used, with the emphasis on the interactive database-driven components.
<table>
<thead>
<tr>
<th>Country</th>
<th>% pages visited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>52,5</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>15,5</td>
</tr>
<tr>
<td>Network</td>
<td>11,4</td>
</tr>
<tr>
<td>Unknown</td>
<td>11</td>
</tr>
<tr>
<td>Italy</td>
<td>3</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2,2</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>1,4</td>
</tr>
<tr>
<td>Germany</td>
<td>0,7</td>
</tr>
<tr>
<td>USA (e.g. educational and military)</td>
<td>0,7</td>
</tr>
<tr>
<td>Hungary</td>
<td>0,6</td>
</tr>
<tr>
<td>Canada</td>
<td>0,4</td>
</tr>
<tr>
<td>Austria</td>
<td>0,4</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0,3</td>
</tr>
<tr>
<td>Australia</td>
<td>0,3</td>
</tr>
<tr>
<td>France</td>
<td>0,3</td>
</tr>
</tbody>
</table>

Table 3 – Distribution of the visits per country and kind of sector

This also includes a substantial engagement with the imagery provided and has involved a large proportion of images being viewed per panel and users regularly enlarging the images. It is also of interest that the download area, which allows users to download their search and browse results, has been used and the project team have received personal communications showing that this includes academic colleagues and students downloading data for their own research purposes as well as volunteers on the Northumberland and Durham Rock Art project (Oswald et.al 2006).

All the parts of the *InterACTIVE Zone* have been visited and it has been possible to identify direct links to components of it such as the Learning Journeys. It is also notable that the Bibliography has been used. These website visitation patterns suggest, at the very least, the use of the website by rock art researchers, people with a general interest in rock art (i.e. university lecturers, students, amateur archaeologists), and those people wanting to visit rock art panels in the field.
Less easy to infer is whether the website has been used by heritage managers, landowners and tenants, and school teachers and learners, although we have noticed that recommendations for the site emerged on various teaching related sites. Insights into this would need to be obtained through surveying these potential user groups but this, unfortunately, has been beyond the remit of the project.

A significant feature of the website was the commitment to share all the data available, except that which might contravene data protection legislation. This material is freely available to all users on an equal basis without the need to register on the website, and users are able to download any part of the website without restriction. In this way, the rock art website forms part of the ‘gift economy’ which is promoted through the sharing of extensive information on the internet, and it has demonstrated its ability to provide data to underpin academic research (see, for example, Fairén-Jiménez 2007 and Mazel 2007).

The website has also provided users with the opportunity to have a ‘one-to-one’ experience by taking advantage of the multitude of search and browse options, which are supported by:

- The ability to view the results geographically using the available mapping facilities
- The option to create and download their own unique datasets drawing on a wide variety of data.

It is believed that these opportunities and facilities represent one of the undoubted strengths of the website and serve as an attraction to many of the users.

This observation resonates with the views of Carey and Jeffrey (2006) who comment, with regard to the provision of information by museums, that ‘audiences are no longer satisfied with passively having information delivered to their screens: they want to remix, re-purpose, and re-use. This may make some museum professionals uncomfortable, as museums have traditionally held the role of interpretation for visitors.’ To the best of our knowledge, this is the first time that virtual visitors have had the opportunity to ‘remix, re-purpose, and re-use’ extensive rock art datasets of a region in the United Kingdom and internationally.

While the browse facilities have been used 40% more often than the search facilities as a way of accessing the data it is the large proportion of people using the search facilities that has been most surprising. Given the large number of browsing options available along with the fact that browsing would be the preferred initial way of accessing the data it was not
expected that the search facilities would have been being activated to the extent that they were. This provides a strong indication that the website was being used by rock art enthusiasts and people interested in performing more sophisticated queries than possible through the browse facilities. This understanding is partly supported by the evidence showing that the data download option is being used by visitors to the website. It could also be that the data provided on the website is being used more abundantly than reflected in these observations as it is possible that, for example, rock art enthusiasts desiring to visit the carved panels at Lordenshaw, one of the richest rock art areas in the county which would require multiple visits to see a good proportion of the carved panels, are now able to download the data from Lordenshaw onto their own computers and use this information as a basis for their visits. Likewise, users of the website interested in the distribution of particular types of motifs would be able to develop their own motif databases drawing on the information provided.

Lastly, it is worth to draw attention to the fact that the key players behind the development of the Beckensall archive project and the website have been clearly identified in the ‘About Us’ section of the website along with their respective roles in the development of the project and the creation of the website. Not only does this lend credibility to the content and authority of the website but it also goes beyond the traditional presentation of author’s names in published papers without recognising the different roles that people have played in the project. Complimenting this feature there is a ‘Peep behind the scenes’ photo gallery which shows the project team and colleagues at work in the office and in the field.’

3. Professional roles involved in building the web site

The professional roles employed for the realization of the web site included graphic designers (Marc Johnstone and Jessica Kemp) and an ICT manager (Horacio Ayestaran). See http://rockart.ncl.ac.uk/about_us.asp for more information about the work they did; the above mentioned roles were outsourced.

There has been no team dedicated to the website following its launch in January 2005. All that changes that have been made to the website since the completion of the project have been done by Aron Mazel and Horacio Ayestaran while doing other jobs.

About the finance of the Project, the following major equipment was bought for the it: two desktop computers, one laptop, two cameras (digital and film), and two scanners (slide and flatbed).
The website has required limited maintenance since it was launched in January 2005 and in that respect it has been 'easily sustainable'.
SUMMARY AND CONCLUSIONS

The questionnaires collected and the stories “told” by the four cases taken into consideration in this work led us to some general conclusions and considerations. The first remarkable data pointed out by this survey allow stating that the realisation of a Virtual Museum is an added value to the actual museum: in fact, for all the cases of this report the Virtual Museum contributed to improve the quality of the services to the public; in regards to this, for the Canadian Museum of Civilization and Corporation as well as for the Newcastle University, there is no doubt that the virtual resource also helped in increasing the number of the visitors, whilst for the Marischal Museum and the Pitt Rivers Museum the general enrichment of the services and of the offer to their audience is one of the most remarkable outcomes of their Virtual Museums.

The case studies of this report led us to consider that it is necessary to realize a Virtual Museum which is:

- Based on new contents (e.g. educational tools and contents, also based on imaginary exhibitions, as seen in the Inuit Virtual Museum of the Canadian Museum of Civilization and Corporation)
- Virtual reality based in order to offer visitors the possibility to explore the Museum making them familiarize with its contents: two of the three cases of Museums taken into consideration built their Virtual Museums using 3D pictures of the items, creating virtual environments and, definitely, realizing something new in comparison with the actual museum.
- With a high communication power: to do this, as seen in the four case studies, it is necessary to build a product realizing a good design, using enchanting graphics and, also, it is very important to properly communicate the e-Museum contents to a very specific audience, as the virtual one is. The staff of the Museums taken into consideration in this Report dedicated their efforts to the elaboration of the Virtual Museum contents and dedicated their professionals to the communication of the contents realized.
- Multilingual: Multilinguality, as in the excellent case of the Canadian Museum, is a key factor of success for a Virtual Museum.
User friendly, easily accessible also for non-specialists (like in the case of the Virtual exhibitions of the Canadian Museum of Civilization and Corporation, and in the easy navigation of the Pitt Rivers Museum web site).

Telling several stories, thanks to different roots and trails for the virtual visitors.

The experiences collected tell that being part of a network or of a Project (see the cases of the Marischal Museum and its Lemur Project and the Northumberland Rock Art Project) is a successful strategy for building a good product, in terms of organization of the work and of the human resources as well as in terms of funds available.

Some considerations, furthermore, have to be done about the professionals needed for realising the Virtual Museums: it is clear the importance of having an internal staff able to manage a virtual product, once realized, starting from its design to its creation and to the maintenance of the contents realised.

For almost all the case-studies, the human resources were internal to the Institution, with few exceptions.

In the majority of the cases, anyway, even if with some efforts, the internal human resources were able to cooperate concretely in building the Virtual Museum.

One last issue has to be underlined: the first is that all the Institutions are committed with the professional development of their staff, with the excellence case of the Canadian Museum, which regularly trains its staff in new technologies, also organising conferences devoted to the theme of Museums and the Web.

In conclusion, this report pointed out the importance of having a properly trained staff, able to be regularly further re-trained; the importance of having a Virtual Museum in order to improve the quality of the services to the public and to increase the number of the actual visitors; the easily sustainability of the Virtual Museums, when they are internally managed and maintained.

In particular, through the four cases of this study it is possible to state that to realize a good Virtual Museum, it is necessary the following:

- A good design of the product and a staff devoted to this step
- ICTs skills of the Museum human resources in order to easily manage the product realized
- Expertise to create appropriate contents, specific for a Virtual museum
Great capability to communicate the contents created, with particular regards to the learning contents for young and adult people

Provide access to new products so as making virtual visits a unique experience, capable to communicate something new in comparison with the visits to actual Museums (e.g. Virtual exhibition putting together items from different geographical areas, times or contexts in order to realize new pedagogical trails; allowing visitors to create personalized tours of the museums, exploring unusual routes, etc.)

To do this, it is of capital importance the training of the Museum staff. From this point of view, the analyzed good practices encourage the realization of a training model which can be managed internally by the Museums, and focusing on the most important steps/aspects of the process of creating and maintaining a Virtual Museum, as follows:

- Designing, developing and managing a Virtual Museum
- Creating new, appropriate contents
- Communicating cultural contents to a virtual audience, which has specific characteristics and needs.
Summary

This bid is characterised by the richness and diversity of both the assets to be created and the teaching experience to be developed. Drawing on one of the country’s most significant museum resources, the collections of the University of Aberdeen’s Marischal Museum and Natural Philosophy Collection, LEMUR will create a resource base of 3500 items designed to provide robust access for a range of teaching purposes in Higher Education. Within LEMUR, the six targeted teaching packages developed by teaching partners in Cultural History, the History and Philosophy of Science, History of Art and Physics demonstrate the value of the resource to Arts, Sciences and Social Science, provide teaching resources for the HE community and exemplify the ways in which teaching can be enhanced and independent learning encouraged through the use of the DNER.

1 Scope and purpose
1.1 Background

The University of Aberdeen was founded in 1495 and has been a centre of academic excellence for over 500 years. During this time the University has acquired a wealth of unique and valuable material related to its core missions of research and teaching, much of it gifted by generous benefactors. By virtue of this long and distinguished history, the University has accumulated material, of a quality and volume available in few other universities, to support its current and future work.

Marischal Museum was established in its present form in 1907, bringing together material collected in the previous centuries. The product of donations by graduates, staff and friends of the University, the collection now consists of around 70,000 items, many of which are of national significance. Particularly important aspects of the collection are Scottish history and archaeology (8,000 items), European. Mediterranean and Near Eastern Archaeology (5,000 items), Non-Western Ethnography (12,000 items), Fine Art (1,500 items) and Numismatics (35,000 items). The collections of African and Oceanic ethnography, Egyptology, Scottish prehistory, Classical coins and Scottish militaria are of particular importance. The museum has won the Scottish Museum of the Year Award for
its displays, and similar awards for education and conservation. It is funded 48% by the University; 50% from SHEFC (Non-Formula Funding allocation); 2% from the Scottish Museums Council and other sources. Since 1997 the museum has been managed within the Directorate of Information Systems and Services (DISS) as part of the University’s Historic Collections, bringing together the museum collections with archives, rare books and historic photographic collections and providing significant developments in the use of ICT by the museum. Other synergies following integration into DISS include close relationships with other Divisions such as the Learning Technology Unit, computing services and the university library.

The Natural Philosophy Collection is managed separately and is also one of the finest of its type in the UK. Items of special interest include late 18th century equipment from the first semi-public astronomical observatory in Scotland furnished with modern instruments, instruments from the first national meteorological observing network established in 1868, instruments from one of the first seismic observatories in Britain, equipment used both by the British and the Germans in World War II, pioneering fine measuring equipment by RV Jones that could determine sub-nanometre displacements almost half a century ago, pioneering crystal growing apparatus for making synthetic, doped crystals that have become the basis of solid state device technology, and many items of individual interest and significance spanning two and a half centuries. Due to difficulties of storage and the cost of public display, the collection contains 2,000 items, yet is almost unknown to both students and staff. It is managed within the University’s School of Physics.

Despite such rich resources, difficulties of access to material not on display have limited the undoubted potential for the use of the collections in university teaching. Recent developments in the museum have demonstrated the opportunities offered by the use of ICT, such as archaeology courses delivered by distance learning to students throughout northern Scotland, which make use of museum material. The University’s commitment to this form of course delivery has also been seen by the award of funding from the Independent Learning Project for the museum to create a digitised resource base and teaching module for a second level Women’s Studies course on Gendered Violence, while in 1998 the museum agreed a series of annual contracts with the Scottish Cultural Resources Access Network (SCRAN) to provide 1500 full records over three years, each with a digitised image and cataloguing information. The project is providing high quality
material to SCiRAN and has established the ability of the museum to undertake similar projects as well as providing a realistic basis for the costing of such work.

While the provision of records for SCiRAN by the University and others has made available some resources for use in schools and Higher Education, it has had only limited success in achieving the use of these resources in HE teaching. The innovative use of this material by LEMUR for teaching and learning is guaranteed by the commitment of academics that have recognised the benefits of using technology to enhance students’ learning through the use of this material. The present project would therefore create an interdisciplinary collection of digital images and metadata targeted specifically for use in particular HE teaching areas for which there is a clear demand, and the framework for this to be used throughout the HE community.

1.2 Aims of the project

➢ To demonstrate the value of university museum and gallery collections in the delivery of HE teaching and in enhancing the HE learning process.
➢ To enhance the DNER through integrated resources utilising important museum, gallery and archive collections.
➢ To increase access to important material in the collections of the University of Aberdeen for teaching and learning across the HE community.
➢ To create digital surrogates of fragile or rare material in the collections of the University of Aberdeen, enabling its use for teaching and learning both in the classroom and at a distance.
➢ To enhance the teaching of specific courses through the use of teaching packages using these digital resources.
➢ Although not a primary aim of the project, this work will inevitably provide materials in support of HE research, together with access well beyond the HE community.

1.3 Objectives

➢ To provide digitised surrogates of material in a linked database suitable for use in HE teaching
➢ To provide teaching packages for students studying specific courses
➢ To provide digitised resources for use by other courses
➢ To provide access to users across the HE community
1.4 The digital resource

By the use of museum collections, students’ learning will be grounded in real objects, their form and function, thus enabling them to develop a clearer understanding of abstract ideas and changes in interpretation. As well as being of specific relevance to the subjects studied, the use of this material will develop a portfolio of transferable skills that will be of life-long value. The use of the digital collection enables access to take place both within normal teaching space and at a distance, does not compromise the security or integrity of irreplaceable material and enables multiple access, such as the repeated study of an item to make comparisons missed at the first opportunity. Equally importantly, once the initial investment is made, material becomes widely available for other use. While the final selection of some individual items will take place during the project, particular areas of the collections have been targeted that relate to the intended teaching requirements of the academic partners and which will offer a rich resource for further uses. The integrity of the selection and its overlapping uses by the specific courses identified in the project courses is noteworthy and indicative of its wider potential.

A virtual Marischal Museum

The creation of a virtual version of the museum exhibition is the prime resource for the 2nd and 4th year Cultural History courses noted below. This will require the digitisation of all material on display as full records, with supporting texts, images of display cases and selected extracts from archival materials and catalogues to provide contextualising information about the uses and meanings of objects before, during and after collection. As a result of the first phase of the SCRAN project, records of 300 out of the 1200 items on display have already been created and will be contributed to LEMUR by the University. The interpretive approach of the museum’s exhibitions has been widely recognised as innovative and influential, and the virtual museum will be an especially useful resource for students with a vocational interest in museums and studying Museology elsewhere. The addition of selected material from the ethnographic collections of Sir William MacGregor (1846-1919) and the Grand Tour collections of Alexander Thomson (1792-1868) and Robert Wilson (1787-1871), would amplify the range of material available for those courses in which students are expected to choose material from a large selection (Material Culture and Museums, Painting in a Stateless Nation: Scottish Art 1707-1837), as well as enhancing opportunities for developing uses beyond the courses identified in
LEMUR. The National Museums of Scotland have expressed support for the project and are keen to offer selected additional material to enhance the teaching value of the project.

Enlightenment Scotland
Portraits of selected individuals and paintings by noted painters of the 18th and early 19th centuries, combined with urban and rural scenes of the period will form a resource that will be particularly useful for Painting in a Stateless Nation: Scottish Art 1707-1837, but which will also be used by the Cultural History and History and Philosophy of Science courses. As the impact of an interest in the Classical world is one of the main features of this course, the inclusion of a series of images of Greek coinage and pottery is important and will provide access to a little-displayed area of the collection. A particularly innovative element will be the display of decorated Greek pottery as QTVR to integrate study of form, decoration and function. Offering objects collected on Grand Tours in Europe and the Near East with associated archives, the material relating to Alexander Thomson (1792-1868) and Robert Wilson (1787-1871) will be particularly important for the History of Art course, but as indicated above, will also be used in the Cultural History and the History and Philosophy of Science courses.

Scientific instruments
Images of scientific instruments will be used in all the courses identified in LEMUR. Of the selected instruments, some will be photographed showing several views and close-up detail, including internal components of some items, so that the functioning of the instruments can be discussed as well as their overall appearance and construction. For selected optical instruments, such as microscopes and telescopes, images will be taken of what can be seen through the devices. Although the preparation of these images and sequences will be relatively expensive, it is a great advantage of this project that the results can be made widely available in the future without the need for repeated handling. For some mechanically based instruments, motion will be shown by video clips or by the synthesis of a comparatively small number of frames. Examples relevant to late 18th century science are the steam engine, moving pulley systems, the dead-beat clock escapement, double cone moving up an inclined plane, the diagonal motion machine and other classic illustrations of mechanical principles and applications that underpinned the Industrial Revolution.
1.5 Use in teaching and learning on specific courses

The resource has been designed to relate to the teaching in specific courses co-ordinated by the academic partners in the project. They are:

History of Art

   Painting in a Stateless Nation: Scottish Art 1707-1837 (HA3531)

Physics

   Crystal structures and the propagation of light (PX2009)
   Crystal Diffraction and Optical Imaging (PX3010)

Cultural History

   Introduction to Historical and Cultural Anthropology (CU2503)
   Culture, Identity and Technology (CU3505)
   Material Culture and Museums (CU4507)

History and Philosophy of Science

   History and Philosophy of Science 1 (HS2001)
   History and Philosophy of Science 2 (HS2501)

History of Art

The Honours option Painting in a Stateless Nation: Scottish Art 1707-1837 will use the database of resources to facilitate a 4-week student project, during which the students will: create online case studies, participate in peer assessment and reflection of the case studies, and complete objective tests. The case studies will be constructed by uploading a selection of artefacts from the LEMUR database, and presenting this as well as other pertinent information as a Web page. Peer assessment and reflection upon the case studies will be enabled by: a case study presentation area, an online interview room where students interview the presenter of a case study, peer assessment questionnaires where views are summarised, a self-assessment questionnaire on the learning outcomes which will be delivered at the beginning and end of the project, forming a learning log. The objective tests will be presented as computer-aided assessments and will occur on each of the four weeks to ensure that the students have the required background knowledge to successfully develop their case study. A Tutor Assessment Interface will allow the tutor to view each case study in conjunction with summarises of Peer Assessment, the Self-Assessment/Learning Log, marks for the Objective Test, and logs of students usage.
The construction of the case study and the peer assessment and reflection on it will utilise and further develop information gathering, critical evaluation and analytic skills, whilst extending presentation and communication experience into an online environment. In the process of completing the project, the student will track and interpret a series of connections between the core project material, the wider Database and external sources: this will extend the student's awareness of the collections in a historical, geographical and cultural context. This contextual awareness will be further supported and advanced in the peer and self-assessment process.

Physics
The Database of resources will be integrated into level two and three optics courses. Optics is a key subject in a physics degree, and one of expanding economic importance. The collection exemplifies the historical development of a wide range of material used by physicists and others, enabling students to associate the evolution of ideas on the nature of light and the development of optical instruments with real equipment, to compare the performance of historical equipment in forming images or demonstrating phenomena. The Database will be central to the students problem based learning activities which will result in students developing virtual exhibitions. Students will be supported in their work by an online environment that will include Project Rooms, Communal Areas, Review Sections and a Public Gallery. The Project Rooms will provide access to the Database, facilities for uploading texts/images to use within group project, and project management tools. A Communal Area will allow the class to share ideas and post project plans. The Review Section, would provide a structure where students in successive years could learn from previous students' exhibitions before commencing their own. In both the Review Section and Public Gallery feedback on the exhibitions will be captured and displayed. To ensure successful integration with the rest of the students' learning the material will be introduced during lectures as part of the electronic presentation of lecture material, will be available on the course web pages, and importantly be assessed and count for a proportion of the final mark.

Cultural History
Cultural History delivers a distinctive interdisciplinary programme in European culture from the 16th century to the present and includes courses in the History and Philosophy of Science. Both the compulsory 2nd year course Introduction to Historical and Cultural
Anthropology and the Honours course Material Culture and Museums will make use of a virtual version of the displays in Marischal Museum, supported by contextualising information about the processes of collection and cataloguing in the form of samples of museum catalogue records and collectors’ notes. Central to these courses is the ability to contextualise artefacts and make links between them. This requires the students to have easy access to the resources, ideal in the proposed database, which will enhance the student’s ability to search for relevant artefacts and make links between them. Using the virtual museum, 2nd year students will be expected to write a critique of the museum displays with particular reference to how cultures have been represented for a project accounting for 25% of course assessment. The compulsory 3rd year course, Culture, Identity and Technology, will make use of the material in lectures and for tutorial discussions, with students able to opt for an essay based on a study of the LEMUR materials. For the 4th year course, the students will again use the virtual museum, but in addition they will be expected to develop a virtual exhibition using the digital records in LEMUR. They would also be able to import a limited number of items from other digital collections through SCRAM, taking account of the cost implications for a real exhibition, and would be expected to submit their ‘exhibition’ for peer review before assessment. It is intended that the most successful of these virtual exhibitions would be created in reality in the museum.

History and Philosophy of Science
The creation of moving images of selected items in use, particularly the recreation of classic scientific experiments, and contextualising information about objects (such as photomicrographs taken through a range of microscopes and historic photographs of the instruments in use) will be used in lectures and tutorials to be held in computer laboratories that will offer students access to the material during discussions in these linked courses. This will include material drawn from the collections of Marischal Museum as well as the Natural Philosophy Collection. Students will also be encouraged to present material drawn from LEMUR in assessed essays. The courses attract students from the Faculties of Arts & Divinity and Science & Engineering.

1.6 Wider uses of the resource for teaching and learning
Although the selection of items for LEMUR has been guided by the academic partners in the project, the range and quality of the potential resource is such that other academic staff in the University already wish to use the material for teaching and who wish to extend
its use through the LEMUR resources, most notably Dr Jane Geddes (History of Art), Professor Tim Ingold (Anthropology), Dr Ian Russell (Elphinstone Institute – Scottish Ethnology) and Dr Paul Tomassi (Philosophy). As well as uses by students on campus, LEMUR will create resources tailored for delivery by distance learning techniques. Staff and tutors in the University’s Centre for Continuing Education who already make use of museum resources for the teaching of Scottish Archaeology, Ethnology and History have therefore expressed their enthusiasm for LEMUR. The cross-disciplinary nature of the project is particularly significant with involvement from the Faculties of Arts & Divinity, Social Sciences & Law and Science and Engineering, while the creation of the Faculty of Education in August 2000 offers further natural links.

By the use of iBase software (see below) the records and images will be available across the WWW, making the digitised resource available to other HE institutions. Historic Collections also proposes to incorporate the Marischal Museum catalogue records into the University’s OPAC which is Z39.50 compliant. This catalogue is currently available across the WWW and is also part of the JISC-funded CAIRNS project. As CAIRNS aims to integrate the 25 Z39.50 compliant catalogues or information services of CAIRNS sites across Scotland, this will provide access to the museum collections through a major gateway. Through the use of the SCran data standards and subject to appropriate copyright protection, the resources will be available to national gateways to museum collections, such as the Museum and Galleries Commission’s Cornucopia project and the 24-hour Museum. SCran has indicated its wish to explore making the LEMUR resources available through the SCran database, thus broadening the educational potential.

The use of the Web for the provision of teaching packages will make them available outside the University of Aberdeen and for courses beyond those originally planned. As an example of use in other subjects, in Museology and Museum Studies (subjects not taught in Aberdeen), the virtual exhibition will enable students of museum studies at HE level who are unable to travel to Aberdeen to critique these important exhibitions. Dr Nick Merriman and Tim Schadla-Hall of University College, London, Dr Peter Davis of the University of Newcastle and Professor Ian Carradice of the University of St Andrews have already indicated that they would use this resource in the teaching of museum studies and public archaeology. Dr Liba Taub has also confirmed that the LEMUR materials would be of value in the teaching of the History and Philosophy of Science at Cambridge University. As
with the uses within the University, the richness of LEMUR will be applicable across many subject areas elsewhere, crossing the Arts-Science divide and involving a range of Faculties.

2 Implementation strategy
2.1 Project team

The project team will consist of Neil Curtis (lead), Michael Arnott, John Milne, Drs Elizabeth Hallam, Ben Marsden, John Morrison and John Reid. In addition, a Curatorial Assistant and Learning Technology Support Officer will be appointed. Neil Curtis will supervise the project, co-ordinating the development of the resource base and teaching packages and will also be responsible for the selection of material from the Marischal Museum collections. Dr John Reid will be responsible for the selection of material from the Natural Philosophy collection and for writing captions for these records. Teaching packages will be developed by the relevant course co-ordinator in association with the Learning Technology Unit. Financial management will be co-ordinated by Dr Alan Knox.

Neil Curtis (Senior Curator, Marischal Museum)
Project leader and responsible for the creation of the digitised resource for the Marischal Museum collections
Currently Senior Curator in Marischal Museum where he has been since 1989, Neil Curtis has an MA in Archaeology (University of Glasgow) and MLitt in Education (University of Aberdeen). He also has a Graduate Certificate in Museum Studies (University of Leicester) and holds the Diploma of the Museums Association. Within the University, he is also an Honorary Lecturer in Cultural History and tutor in archaeology for Continuing Education. Other current responsibilities include membership of the Treasure Trove Advisory panel for Scotland and convenorship of Scottish Museum Archaeologists. As a professional museum curator, he has particular interests in the interpretation of material culture for and with the public and has been responsible for a number of major exhibitions, the development of an award-winning schools service and the teaching of undergraduate archaeology courses by distance learning techniques. Recently, he has been responsible for establishing and managing a SCRAM-funded programme to digitise material from the collections.

Michael Arnott (Technology Support Officer, Historic Collections)
Responsible for the creation of moving images and web mounting the database
Currently Technology Support Officer for Historic Collections, Michael Arnott has been creating and developing computer aided learning and World Wide Web resources since 1992. These resources have involved the application of leading technologies to some of the University’s greatest treasures. The results of this work have included the acclaimed award-winning Online Aberdeen Bestiary, the Burnet Psalter, the Drawn Sword (prints and engraving from the MacBean Stuart & Jacobite Collection) as well the creation of a networked database of archive collections descriptive lists which enables users to search the holdings of Special Libraries and Archives down to item level from anywhere in the world. Most recently the success of this work led Aberdeen Harbour Board to choose to deposit its collection of glass plate negatives with Historic Collections for digitisation to provide global access. This work is all available at http://www.abdn.ac.uk/diss/historic/

John Milne (Manager, Learning Technology Unit)
Responsible for the creation of teaching packages using the LEMUR resources
John Milne is the Learning Technology Unit Manager at the University of Aberdeen. He is experienced in the design, development and evaluation of learning technology and also the implementation of learning technology to teaching and learning. Internally to the University of Aberdeen he has provided input into numerous projects (http://www.abdn.ac.uk/diss/ltu/). Nationally he has been involved with the Teaching and Learning Technology Programmes (Phase 1 and 2), contributed staff development material and expertise to the Computers in Teaching Initiative and contributed to a number of Scottish Higher Education Funding Council initiatives including co-ordinating a 'Consortium for the Provision of Digital Video and Images on Demand' (http://umi.eee.rgu.ac.uk/), and ‘Building a Virtual Learning Space’ (http://campus.rgu.com/webtools/). Internationally he has provided input into learning technology programmes in Europe, the Republic of South Africa, New Zealand and China.

Dr Elizabeth Hallam (Director of Cultural History)
Responsible for developing teaching material for Introduction to Historical and Cultural Anthropology and Material Culture and Museums.
PhD in Social Anthropology (1994); Teacher in Social Anthropology at the University of Kent at Canterbury (1993-4); Lecturer in Social Anthropology at the University of Sussex
Dr Ben Marsden (Lecturer, Cultural History)
Responsible for developing teaching material for History and Philosophy courses and Culture, Identity and Technology
PhD in History, Philosophy and Social Relations of Science (1992); Honorary Research Fellow University of Kent at Canterbury (1992-3); British Academy Postdoctoral Fellow at University of Leeds (1993-5), Royal Society/ British Academy Postdoctoral Research Fellow in History of Science at University of Kent at Canterbury (1995-9) and University of Aberdeen (1999-2000); Lecturer in Cultural History at University of Aberdeen (from October 2000). At these institutions Dr Marsden has taught widely in the history and philosophy of science and technology from the sixteenth century to the present day. He has obtained support for teaching and research from funding bodies including the SERC, the ESRC, the Royal Society of London and the British Academy. His publications include papers in scholarly journals, including the British Journal for the History of Science and History of Science, contributions to edited volumes, and articles in the new Dictionary of National Biography, the Readers’ Guide to the History of Science, and elsewhere. He is currently working on Engineering an Empire (Macmillan), a cultural history of science and technology in nineteenth century Britain.

Dr John Morrison (Lecturer, History of Art)
Responsible for developing teaching material for History of Art course

Dr John Reid (Senior Lecturer, Physics and Curator, Natural Philosophy Collection)
Responsible for the creation of the digitised resource from the Natural Philosophy Collection and for developing teaching material for physics courses.
Dr John S. Reid BSc, MLitt, PhD, MInstP, CPhys, FRAS, FRMetS is a senior lecturer in the School of Physics. He was first appointed Assistant Lecturer in 1968 and since then has taught courses in a very wide number of disciplines within Physics. He has also taught IT related subjects and data analysis. John Reid has had an interest in the University's Collection of historical scientific instruments for over 25 years. He obtained a MLitt in 1983 in the History of Science for work that included a study covering the 18th century and early 19th century instruments. He is a founding member of the international Scientific Instrument Society (1983) and has been the curator of the Natural Philosophy Historical Collection since the post was established in 1993. Recent historical work has included an analysis of the performance of historical microscopes and a modern assessment of the accuracy of precision linear measures.

2.2 Staffing requirements
Curatorial Assistant
A 1.0 fte Curatorial Assistant will be required to select and prepare material from the Marischal Museum collections, co-ordinate photography, write captions for most of the material and return items to store or display as appropriate. The post-holder will require
significant organisational abilities, experience of museum documentation procedures and a wide range of knowledge about the material selected. Just over 1100 images and metadata records will be produced by the Curatorial Assistant in one year. This estimate is based on the experience of the SCrán project at Marischal Museum, in which a 0.5 fte post created 500 records in one year. Supervised by the Senior Curator of Marischal Museum and advised by the Project Management Group, appointment will be at grade ORS1 on the Academic-Related scale.

Technology Support
Learning Technology Support Officer
A 15-month appointment of a Learning Technology Programmer is required to create the Web-based teaching materials. These materials will be based around the iBase Database of resources and provide a supported learning environment designed to engage the students. This will make use of existing programmes and code as well as develop new code. The project will use established code for discussion boards and computer aided assessment, reuse java applets for the display of student feedback and assessment systems, and use the SCrán student exhibit software ‘Clipper’. New code will be developed to integrate the various tools and develop new tools using JAVA, HTML and CGI Scripts. Appointment will be at Grade 2 on the Academic-Related scale.

Technology Support Officer
The creation of Quick Time video and VR clips and the subsequent Web mounting of the digitised images, captions and cataloguing data will require the allocation of one month fte by the Technology Support Officer of Historic Collections who is on Grade 2 on the Academic-Related scale.

Evaluation Support Officer
The formative and classroom evaluation expertise will be seconded from the Learning Technology Unit. The three month of evaluation resources required will be used intermittently over the project. The evaluator is currently on Grade 2 on the Academic-Related scale.

Teaching cover for academic partners
The creation of teaching material will also involve academic staff being released from teaching duties and the allocation of time by the Learning Technology Unit. The experience of the Learning Technology Unit indicates that this would be most efficiently achieved by the appointment of a dedicated post for one year, supported by time allocated to the project by the academic partners amounting to 30 days per person. In addition, the academic partners will be closely involved in the selection of material, research into museum objects and background material, assisting in the writing of record captions to ensure that they are appropriate for teaching purposes, ICT training and course development. This will be managed as distinct blocks of time for Drs Elizabeth Hallam, Ben Marsden and John Morrison, which will require the appointment of staff at Lecturer Grade A to provide teaching cover. There is a need for additional time to be allocated to the project by Dr Reid, the Honorary Curator of the Natural Philosophy Collection to select material and to write captions for the records. This amounts to 7 hours per week for 15 weeks in both half sessions for the first two years of the project. Cover will be at Lecturer Grade B as it includes responsibility for teaching, marking, laboratory administration, planning and responsibility for up to 10 support graduate demonstrators.

Project management
Managing the project will require the release of the Senior Curator of Marischal Museum for 20% of time. This will be covered by a part-time appointment at Academic-Related Grade 1.

2.3 Software
The catalogue of Marischal Museum is available and accessible locally via Cardbox for Windows database software, and will be absorbed into the iBase image management system becoming available in 2000 through Historic Collections' RSLP-funded Visual Evidence project. The iBase resource will be delivered across the WWW, thus providing search facilities to remote users. iBase is currently working towards the implementation of Z39.50 compliance. Image manipulation will require the purchase of Adobe Premier and Quicktime VR Authoring Studio software. The University will provide other software as required.

2.4 Hardware
Due to the large amount of photography of varied objects with major security and conservation considerations, the quotation from the University’s Department of Medical
Illustration requires the creation of a studio facility in the museum. Space for this will be made available by the museum, while lighting, backgrounds and stands need to be purchased. The manipulation of image files to create Quick Time video and VR clips will require an Apple Macintosh G4 and associated hardware which are not otherwise available, while the Learning Technology Unit will require the purchase of an additional PC. A digital video camera will be made available by the University.

2.5 Additional resource implications

The project budget includes a quotation of £5 per photograph from the University’s Department of Medical Illustration, guaranteed for the life of the project. This is a very competitive quote for the high quality photography, which is necessary for the long-term sustainability of the resource. Similarly, the quotation for digitising to Kodak Photo CD has been negotiated on the basis of the large quantity of images required and is guaranteed for three years.

Web mounting the resource is estimated to require 500MB of file space, which will be provided by the University’s Directorate of Information Systems and Services. The archiving of the images will be on copy Photo CDs, which will be produced within Historic Collections, while the original 35mm colour slides will be stored in the museum.

2.6 Standards

The creation of digital surrogates will follow the Data Capture Standards established by SC Ran to ensure that images and associated data are captured and stored in a format that is sustainable in the long-term and which is accessible to a wide range of users. Records will comprise cataloguing following the Dublin Core and SPECTRUM. Images will be recorded as 35mm colour slides digitised on Kodak Photo CD (2048 x 3072 pixels) then using derived JPEG files for efficient web delivery. Moving and interactive images will be displayed as Quick Time videos and QTVR clips.

3 Project development plan

3.1 Project start date, length and milestones

The project will start on 1st August 2000 and will last for three years. A series of milestones thereafter will ensure that resources are delivered on time. These will be as follows:

Month 12 Web-mounting of 1200 photographs, 1000 digitised images, 1000 full records
Creation of teaching packages for History of Art and History and Philosophy of Science

Month 24
Web-mounting of 2400 photographs, 2200 digitised images, 2200 full records

Creation of teaching packages for Cultural History and Physics
First delivery of teaching material for Cultural History and History of Art

Month 34
Delivery of final 1100 photographs, 1300 digitised images, 1300 full records
First delivery of teaching materials for Physics and History and Philosophy of Science

Month 36
Conclusion of project and delivery of evaluation reports

3.2 Project management
A project management group will be established to oversee the project and will ensure that the aims and objectives of the project are followed and that the results of formative evaluation are incorporated. The project management group will be chaired by Dr Alan Knox (Manager, Historic Collections) and will also comprise Neil Curtis, Dr Elizabeth Hallam, Dr Ben Marsden, John Milne, Dr John Morrison and Dr John Reid. It will meet bi-monthly during term time throughout the project. The project management group will report to the University's Museums, Collections and Galleries Committee, which is chaired by a Vice-Principal. Day-to-day management of the project will be by Neil Curtis, Senior Curator of Marischal Museum.

3.3 Formative evaluation
The project evaluation will assess the educational effectiveness of using a database of materials mounted on the Web for project-based learning using the expertise of the Learning Technology Unit. Formative evaluation will be carried out throughout the project. In the project's early stages evaluation will be based on expert reviewers (learning technologists and academics with appropriate subject based expertise) and a sample of students taken from the courses who will use the material. This will help to ensure that the educational aims are on target, the lecturers' and students' ideas can be incorporated into the courseware, and also that the material is easy to use. When the application is more fully developed it will be tested by lecturers within their courses.

4 Financial details
4.1 Staffing costs
The requirements for staff are outlined at 2.2 above. The costs of these posts and providing cover for the academic partners are shown in the attached spreadsheets.

4.2 Other sources of funds
The University strongly supports this project and has confirmed funding in support as indicated on the attached spreadsheet.

4.3 Cost of project presented in academic years
See attached spreadsheet.

4.7 Total budget profiled over life of project
See attached spreadsheet.

5 Evaluation, sustainability and dissemination
5.1 Evaluation of the project
The project evaluation will be designed and carried out by the Learning Technology Unit, which has considerable experience in this area. It will assess the educational effectiveness of using a database of materials mounted on the Web for project-based learning. Formative evaluation will be carried out throughout the project as outlined above at 3.3. When the applications are more fully developed they will be tested by lecturers within their courses in the University of Aberdeen. The aim of this classroom evaluation will be to identify factors that make for successful integration of the courseware into a course. The quality of the resources base of digitised material will be assessed for its compliance with standards. Wider community feedback will be sought by online logging of user perceptions, the results of which will be displayed in real time and made available to the academic community and which will be used in the longer-term maintenance and development of the use of the LEMUR resources. Feedback from external users will also be solicited directly.

5.2 Exit strategy and sustainability
The selection of resources for LEMUR and their mode of delivery have been designed to offer a long-term resource that can be used for teaching in a variety of subjects both within the University of Aberdeen and beyond. This will be achieved by the use of agreed national standards for the data structure, digital storage and delivery. The potential for
realistic scaling up the LEMUR project for use in teaching in the wider HE community (see above) is one of its strengths, as it will make available a resource of proven teaching value and associated teaching packages. The virtual museum, animated classic scientific experiments and case studies of collectors are of particular note in this respect.

The creation of digital surrogates of the University's collections for use in teaching is one of the long-term strategies of Marischal Museum. This is being achieved through existing projects such as SCран and the provision of funding from the Independent Learning Project by the University. The Departments involved will support maintenance and development of the teaching and web resources created in this project as well as seeking to extend teaching use into new areas. Further digitisation will be achieved through additional fundraising as available, as well as through Museum core funding.

5.3 Dissemination
With little existing practice in the use of museum collections in teaching, particularly in the Arts and Social Sciences, the lessons learnt will be disseminated to the academic community through conference presentations, publication and the use of the WWW. This proposal has three special ingredients, which are well worth disseminating in order to encourage other museums and academics to initiate related developments.

- The development of coursework in which the use of museum images and contextualising information is well integrated and forms an essential aspect of student-centred learning.
- The cross-departmental and cross-faculty use of the same resources, which will inevitably lead to an expansion of students' perspectives.
- The provision of a rich and integrated collection of records with a series of accessible and useful gateways that will be valuable to many others in the HE community.
APPENDIX II

QUESTIONNAIRE FILLED BY THE PARTICIPATING INSTITUTIONS

F-M U. S. EU. M.
(From Multimedia System for a European Museum)

NAME OF THE MUSEUM:
COUNTRY AND ADDRESS:
PESON FILLING THE QUESTIONNAIRE (please indicate name and position within the institution)
NAME OF THE RESPONSIBLE OF THE VIRTUAL MUSEUM:
NAME OF THE DIRECTOR OF THE MUSEUM:
Contacts (emails, phone numbers):

HISTORY OF THE VIRTUAL MUSEUM
Can you shortly describe your experience in the realization of your Virtual Museum (year of realization, duration of the works for the creation of the Virtual Museum, number of people involved and kind of professionals needed)

BACKGROUND
Could you please indicate what is the current legal status of your Museum e.g. municipally owned, charitable trust, etc.
Is your Museum part of a network of museums? If yes, did this network contribute or help to the realization of your Virtual Museum? And in what terms?
VIRTUAL MUSEUM AND TARGET GROUPS

Was your Virtual Museum built within a project (also including other museums)?
Can you give a profile of some of the key customer groups using your Virtual Museum?
If existing, could you shortly indicate the problems/difficulties appeared in building your Virtual Museum?
Can you give some examples of where your Virtual Museum is strong and where it may need to strengthen?
What are, in your opinion, the key success factors of your Virtual Museum?
Did the realization of the Virtual Museum improved the services of your museum? If yes, could you please indicate how?
Has the number of the visitors of your museum increased thanks to the Virtual Museum?
Could you indicate other advantages for your museum coming from the realization of the Virtual Museum?

MUSEUM’S STAFF AND TECHNICAL QUESTIONS

What team of your museum is dedicated to the Virtual Museum?
How many staff do you have trained in preparing pedagogic materials?
For the realization of your Virtual Museum, which were the professional roles that you had to involve?
Are these professional roles part of the staff of your Museum or did you need to outsource human resources? If yes, please describe exactly what professional roles did you outsourced and how was your experience about it.
What specific support infrastructure and services have been necessary to create the Virtual Museum?
Do you have the specific staff to maintain and update the Virtual Museum or do you need to outsource human resources to do it?
If the staff to maintain and update the Virtual Museum is internal to your Museum, who is in charge of training it? How is the training made and with which frequency? Please describe your experience.
FINANCE

What new investments capital did you have to provide in order to start up the Virtual Museum?
Could you approximately indicate the costs for the realization of your Virtual Museum?
Is your Virtual Museum easily sustainable? Could you give indications about provenance of the resources to sustain it (private sponsors, State funds, etc.)?