IST IST-2000-28336 **ARCO**

Augmented Representation of Cultural Objects

D18 Dissemination and Use Plan

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Glossary

Term	Description
ARCO	Augmented Representation of Cultural Objects
OM	Object Modeller
IMRR	Interactive Model Refinement and Rendering
ARIF	Augmented Reality Interface
DBMS	Database Management System
XML	Extended Meta Language
RDF	Resource Description Framework
DUP	Dissemination and Use Plan
ROI	Return of investment
MCSG	Museum Curatorial Steering Group
X-VRML	XML Virtual Reality Modelling Language

Terms	ARCO Glossary File
For a complete glossary of ARCO terms see	ARCO-Glossary-R-1.0-280402.doc

Definition of Responsibilities

Chapter 1/2/3/4/5	GIUNTI
Chapter 3.1/3.2	CONTRIBUTIONS FROM **ALL** PARTNERS
Chapter 3.3	UoS/PUE/UKOLN/GIUNTI/Sussex Past/ CEA-LIST/V&A develop their individual dissemination plan
Paragraph 4.1.1/4.1.2/4.1.3/ 4.1.4/4.1.5	CEA-LIST (4.1.1)/ UoS(4.1.2/)/ PUE(4.1.3-4.1.4)/ UoS (4.1.5)
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1. Executive Summary

The aim of the ARCO project is to analyse and provide innovative but simple-to-use technical solutions for virtual cultural object creation using Image Based Modelling through Photogrammetry, manipulation of cultural objects through Interactive Model Refinement and Rendering, management of these objects (virtual representations) through an XML driven Cultural Object Relational Database, and presentation technology based on an Augmented Reality Interface or Web Browser, all developed in this project. All system components will be integrated through XML providing data exchange and interoperability. End users (museum researcher and public) are going to be addressed mostly by involving them through the Museum Curatorial Steering Group.

The Dissemination and Use Plan aims at describing the planned strategy for the internal and external dissemination of the project's objectives and also at stating a preliminary approach to the exploitation of the ARCO project's results and outputs. The DUP is conceived in concert with all the Consortium partners in order to give way to the most effective strategy and to obtain the highest return in terms of mass-knowledge on the project's topics and of economic gain.

This deliverable, in particular, addresses specific dissemination actions and proposes an approach to the future exploitation of ARCO project results and outputs.

The document is composed of the following parts:

- Chapter 2 focuses on the communication and information infrastructure. In particular, it deals with the methods adopted to promote the project and communicate inside and outside the Consortium (internal & external web site, the logo, the project's leaflet);
- Chapter 3 approaches the dissemination actions to be undertaken. The Chapter focuses the attention on the major events, conferences, workshops that are going to take place this year, the main R&D projects for possible clustering and the Consortium partners' individual dissemination plans;
- Chapter 4 addresses the product definition and a preliminary approach to the exploitation strategy that could be applied to ARCO expected final System and related components.
- Chapter 5 draws the conclusions.

2. Information and Communication Infrastructure

2.1 Establishing stable conduits within and outside the project community

A fluent and effective communication is at the basis of the success of each kind of collaborative working. In particular, within an European R&D project, a good and timely exchange of information and ideas improves and reinforce the collaboration among partners.

Since the beginning of it's activities, the ARCO project's Consortium has established an effective and stable way of communicating by creating a number of electronic mailing lists, each one concentrating on a specific project-related activity (for example: finance/administrative/technical …). Phone meetings are also often used to address those problems that written words can't solve.

An internal web site is going to be developed for mainly hosting all the documentation produced during the development of the project. External communications are also important in order to assure the projects visibility to the communities interested to the results of the project. With this aim, it is being created an external web site, which is going to be implemented and put on-line by GIUNTI Ilabs and UoS.

Moreover, attending international conferences and workshops will be the main vehicle for external communication and dissemination. Later in the project, it is planned to submit scientific papers to specialised magazines (for example IEEE computer, IEEE transaction on multimedia, etc.).

The following chapters provide further details about those internal and external dissemination-related arguments.

2.1.1 Electronic mailing lists

An electronic mailing list has been established in order to improve communication and information sharing between partners. Currently, the mailing lists available are well articulated and are specified hereafter:

- **ARCO**: this is the super-list for all ARCO mailing lists. Hence, a mail sent to ARCO will be forwarded to all members of all sub-lists. Due to its broadcast-type behaviour you should not use this list except for highly relevant, global notifications;
- **ARCO-ADMIN:** used by people with administrative roles;
- **ARCO-BOARD:** the mailing list for members of the project board;
- **ARCO-COORD:** primarily intended for University of Sussex project co-ordination team;
- **ARCO-EU-ADMIN:** for people responsible for close communication with the European Commission (this is the only list which is not yet up-and-running, but this issue will have been taken care of within the next few days);
- **ARCO-FINANCE:** used to communicate about financial issues;
- **ARCO-MUSEUM:** intended to be used by the Museum Curatorial Steering Group;
- **ARCO-TECHNICAL:** for technical correspondence.

This structured mailing list aims at avoiding the use of personal email addresses because they are not guaranteed to be archived. Furthermore, by using these mailing lists partners will distinguish ARCO communication from their general communications.

2.2 Developing effective mechanism for disseminating material

2.2.1 The Logo

The logotype or trademark represents the public image of an enterprise or organism, the gateway for spreading information on its activities to the interested targeted audience. It is intended to be a distinctive image, in the sense of identifying the entity (company, consortium etc.) by differentiating it from any other existing or potential competitor. Therefore, the choice of the logo plays a key role for the dissemination of the consortium public image, as it is one of the most effective ways of getting in touch with the customers in an intuitive, attractive and long-lasting way.

Logotype images can be classified in four different categories, regarding the pictorial or textual content of the trademark.

- *Word-in-marks*, containing only characters or words,
- *Device marks*, containing graphical or figurative elements only,
- *Composite marks*, including characters or words and figurative elements,
- *Complex marks*, containing a complex image.

In ***Figure 1***, below some examples of marks of these categories can be observed.

Figure 1 – Word in marks, device marks, composite marks, complex marks

As shown in ***Figure 2***, GIUNTI has proposed a set of logos concerning the last two categories (Composite and Complex marks), within which the Consortium is going to choose the one that will represent the ARCO project.

Figure 2 – Proposed logos for ARCO project

The Consortium has chosen the following logo:

Figure 3 – ARCO project final logo

2.2.2 ARCO project web sites

The ARCO project's web sites are being developed both as a means for supporting communication within project's partners (internal site) and also as an advanced tool to support the dissemination strategy in order to reach the widest number of potentially interested end users (external site).

Both the internal and external web sites are being developed by the Consortium partners and the image of the two home pages are going to be put in the next paragraphs.

2.2.2.1 Internal site

The internal web site aims mainly at being a means of communication among the Consortium partners, containing the project-related deliverables and all helpful information for the good and efficient ongoing of the project's activities.

The ***Figure 4*** hereafter reported shows a screenshot of the internal web site home page.

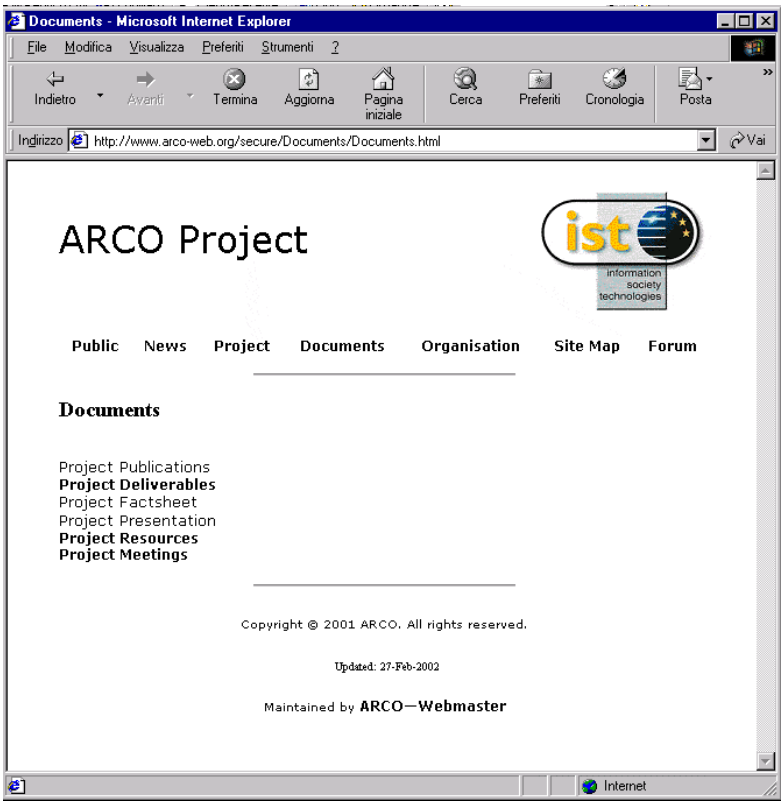

Figure 4 – ARCO internal site home page

2.2.2.2 External site

The objectives of the external web site are mainly two: to update on the scientific achievements of the project and to create an attractive pole for any new interested user. More in detail, the external Web site's aims are:

- To provide information on the project in general (overview, objectives and description),
- To provide information on the technical characteristics of the project' expected outputs,
- To publicise open related events, project presentation and related workshop,
- To publish the deliverables relating the state of the art of the output's development,
- To spread information on the involved partners,
- To keep contact.

Figure 5, hereafter, reports the proposed external web site home page. To be noticed that it has been developed both the Html and Flash version.

Figure 5 – ARCO external web site home page

2.2.3 The Brochure

The draft of ARCO project leaflet is currently under implementation by the Consortium partners. The idea is to prepare a standard 4-pages brochure structured as follows:

1) the cover contains only graphical aspects;
2) the inner pages (pages 2 and 3) may contain project details and some graphical aspects such as for example mages, photos, pictures, drawings;
3) the rear page contain details about the partnership (partners, addresses, contacts,...) and graphical aspects.

As far as the contents of the leaflet are concerned, the Annex B at the end of the document reports the ones proposed by GIUNTI and currently under evaluation and implementation by the Consortium partners. To be underlined that the preparation of the brochure, thought as project presentation, follows the Guidelines for contract preparation for coordinators of IST projects; this document can be downloaded from the following web site: http://www.cordis.lu/ist/cont-prep.htm.

3. Dissemination Activities

3.1 Key conferences, concertation meetings, publications and other relevant dissemination events

This Chapter concentrates on the available means for disseminating the ARCO project's objectives and future outputs. In particular, it concentrates on the conferences/exhibitions, publications and also other R&D projects for possible clustering.

3.1.1 Conferences

The following ***Table 1*** reports a list of events at the international level focusing on ARCO project related issues such as image processing, new applications in 3D processing, and also on the possibility to come into contact with museums, galleries etc.

The list has an informative aim and gives suggestions on some events that could represent a useful occasion to disseminate ARCO project's results and outputs. The Consortium partners can freely decide to which one of them take part and there may be also some other interesting events at their own national level.

The list contains also some references to events that have already taken place this year, but that can represent useful hints for the next year's session.

TITLE	Place and Date	Web site	Areas of interest for ARCO
Electronic Imaging 2002	San Josè, California January 20th/25th 2002	http://www.spie.org/conferences/programs/02/pw/ei.html	• Electronic imaging and system processing methods • 3D capture and display • Virtual Reality
Interfacing Knowledge: New Paradigms for Computing in the Humanities, Arts and Social Sciences	University of Santa Barbara (California) March, 8th/10th 2002	http://dc-mrg.english.ucsb.edu/conference.html	• New technologies for accessing knowledge in the cultural heritage field
ILI 2002 – 4th annual Internet Librarian International	London, UK March 18th/20th 2002	http://www.internet-librarian.com	• Information access and retrieval from distributed heterogeneous data sources
EVOIASP 2002 - 4th European Workshop on Evolutionary Computation in Image Analysis and Signal Processing	Kinsale, Ireland, April 3rd/5th 2002	http://evonet.dcs.napier.ac.uk/eurogp2002/evoiasp.html	• Evolutionary computation to image analysis and signal processing
BAVR Workshop (Business applications of virtual reality) and **BIS2002** Conference	Poznan, Poland, April 24th/25th 2002	http://bis.kie.ae.poznan.pl/	• Modelling of VR environments • Database support for VR applications • Combining VR with multimedia data
Cultural Heritage Research - 5th European Conference on research for protection, conservation and enhancement of cultural heritage	Cracow, Poland May 16th/18th 2002	http://www.cordis.lu/eesd/src/ev160502.htm	• How research on cultural heritage can help to protect and integrate cultural heritage • Present results of concluded projects in cultural heritage from the EC framework programmes
AVI '02 - Advanced Visual Interfaces	Trento, Italy, May		• Graphical communication tools

	22nd/24th 2002	http://www.diel.univaq.it/avi2002/geninfo.php	• Multimedia environments
GI 2002 - Graphics Interface 2002	Calgary, Canada May 26th/29th2002	http://www.graphicsinterface.org/	• Vision and 3D image processing
VIPromCom 2002 - 4th EURASIP - IEEE Region 8 International Symposium on Video / Image Processing and Multimedia Communications	Zadar, Croatia, June 16th/19th 2002	http://www.vcl.fer.hr/vip/	• 3D Image Processing • Multimedia Communications
CA2002 – Computer Animation	Geneva,Switzerland June 19th/21st 2002	http://cawww.miralab.unige.ch//index.html	• Virtual reality • Virtual Cultural Heritage • Augmented Reality
3DPVT - 3D Data Processing Visualization and Transmission	Padova, Italy June 19th/21st 2002	http://www.dei.unipd.it/conferences/3DPVT/index.htm	• New applications in 3D processing • 3D Capture
CGI2002 - Computer Graphics International Conference	Bradford, UK, July 1st/5th	http://www.inf.brad.ac.uk/cgi2002/cgi2002.html	• Rendering Techniques Virtual Reality • Real Time Graphics Digital Libraries • Computer Art Non Photo-realistic Rendering
Digital Cultural Heritage IIII – Networked Virtual Museums and Memory Institutions	Maastricht, Holland July, 10th/13th 2002	http://www.amsu.edu/courses/culture/#media1	• New technologies in the cultural heritage area
ICIP 2002 - 8th IEEE International Conference on Image Processing	Rochester, NY, USA, September 22nd/25th	http://icip2002.com/	• Image processing research and applications

	2002		
WSEAS 2002 - International Conference on Signal, Speech and Image Processing	Koukounaries, Skiathos Island, Greece, September 25th/28th 2002	http://www.wseas.org/conferences/2002/skiathos/icossip/	• Image analysis and segmentation • Image filtering, restoration and enhancement • Image representation and modelling
EVA 2002 Berlin: Electronic Imaging & the Visual Arts	November 6th-8th 2002, Berlin, Germany	http://www.gfai.de/pinboard/eva/e_index.htm	• Bring together scientists, museums, galleries to exchange experiences and information

Table 1 – Events' list

Although the ARCO project is still at the initial phase, partners have made several paper submissions to conference already where ARCO is presented in the context of other developments. Some papers have been already presented; some others have been submitted and accepted.

The list of the papers follows:

1. PUE has presented a paper entitled "X-VRML - XML Based Modeling of Virtual Reality" Proc. of the 2002 International Symposium on Applications and the Internet - SAINT-2002, pp. 204-211, Nara, Japan, January 28-February 1, 2002
2. PUE has presented a paper entitled "Building Database Applications of Virtual Reality with X-VRML", Proc. of 7th International Conference on 3D Web Technology - Web3D 2002, pp. 111-120, Tempe, Arizona, USA, February 24-28, 2002
4. PUE has established a workshop called Business Applications of Virtual Reality (BAVR), which is attached to the Business Information Systems (BIS) conference in Poznan in April 2002. Several ARCO partners have contributed to this workshop
5. UoS has submitted a paper entitled "Virtual and Augmented Reality Applied to Educational and Cultural Heritage Domains", business Application of Virtual Reality (BAVR), Poznan, Poland, April 24-25, 2002. The paper has been accepted
6. UoS has submitted a paper to the 3DPVT 2002 conference in Padova, Italy, entitled "An Approach to Using Image-Based Techniques across Unreliable Peer-to-Peer Networks", which discusses applications of ARCO technology. The paper has been accepted
7. UoS has submitted a paper entitled "An Interactive Augmented Reality System for Engineering Education" to the 3rd Global Congress on Engineering Education, to be held in Glasgow Caledonian University (GCU), Glasgow, Scotland, UK between 30 June and 5 July 2002

3.1.2 Publications

This paragraph contains a series of references and links related to magazines, journals and newsletters specialised on specific topics, such as virtual representation of object, 3D objects creation, 3D modelling techniques etc, and also on the wider area of new communication and information's retrieval technologies which are relevant to ARCO.

- ***E-Culture newsletter***

eCulture

It is a bi-monthly booklet on cultural content and digital heritage to inform people about the projects funded, results obtained and organisation of events. The main aim of this newsletter is also to encourage co-operation between cultural organisations and academics, researchers, technology providers and other content holders.

For more information: http://www.cordis.lu/ist/ka3/digicult/en/newsletter.html

- ***Cultivate Interactive***

It is a Web magazine which is funded under the *European Commission's Digital heritage and Cultural Content* (DIGICULT) programme. The magazine aims at providing a forum for professionals to find out more about the European Digital Heritage and Cultural Content area.

For more information: http://www.cultivate-int.org

- **eMedia Magazine**

eMedia Magazine is for technology professionals who produce, store, present, and stream digital content. Readers work in all industries–from publishing and multimedia to education and training in everything from content creation and delivery to corporate sales and marketing. Readers count on eMedia to deliver relevant product reviews and news, industry trends, case studies, and emerging technology analysis. As early adopters of new technologies, readers look to eMedia to deliver the latest on video production equipment; network delivery and storage devices; authoring, encoding, playback, and streaming tools; sophisticated presentation equipment; duplication and replication products and services; and media packaging.

For more information: http://www.emedialive.com/

- **ARIADNE**

Ariadne is a quarterly magazine, principally addressing information science professionals in academia and also to interested lay people both in and beyond the Higher Education community. Its main geographic focus is the UK, but it is widely read also in the USA and worldwide.

The main goals of this magazine are to report on information service developments and information networking issues worldwide and to keep the busy practitioner abreast of current digital library initiatives.

For more information: http://www.ariadne.ac.uk

- **JASIS**

Journal of the American Society for Information Science and Technology

The Journal of the American Society for Information Science (ISSN: 0002-8231) is the official journal of the American Society for Information Science. It is published monthly for the Society by John Wiley & Sons, Inc. This journal serves as a forum for new research in information transfer and communication processes in general, and in the context of recorded knowledge in particular.

Concerns include the generation, recording, distribution, storage, representation, retrieval, and dissemination of information, as well as its social impact and management of information agencies. There is a strong emphasis on new information technologies and methodologies in text analysis, computer based retrieval systems, measures of effectiveness, and the search for

patterns and regularities in measures of existing communication systems. The orientation is toward quantitative experimental work, but significant qualitative and historical research is also welcome.

For more information: http://www.asis.org/Publications/JASIS/jasis.html

- *IEEE Communications Magazine*

It is a monthly magazine providing information on all aspects of communication and describing technology, systems, services, market trends, development methods, regulatory and policy issues, and significant global events. IEEE Communications Magazine also has an online version called **Communications Interactive (CI)**. The on-line version has drawn upon the content of the magazine and has built on that foundation so as to include enhancements not possible with a print periodical.

For more information: http://www.comsoc.org/pubs/commag/commag.html

- **CORDIS *focus***

CORDIS *focus* is published every two weeks in English, French, German, Italian and Spanish and can be downloaded from the web site. With over 35,000 readers throughout Europe and beyond, each issue of CORDIS *focus* provides a review of the main developments in all aspects of European Union research and innovation activities, covering general policy developments, programme implementation and updates, calls for tenders and their results, events, legislative activities, and much more. For the most up-to-date information on EU research-related developments, consult the daily CORDIS on-line News Service, currently available in English, French, German, Spanish and Italian.

For more information: http://www.cordis.lu/focus/en

3.1.3 Concertation meetings

The ARCO project's Consortium partners are planning to participate at the European concertation meetings that are going to be held with relation to cultural heritage-related and 3D object creation's topics.

GIUNTI has participated to a concertation meeting EC/NSF (Rome, March 25th-26th) where the ARCO project has also been presented.

3.1.4 Standardisation Fora

The ***Table 2*** hereafter reported shows a list of the main standards that may represent a helpful means during the ongoing of the ARCO project, and whose detailed description is contained in Annex A, at the end of the document.

SPECTRUM – the UK Museum Documentation Standard	http://www.mda.org.uk/spectrum.htm
CIMI – XML Spectrum	http://www.cimi..org

CEN/ISSS **Metadata for Multimedia Information**	http://www.cenorm.be/isss/workshop
Dublin Core	http://dublincore.org
W3C: **XML** **RDF** **VRML**	http://www.w3.org http://www.w3.org/XML/ http://www.w3.org/RDF/ http://www.w3.org/MarkUp/VRML/
ISBN	http://www.isbn.spk-berlin.de
Z39.50	http://www.loc.gov/z3950/agency

Table 2 – Standardisation Fora

3.2 Other R&D projects for possible clustering

This paragraph presents an overview on the different European projects that may provide a list of useful links for ARCO project's possible clustering. In particular, the ***Table 3*** hereafter reported, indicates the projects and their web site references, and the detailed description of each one is contained in Annex C at the end of the document.

PROJECT	***WEB SITE***
EUROPEAN VISUAL ARCHIVE	http://192.87.107.12/eva/search.asp
ARTISTE	http://www.artisteweb.org
COVAX	http://www.covax.org/primera.htm
ARCHEOGUIDE	http://archeoguide.intranet.gr/
3D MURALE	http://www.brunel.ac.uk/project/murale/home.html
VIRARTIS	http://www.virartis.com
PAST	http://www.mjc2.com/PAST/home/
DICEMAN	http://www.teltec.dcu.ie/diceman
CIMI Consortium	http://www.cimi.org/
TOURBOT	http://www.ics.forth.gr/tourbot/
PISTE	http://piste.intranet.gr/

Table 3 – R&D projects for possible clustering

3.3 Individual dissemination plans

In this paragraph are presented the individual dissemination strategies adopted by each Consortium partner for widening, both at the national and international level, the knowledge on ARCO project's objectives and results.

3.3.1 UoS

UoS plans to disseminate actively in the form of articles and papers to journals, conferences and workshops targeting the dissemination groups outlined in attachment 14.7 of the ARCO Description of Work. In particular, UoS will strive to disseminate on the IMRR and the ARIF results as well as ARCO results in general, while observing the Scientific, Technical Publications and Patents Plan detailed in attachment 14.4 of the ARCO Description of Work UoS will collaborate with all ARCO partners in this respect, taking into account the Consortium Agreement.

UoS is particularly interested in disseminating ARCO results in collaboration with the museum partners at venues more appropriate to cultural heritage, as detailed in the Scientific, Technical Publications and Patents Plan.

3.3.2 PUE

PUE intends to disseminate the results of the ARCO project by publishing papers at relevant international conferences and workshops and in technical journals.

PUE is particularly interested in disseminating the results obtained in the area of the X-VRML technology. X-VRML is a high-level extensible language for building active applications of virtual reality as opposed to passive virtual scenes that can be developed by the use of existing virtual reality standards. ARCO is an excellent opportunity to evaluate how the X-VRML methodology can be used in advanced database applications of virtual reality that use complex virtual models.

The process of disseminating X-VRML has been already initiated in the first months of the project. Two papers have been presented on relevant technical conferences – SAINT-2002 conference in Nara, Japan in January 2002, and Web3D conference in Tempe, AZ, USA in February 2002. A paper about X-VRML has been also accepted to the BAVR workshop in Poznan, Poland to be held in April 2002. The X-VRML dissemination activity will continue throughout the duration of the project focusing more on the ARCO application context as the ARCO system development proceeds.

PUE is also interested in disseminating other ARCO results such as the XML technology, the ARCO database and the complete ARCO system. PUE will collaborate on the dissemination activities with other ARCO partners.

3.3.3 UKOLN

As part of UKOLN dissemination strategy within the ARCO project, we will produce articles and reports aimed at specific forums such as journals, newsletters, conferences and workshops. As leader of WP2: User requirements and specifications, we will work closely with the MCSG to raise awareness of the project and its results within the digital library, museum and cultural heritage communities.

As part of UKOLN dissemination strategy within the ARCO project, we will produce articles and reports aimed at specific forums such as journals, newsletters, conferences and workshops. These forums will be identified and targeted as the project progresses. As leader of WP2: User requirements and specifications, we will work closely with the MCSG to raise awareness of the project and its results within the digital library, museum and cultural heritage communities. Our role in WP6, XML schemas and the development of the ARCO metadata element set, in particular, will be of interest to those involved in memory organisations and other digitisation efforts.

3.3.4 CEA-LIST

CEA LIST is particularly involved in the design of the Object Modeller. Those developments concern the field of computer vision. First prototype of Object modeller concerns commercial software. The next prototype, until the final system, is going to consist in the development of original technical solutions to the modelling of artefact. Innovation is necessary to succeed in this task. CEA-LIST will be interested in the scientific valorisation of Object Modeller results we will get. Several levels of dissemination can be targeted:

- International conference (International Conference on Computer Vision, European Conference on Computer Vision, International Conference on Image Processing, Machine Vision Application etc.) and dedicated Workshop (3D Data Processing Visualization and Transmission, etc.) and International journal (IEEE-Pattern Analysis and Machine Intelligence, International Journal of Computer Vision, Pattern recognition letters, Pattern Recognition, Image and Vision Computing, etc.);
- National conference (RFIA, GRETSI) and Workshop (GDR-ISIS/GT5-Orasis, etc.) and national journal (Traitement du Signal, Technique et Science Informatiques, etc.)

Besides scientific dissemination, we project to develop communication in national commercial and industrial workshops (MICAD, Numérisation 3D, Méthodes et techniques Optiques pour l'Industrie etc.).

3.3.5 GIUNTI

The marketing and dissemination activities that are going to be undertaken by GIUNTI during the project comprehend the following actions, that are detailed hereafter: taking part at relevant events at the national and European level, prepare and publish press releases on the Italian newspapers and magazines, and also the preparation of dissemination material for the events such as posters.

The overall aim of those activities is to widely disseminate at the national level the objectives and results of the ARCO project and also come into contact with possible partners and potential customers for the exploitation phase.

As far as the events (conferences, exhibitions etc.) are concerned, GIUNTI plans to participate, during the year 2002, at the following:

EVENT	PLACE AND DATE
Convegno sulla progettazione Europea	Genoa, March 22nd/23rd
eLearning Executive Seminar	Milan, April 18th
New Educational Environments	Lugano, May 8th-11th
12° Incontro Annuale Risorse Umane & Organizzazione	Milan, May 14th-15th
SMAU 2002	Milan, October 24th/28th
European Research 2002	Bruxelles, November 11th/13th
Forum Formazione 2002	Milan, November

IST02 Conference	Copenhagen, December

Table 4 – list of events concerning GIUNTI

In order to support the participation to the events and to give adequate resonance to the project itself, information sheets and posters are going to be prepared.

Moreover, GIUNTI is going to prepare press releases to be published on Italian journals and magazines, such as for example *Il Sole 24 Ore*, *Corriere delle Telecomunicazioni*, *Information Technology Press*, *Corriere della Sera*.

3.3.6 Sussex Past

Sussex Past will disseminate news of the various stages of ARCO development in its newsletter, Sussex Past&Present. In addition, towards the end of the project, a paper will be written for its academic journal, Sussex Archaeological Collections. Sussex Past will also disseminate news of ARCO to museums in the southeast through SEMLAC (South East Museums Libraries and Archives Commission) and through email groups and by its own website; and to national museums by contributing an article to the Museum Journal.

Sussex Past will also utilise ARCO technologies, and display them to the public, in new museum developments at Barbican House (Lewes), Marlipins (Shoreham) and Fishbourne (Chichester).

3.3.7 V&A

The V&A will present papers to image professionals in the cultural heritage sector on aspects of the ARCO project.

These will include conferences of:

- The Association for Historical and Fine Art Photography
- EVA
- Museums Association
- Any other suitable conferences as they occur

The V&A will participate in any EU Concertation events as requested. The V&A will organise demonstrations of the developing prototypes to audiences of image professionals in the UK. The V&A will organise these through its network of museum photographic departments. The V&A will also organise demonstrations internally for V&A staff.

4. Exploitation plan

4.1 The Product line

In the next paragraphs, the technical description of the ARCO project's outputs follows, and it is going to lead to the description of the project's end product. A detailed exploitation business plan and ROI calculation will be prepared for the deliverable D19 *"ARCO exploitation agreement"*.

4.1.1 The Object Modeller

Object Modeller (OM) has to perform the capture of textured 3D models of artefacts. This tool is based on image processing to build the 3D models of artefacts. There are two ways to perform image acquisition. On the one hand, this acquisition is included in the Object modelling process. This allows the use of a specific hardware or more generally to impose constraints on the image acquisition process (light control, camera position…). On the other hand, user requirements impose to be able to use existing images to model artefacts. Nevertheless, the image collection must respect some obvious constraints (surface recovery, different camera positions…). Both cases will be implemented in the final system.

The OM outputs are images, 3D meshes, textures and some technical data (camera calibration, view registration…). These outputs have to be stored into the ARCO database, respecting XML description. This storage is necessary:

- to give access to 3D information, which can be used by the Interactive Model Rendering and Refinement tool, or directly by the visualization tool.
- to save data, to allow future reconstruction using improved releases of OM.

A state-of-the-art solution

The first prototype will be based on existing close range photogrammetry software to quickly provide 3D models of artefacts to the consortium.

The advantages of this solution are listed hereafter:

- it is a low-cost solution (from 500€ until 1500€). Software process classical images; no specific hardware is required, no information on camera is necessary.
    - This solution will facilitate uptake of the OM because it is based on existing software that museums can easily understand and gain experience with.
- Outputs formats of these software are compatible with 3ds max 4 (or equivalent), which will be the 1st prototype of the IMRR tool.
    - Customised versions of 3ds max (the IMRR tool) will be developed for specific museum requirements. For example, a customised version of the IMRR for developing models of ancient coins is nearing completion already, including database connectivity through the ACMA interface.
- these tools can process existing image sequence.
    - This is a major advantage enabling museums to exploit archives of photographs. Thus, using existing close range photogrammetry software throughout the ARCO system becomes an opportunity that will be exploited by offering a systems customised for this purpose.

The drawbacks of this solution are due to the weight of user interactions. User has to select a lot of features (mainly points) to calibrate camera, to register views, to describe the surface. The negative consequences are listed hereafter:

- modelling process is time consuming (until several hours to process a 3D model)
- only textured objects can be modelled. Object surface must contain features to allow matching between views.
- the number of points selected on the surface give the level of details of the final mesh. The more complex the shape is, the higher the number of selections to perform is.

A custom system

The objective of Object Modeller developments is to build a system dedicated to artefacts modelling. Improvements of the 1st prototype rest in the following points:

- to reduce user intervention, and so, time consuming
- to enlarge the kind of artefacts, which can be modelled
- to improve the 3D model level of details

To reach these goals, the final prototype will include both hardware and software components.

More precisely:

- Specific software will perform automatic pixel correspondence through image sequence avoiding a large part of the user intervention..
- Uniform (without feature) surfaces will be recovered by structured light projection.
- A stereo rig will improve accuracy of reconstruction.

Of course, this system outputs must remain compatible with the IMRR tool and respect the XML description (connection to database).

The final Object Modeller

The final system will include both the state-of-the-art software and the novel system. Indeed, the existing software will remain complementary of the developed hardware solution (low-cost, existing images process…).

The final Object Modeller and its variants will be exploited by offering it as part of a system or as a separate component. Small museums are expected to use a service whereas large museums might be expected to purchase the system. This will be the same for all ARCO system components and the whole system

4.1.2 Interactive Model Refinement and Rendering Tool

The role of the Interactive Model Refinement and Rendering (IMRR) Tool is to take or parse the 3D object data coded in the XML 3D object Schema, that is the XML polygon mesh and provide functionality with the framework of 3ds max for the museum curator or researcher to polish (apply renderings, such as textures, etc.) the model into its final virtual representation.

However, the user interface to IMRR tool must consider socio-economic factors such as user-friendly interaction to the IMRR tool in order to facilitate its uptake. ARCO has two choices: design a tool from scratch or use a commercial package such as 3ds max or Maya. Designing the IMRR tool from scratch gives ARCO complete control over functionality and the human computer interface. But it is also possible to access the full functionality of 3ds max, for example) by re-configuring its complex user interface and replacing it with a user interface that is simple and intuitive to use for the museum curator or researcher. ARCO has opted for this approach by selecting 3ds max, thus keeping the advantage of using an industry de-facto standard for 3D modelling and animation of cultural objects.

3D polygon mesh models are the most common and oldest form of modelling objects for presentation in 3D graphics. Most if not all 3D graphics accelerators in PCs these days use polygon mesh models for rendering. Thus, 3ds max for creating and rendering models is a popular industry standard. This is also the reason that the Object Modeller will output XML polygon mesh surfaces or models for further refinement. The IMRR Tool can be implemented with 3ds max using a combination of MaxScript, which is the scripting meta-language of 3ds max based on C, or by utilising the 3ds max SDK, or both.

3ds max functionality perhaps written as plug-in or equivalent will apply attributes to the virtual representation (3d cultural object) depending on the museum curators' or researchers' interpretation of the original physical artefact. Examples of this can be texturing, lighting effects, shadows, etc. in order to make the 3D cultural models look photo-realistic, or other cultural context information. Thus, the physical object can be modelled. Further interpretations are then needed to construct the missing parts of the object. An example might be a vase with the physical object being the lower part converted to a photo-realistic virtual representation, and the upper part in the process of interpretation by the curator using the IMRR Tool. Another typical example may be the classic case of axe head finds from the Bronze Age where invariably the wooden handle has disintegrated. With the IMRR Tool the curator can apply their interpretations and generate the virtual representation of the axe handle. Thus, the museum visitor to the virtual archive will see the whole artefact, which cannot be seen in the physical museum.

The museum curator using other tools (perhaps as 3ds plug-ins) will be able to edit the cultural metadata and technical metadata and connect direct to the database or the database management system. Thus, the IMRR will effectively be able to operate on the ARCO XML Schema by updating the schema data content.

4.1.3 The Object Relational Database

The ARCO object-relational database will store the cultural objects – virtual representations – and supporting cultural information. The database will incorporate a high-capacity/ high-performance database management system supporting XML that is able to handle large archives of virtual representations and associated attributes, including the extensions to the virtual representation for intelligence and augmented reality interfaces.

The types of data stored in the ARCO database include the following:

- results of the object acquisition process,
- virtual object models produced by the Object Modeller,
- results of the Interactive Model Refinement and Rendering Tool,

- cultural object metadata,
- X-VRML presentation templates, and
- information about users, groups and privileges.

The data will be organized into hierarchical, folder-like structures.

The data stored in the database will be managed by the use of ACMA – ARCO Content Management Application. The ACMA tool will provide an easy to use and intuitive user interface for managing contents of the ARCO database. The main features of the ACMA application will include:

- loading and saving data to/from DB,
- organizing data into hierarchical structures (cultural objects, folders),
- creating and deleting objects,
- displaying and modifying object attributes,
- maintaining X-VRML models,
- maintaining users/groups/privileges, and
- moving objects between databases.

The museum curator or other users will be able to access and navigate the ARCO database in a way similar to managing files in a file system. ACMA will provide access to both local and remote databases in the same way.

The XML standard will be used for representing metadata in the ARCO project. XML interfaces will ensure data interoperability and system modularity. The ARCO database will also provide an XML interface. This interface will ensure data interoperability with other system components. The internal representation of data in the ARCO database can be either XML or non-XML.

While the project may develop its own database management system (DBMS) it is most likely that a suitable commercial object-relational database technology will be chosen. A typical database of choice may be Oracle8i, because of its excellent support for XML, its content management facilities, and ability to develop and integrate with enterprise-class solutions.

The ARCO database contents will be accessed by both of the Augmented Reality Interfaces – the screen-based interface and the Web-based interface. The screen-based interface will provide more advanced browsing, searching and visualisation capabilities. The contents presented by these interfaces will be dynamically generated based on the database contents and the user interaction.

4.1.4 The XML technology

ARCO will use the XML standard for exchanging data to provide the highest level of interoperability between system components and convenient data communication between users (museum) sites and their respective content providers.

XML is widely accepted by the international community and provides all the necessary mechanisms for data interoperability. There are significant advantages of using XML for this purpose. There is large body of XML tools now available—a good example is the Oracle 8i database with its XML development tools. Also the parsers and style sheet processors for querying and transforming the XML contents are available.

- **XML Metadata and Schema for the Museum Archive Description**

XML metadata description and schema (XML DTD or XML Schema) for the museum archives will be developed. To this end the current EC and international efforts, both in cultural heritage

and outside, will be analysed. Also, the current practice at the museums sites will be thoroughly studied.

- **X-VRML templates for the Augmented Reality Interfaces**

XML-based X-VRML templates will be prepared to allow the XML data files (cultural objects) and the database contents to be transformed into formats suitable for input into the screen browser or web browser. The templates will read the cultural object data from the database for insertion into the HTML and VRML code. The X-VRML templates will be stored in the ARCO database.

- **XML System Component Interface description**

The system interface language will be XML. Generic XML interfaces will be defined that will allow data exchange and interoperability between system components. This XML interface description will be defined to allow import and export facilities into and out of the system components. The XML interface description will allow independent exploitation of system components.

- **XML Metadata and Schema for the Intelligence Rule-base—Cultural Object Behaviour**

The cultural object will have attributes in the XML description, which define an intelligence rule base, that governs how the cultural object may be used within archival or presentation environments. For example, Roman cultural objects will be self-aware and associate into Roman archives, or be visualized in a Roman augmented reality environment. The intelligent rule-base will allow the cultural object to dynamically adapt, for example change its virtual representation in the augmented reality environment depending on user input. The MCSG will help define the attributes that govern cultural object intelligence.

4.1.5 Augmented Reality Interface

The Augmented Reality Interface is the GUI to the object-relational database on the client side. It will consist of a screen based interface and a web-based interface. XSL style sheets for the OpenGL screen browser and X-VRML for the web browser will be used to transform the XML cultural object descriptions in the database into a suitable format for browsing on the appropriate interface. The user will simply make queries on the database for a particular cultural object for viewing in either Augmented Reality Interface.

- **Screen Based Augmented Reality Interface**

The screen based augmented reality interface is a simple form of augmented reality where either the physical computer screen or other projective device is used as the display device and we rely on spatial immersion to experience the virtual world in an augmented manner. Augmented Reality in this scenario is meant to convey two notions: first, the virtual representation is augmented with the cultural metadata, second a photo-realistic scene could be augmented with the virtual representation of the cultural object.

We can also use shutter glasses for stereoscopic vision of the cultural object. The user (museum curator or researcher) will look at the cultural object and interact with several augmented interpretations (virtual representation augmented with cultural metadata) stored in the database. The screen based augmented reality system is focused on simple and cheap technology based around a simple PC, operating system, augmented reality software system (coded in OpenGL compliant API), and possibly shutter glasses. The use of a projective screen is a fast and cost effective method of presenting a simple spatial augmented reality application.

- **Web Based Augmented Reality Interface**

The web based augmented reality interface will exploit HTML and X-VRML to build a web interface into the database. In terms of technology and system architecture the web based system is similar to the screen based system. The major difference is that we implement the visualisation software in X-VRML and supporting context information using HTML in a web browser. The X-VRML and HTML code can be embedded in the database.

- **Integration of the Augmented Reality Software with the Web Browser**

The two Augmented Reality Interface systems will be integrated through the use of XSL, i.e. style sheets or X-VRML to transform the XML based objects into a suitable format for browsing. The user will select the interface required and the XSL style sheet or X-VRML will transform the XML description into the appropriate format, e.g. VRML or OpenGL compliant API format, and associated information for each augmented reality interface.

4.1.6 The project final output: the ARCO System

The ARCO system will be the result of the integration of all its components such as to allow a smooth process from digital capture to visualisation of the virtual representation by ensuring all component interfaces will be compatible.

The system will be integrated with extensive use of XML as the data exchange mechanism, thus guaranteeing data interoperability between the system components. In particular, a systems view of the XML metadata, schemas and style sheets will be undertaken to ensure there is no duplication within system components. This will be facilitated by use of a metadata registry such as that made available within the SCHEMAS project. System components integration will be progressive through the prototype systems through to the final ARCO system.

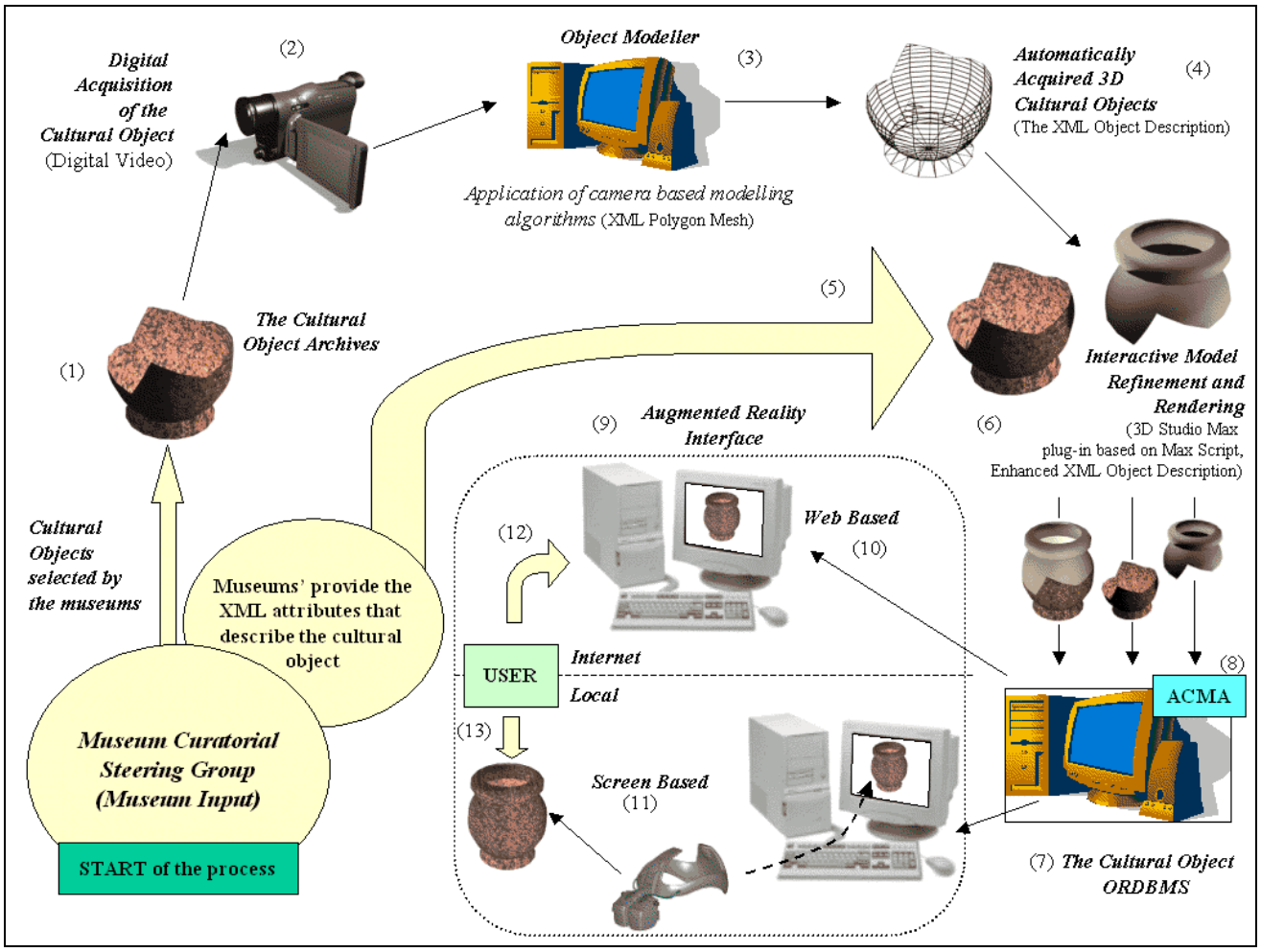

Figure 6 – The ARCO System Architecture

The ***Figure 6*** above reported, illustrates the ARCO system architecture and the pipeline from digital acquisition to final visualisation of the virtual representation by the end-user (museum researcher or public). The museum cultural object (1) will be digitally captured (2) and processed through the Object Modeller component (3) to produce an XML polygon mesh (4). Museum curator will provide then the XML attributes that will describe the Cultural Object (5) according to the XML metadata description and the schema (XML DTD or XML Schema) defined for the museum archives.

The mesh and Cultural Object (the *XML Object Description*) will be then input to the Interactive Model Refinement and Rendering tool, which will be a plug-in for 3ds max , and may be written in a scripting language (MaxScript) or C/C++.

The result will be a photo-realistic rendering of the cultural object plus an interpretation of any missing parts together with a comprehensive XML based cultural object description (the metadata) (6). The metadata and virtual object will be then written to the ARCO object-relational database (7). ARCO will probably assume Oracle8i (or 9i) or Tamino as own database as a consequence of their high support for XML.

The database manager (ACMA) (8) will allow a database administrator to access the database at the SQL level, and write or edit XML style sheets (XSL), Schema or DTDs and X-VRML templates. The database will consist of records with fields that map to XML tags (metadata).

The presentation technology based on an Augmented Reality Interface (9) will allow transforming the XML cultural object descriptions stored in the database into an appropriate format to be visualised on commonest web browsers (in case of Internet access) (10) or screen browser (in case of local access) (11).

To do that, the Augmented Reality Interface will generate the OpenGL code making use of the XSL style sheets stored in the database or HTML and VRML code employing the X-VRML templates stored in the database too.

The points of access to the ARCO system for a public user will be (12) for those accesses by web and (13) for those accesses by a local Pc.

4.2 Addressed Markets

The present paragraph introduces the addressed markets of the final expected output of ARCO project: the ARCO System. The identified market is going to be updated and implemented during the project's development and in particular in the deliverable D20 "*ARCO exploitation agreement*" due at month 20. In that way, the exploitation opportunities present on the market are going to be deepened, by taking into consideration also the inputs contained in the Linking Finance and Technology (LIFT) Guide published from the "Innovation and participation of SME's programme, part of the EC's Fifth Research Framework Programme".

An introductory categorisation of the target market now follows in ***Table 5***:

Target market	*Potential use of ARCO System*
EDUCATION	To provide Universities, Schools and Educational Institutions in general with an innovative tool allowing the performing of detailed 3D image retrieving and analysis and the navigation in virtual cultural environments.
CULTURAL HERITAGE ASSOCIATIONS/ORGANISATIONS	To deepen the members' knowledge about the many different ways of accessing cultural/historical information with an extremely innovative tool.
PUBLISHERS/EDITORS	They could find in the ARCO System new ways of presenting knowledge and it could be an interesting opportunity for submitting the text parts and cultural/historical/books' references associated to each image.

Table 5 – ARCO System addressed markets

4.3 Addressees of ARCO project's outputs

The preliminary analysis of the ARCO project's end users has taken inspiration from the deliverable D3.1 "*User Requirements Specification*", where an initial list of various categories of users is reported.

The macro-categories introduced hereafter can clarify the target groups to which the Consortium may address during its dissemination and exploitation activities.

Organisations and Institutions:

- Member state **regional archaeological units and county archaeologists** (e.g. Institute of Field Archaeologists Annual Conference; Society of Museum Archaeologists)
- **CIMI**— Computer Interchange of Museum Information
- **EMII**—European Museums Information Institute
- **National and European museums** (example: museum members of EMII)
- **Council for Museums, Archives and Libraries** in the UK
- European professional photography bodies
- The **Association for Historical and Fine Art Photography**—an association for image professionals in the cultural heritage sector in the UK

Individuals:

- **Museum curators**
- **Museum photographers** who are developing common interests in the cultural heritage sector
- **Archaeologists**
- **Historians**
- **Image creators** in museum environments

Inside these two macro-categories, it is possible to distinguish two main levels, and namely:

- *Back End Users*, including all those exploiting the expected final ARCO System by means of its building constituents: technology, services etc, and by also contributing to its development from a technical point of view;
- *Front End Users*, including all those who will exploit the ARCO final system by means of the visible end results, i.e. the possibility to search and retrieve cultural and historical images.

Back End Users	***Front End Users***
Persons performing digital capture (who captures the cultural object by using the photogrammetry technique and generates the 3D digital image)	General public (those individuals sharing passion and interest in the culture heritage area)
Metadata manager (who manages – inserts, cancels, modifies – all kind of metadata associated to the captured cultural object)	Curators (who manages the museums' activities related with the definition of what has to be exposed, to be bought or even to be borrowed from other museums or private collections)
Museums metadata manager	Education department

(who manages – inserts, cancels, modifies – the metadata terms related to "cultural aspects" of the acquired object)	(which may be part of a cultural association as well as of an university or even training association)
Administrative metadata manager (who manages – inserts, cancels, modifies – the administrative metadata such as date, time, language, rights…)	Picture researchers (who is deeply involved in picture and images searching and retrieving)
Technical metadata manager (who manages – inserts, cancels, modifies – the technical metadata such us number of images, format, type of used digital camera…which characterise the acquisition or refinement process)	Conservators (who is professionally involved in the conservation and cataloguing of cultural objects, symbols and images)
System development maintainer and administrator (who is responsible of the working of the system and provides accesses /services to it)	Researchers (who is characterised by personal passion and professional commitment in the culture heritage world)

Table 6 – ARCO System Back and Front End Users

4.4 Preliminary competitors' analysis

This paragraph concentrates on a preliminary approach towards the competitors already present on the market and that may represent a "menace" for the commercial success of ARCO project's final outputs. The potential competitors described hereafter, have been developed on the basis of already existing GIUNTI business contacts, developed even during other precedent European projects

1) IBM IMAGE LIBRARY APPLICATIONS

URL: http://www.research.ibm.com/image_apps/

The image library applications team within the IBM T.J. Watson Research Centre has the goal of capturing and reproducing "faithful" digital images. They develop technology to make this possible, and work to bring the benefits of this technology both to the cultural and to the commercial arenas. The main topics developed by the IBM research centre is strictly related to the capturing and reproducing of art images can be summarised as follows:

- Colour science
- Capturing the image
- Compressing the image
- Displaying the image
- Printing the image
- Watermark: protecting the image

The IBM image related technology addresses in particular:

- *Cultural applications*

It provides museums, art galleries and other cultural institutions with a means to make valuable objects more widely accessible to everyone who's interested, and at the same time protecting and preserving the objects themselves.

Some examples are represented by the Hermitage Museum (St. Petersburg, Russia), the National Palace Museum (Taipei, Taiwan), the Vatican Library (Rome, Italy), Lutherhalle (Wittemberg, Germany).

- *Commercial applications*

The IBM imaging technology has been widely used also by IBM customers to improve the selling strategy of their merchandise.

Pros	Cons
▪ Strong and worldwide known brand ▪ Image processing (compression, watermarking…)	▪ 3D objects not treated ▪ Virtual Reality not considered

2) ELOQUENT SYSTEMS Inc.

URL: http://www.eloquent-systems.com/

Eloquent Systems Inc. is a private company incorporated in the province of British Columbia, Canada in 1975. Eloquent is in the business of developing, packaging, selling, installing and supporting application software. Over 1000 licenses of their proprietary software have been sold from Hong Kong to the Middle East.

Eloquent Systems now delivers software that will launch applications into the modern world of the Internet. All the advanced database technology developed over the last 25 years while serving over 1,000 licensed customers is included. The software manages all the information you have about valuable assets such as:

- Archives and manuscripts
- Artefacts, photos, and fine art
- Books and magazines
- Office records and legal documents

Their technology brings the user all the advantages of the Internet: automatic links to images, electronic documents, Web sites, collecting data at the source, communication with integrated email. In other words, it presents information anytime and anywhere:

- Heritage & Culture Collections
- Medical and Legal Libraries
- Records & Archival Holdings
- School & Public Libraries

The solutions offered by Eloquent Systems are the following: WebGENCAT, WebLibrary, WebArchives, WebGallery, WebMuseum, WebHeritage, WebRecords, CorpArchives and ArchProteus.

Pros	Cons
▪ software able to manage photos, artefacts, archives etc ▪ addresses directly the cultural heritage area	▪ not present 3D solutions ▪ Virtual Reality not addressed

3) INMAGIC

URL: http://www.inmagic.com/

Inmagic is a global leader in addressing the information management needs of businesses and special librarians. Inmagic provides solutions that allow businesses to organize, search and retrieve information, images, and other types of multi-media at lightening speeds.

More in detail, the company provides flexible, easy-to-use information management and library automation software and services to information managers and special librarians seeking to organize, search and retrieve text, images and multi-media information.

While Inmagic solutions still support the traditional needs of special librarians - online catalogues, serials management, orders, loans, etc. - managers are looking to us to handle other types of information, such as technical reports, competitive intelligence, research and photo archives, and much more.

Within the many solutions offered by the company, the **Library Automation Solutions** are composed by the following software: the fully integrated library system (ILS) BiblioTech PRO®, the easy-to-use, flexible and readily customized DB/Text® for Libraries and Web Library.

Those products meet the need for an efficient system for organising and retrieving documents or images, or for a way to provide thousands of employees in offices around the world with 24hour access to critical information.

Pros	Cons
▪ the software permits also the retrieving of images ▪ Easy to use	▪ their business does not focus on the cultural heritage area specifically ▪ Use of a proprietary format: no standard for library management respected

4) THEATRON

Theatron™

URL: http://www.theatron.co.uk/

Theatron is a small, dynamic company specialising in the field of virtual reality and multimedia for cultural heritage-related clients.

They combine the skills of academic and pedagogical specialists, archaeologists, architects, computer programmers, virtual reality modellers and multimedia designers to create accurate, interactive presentations designed to attract, involve, educate and motivate.

They provide services for:

increasing awareness and attract more visitors

- by creating or enhancing a website, transforming it from an attractive but static electronic brochure into a site, with engaging interactive elements and navigable virtual reality models
- by developing high-quality materials for educational outreach, such as study packs, CD-ROM presentations, and special Internet resources linked to databases that they call Treasure Houses

providing absorbing exhibits by constructing carefully researched and accurate virtual reality models

- by creating visually stunning interactive multimedia kiosks
- by putting the emphasis on learning by exploring, both for visitors to the user site and, via the internet, even for those who live thousands of miles away

seizing new marketing opportunities

- by creating CD-ROMs that serve both as exhibits and as souvenirs
- by creating breathtaking animations for video presentations

developing cultural heritage site

- by giving technically informed advice in making grant applications
- by digital recording and virtual preservation of extant sites
- by research, documentation and reconstruction of underdeveloped but historically important areas, using innovative keyhole archaeology techniques where appropriate

Pros	Cons
▪ Development of virtual reality models ▪ Digital recording and virtual preservation of extant sites ▪ Addresses also the cultural heritage area	▪ Database not supported

4.5 Marketing Strategy

In the following paragraphs are presented the preliminary marketing approaches concerning both the different components of the ARCO System and the System itself. This analysis can be considered a preliminary one in the sense that the project is still at the beginning and the complete exploitation plan is going to be detailed in the deliverable D20 "*ARCO exploitation agreement*" which is due at month 20. Moreover, the exploitation plan at a more implemented stage of the project, is going also to report the exploitation approach of the museums, that, at this stage, are going to have delineated a clear outlook of the ARCO final product and a related strategy.

4.5.1 The Object Modeller

The object modeller is a main part of the ARCO system. This tool is used by Museums to build a 3D representation of their artefacts. Each museum interested in the ARCO concept will need an Object Modeller (OM). The final OM system will be designed to perform artefacts with respect of museum requirements. The digital capture of museum artefacts will be an important factor in determining the functionalities that the system needs to address. Market access will be favoured by a well-designed OM which respects museum requirements.

Concurrently to the ARCO context, the developed object modeller can interest others application fields (e-store, industrial control…). A more complete analysis will be performed until the final system. Each prototype is a good demonstration tool to show capabilities of the tool.

From a commercial point of view, the Object Modeller marketing strategy can be seen as a combination of a product and services.

As far as the PRODUCT is concerned, the strategy may foresee the selling of the tool for the cultural object acquisition by means of photogrammetry and the realisation of 3D Meshes, Textures compatible with 3ds max and other CAD systems.

On the other hand, the SERVICES offered could comprehend what follows. To be noticed, that those services can be done on commission.

- the service of acquisition of the object's image by means of photos taken on place (i.e. without moving it, in the case it cannot change location) and the realisation of 3D Meshes and Textures compatible with 3ds max and other CAD systems.
- the realisation of 3D Meshes and Textures compatible with 3ds max and other CAD systems starting from already existing photos in the different archives.

4.5.2 Interactive Model Refinement and Rendering Tool

The role of the Interactive Model Refinement and Rendering (IMRR) Tool is to take or parse the 3D object data coded in the XML 3D object Schema, that is the XML polygon mesh and provide functionality with the framework of 3ds max for the museum curator or researcher to polish (apply renderings, such as textures, etc.) the model into its final virtual representation.

However, the user interface to IMRR tool must consider socio-economic factors such as user-friendly interaction to the IMRR tool in order to facilitate its uptake. ARCO has two choices: design a tool from scratch or use a commercial package such as 3ds max or Maya. Designing the IMRR tool from scratch gives ARCO complete control over functionality and the human computer interface. But it is also possible to access the full functionality of 3ds max, for example) by re-configuring its complex user interface and replacing it with a user interface that is simple and intuitive to use for the museum curator or researcher. ARCO has opted for this approach by selecting 3ds max, thus keeping the advantage of using an industry de-facto standard for 3D modelling and animation of cultural objects.

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3ds max functionality perhaps written as plug-in or equivalent will apply attributes to the virtual representation (3d cultural object) depending on the museum curators' or researchers' interpretation of the original physical artefact. Examples of this can be *texturing*, *lighting effects*, *shadows*, etc. in order to make the 3D cultural models look photo-realistic, or other

cultural context information. Thus, the physical object can be modelled. Further interpretations are then needed to construct the missing parts of the object. An example might be a vase with the physical object being the lower part converted to a photo-realistic virtual representation, and the upper part in the process of interpretation by the curator using the IMRR Tool. Another typical example may be the classic case of axe head finds from the Bronze Age where invariably the wooden handle has disintegrated. With the IMRR Tool the curator can apply their interpretations and generate the virtual representation of the axe handle. Thus, the museum visitor to the virtual archive will see the whole artefact, which cannot be seen in the physical museum.

The museum curator using other tools (perhaps as 3ds plug-ins) will be able to edit the cultural metadata and technical metadata and connect direct to the database or the database management system. Thus, the IMRR will effectively be able to operate on the ARCO XML Schema by updating the schema data content.

4.5.3 The Object Relational Database

The ARCO database will be marketed both as the database management system – a technical element of the overall ARCO system, and as the repository of data.

The ARCO database management system will be marketed as a part of the complete ARCO system. The Object relational Database (for example, Oracle 8i/9i or Tamino) will be the central element of the ARCO architecture and it will be the basic means of exchanging data between the ARCO components. It will also enable remote and multi-user access to data.

The ARCO database will be also marketed as a repository of data. After ARCO prototypes are successfully installed on the trial sites (museums), the museums will start gathering data in the ARCO database(s). Eventually, the ARCO database will become a repository of valuable data. Access to these data will be simplified by the fact that the ARCO database will support XML standards for exchanging data. It will allow exporting the data into XML files that can be further transformed into an arbitrary format by the use of XSL transformations.

The primary market for the ARCO database are museums.

4.5.4 The XML technology

The XML technology will be an element integrating all ARCO components and allowing data interoperability with other systems and applications. The XML technology will be marketed together with the complete ARCO system as a key technical element significantly improving the overall quality of the system.

Use of the XML technology makes the ARCO architecture open regarding both the data and the tools. Open XML interfaces allow data interchange with other systems and applications at any stage of the ARCO processing chain. The use of an open XML description of cultural objects enables to easily extend the ARCO architecture and functionality by adding new tools performing more advanced tasks. Moreover, any of the ARCO components can be replaced by a new version or different implementation provided that the XML input and output interfaces remain the same.

4.5.5 Augmented Reality Interface

The possible marketing strategy for the ARIF (web browser) is to adopt X3D browser technology to enable ARCO virtual representations to be visualisation in a standard way over the Internet. Thus, X-VRML will be the technology of choice in this respect. For the 1st prototype this is also true for the ARIF (screen browser). Thus, the end-user will use standard 3D browser technology. Future ARIF (screen browsers), will target the implementation of a

visualisation capability allowing use of virtual reality haptic devices (such as, for example, the shutter glasses) to provide a more interactive experience for the museum curator of researcher and will be possibly based on the use of a commercial 3D content authoring solution such as WorldUP or WorldToolKit. WorldUP would allow the distribution of a browser-based application using the WorldUP viewer.

4.5.6 Preliminary ARCO System marketing strategy

Once ready to be launched on the market, the ARCO System is going to represent, from a commercial point of view, a set of product and services able to provide the potential users with the widest array of opportunities concerning the visual and virtual representation and retrieving of cultural images.

The final ARCO PRODUCT will be represented by the selling of the system complete of all the components described in subchapter 4.1 *The product line*, for the acquisition of cultural objects, the creation and management of the artefacts' virtual representation, the refinement and visualisation in a virtual dimension, both Web browser and screen based.

The possible marketing strategy of the ARCO System may also foresee a number of related SERVICES, and in particular:

a) the management and maintenance of the ARCO System itself.

   This could represent an additional service to the selling of the System, in the case the buyer (Museum, Gallery etc.) does not have enough technical skills to guarantee the maintenance and running of it;

b) the realisation of virtual Museums, Galleries and/or Exhibitions presenting objects coming from a single cultural entity as well as from the union of different Museums.

   In that way, people could have access to the images through the Web or even from computers installed in the Museums or Galleries. This could represent a good means for adding value to the Museums' services offered to the visitors;

c) the realisation, on commission, of CD-ROMs containing virtual objects' images acquired, refined and rendered with the ARCO System, and enriched with all the related cultural/historical information.

To be noticed, that the strategy above introduced represents a suggestion, and that it is going to be implemented and structured in the deliverable D20 "*ARCO exploitation agreement*".

4.5.6.1 ARCO System SWOT analysis

The ARCO project, by its very European scope and character, promotes the spread of European culture and enhances the mutual knowledge of the culture and history of the European people by means of technologically advanced means..

A preliminary analysis of the main Strengths, Weaknesses, Opportunities and Threats (the so called SWOT approach) can be proposed with reference to the ARCO System, and are reported in the next ***Table 7***. To be underlined the fact that they represent suggestions and can be modified and integrated during the ongoing of the project.

STRENGHTS	WEAKNESSES
• Increase of the knowledge on the cultural resources available across Europe • Open up the cultural patrimony to the East European countries	• Long time required for the entire process (from the acquisition to the storage, passing through the refinement) • Training for use needed

• Use of 3D technology and virtual reality	
OPPORTUNITIES	**THREATS**
• No fully and few partially overlapping players on the market place • Removal of economic barriers: more cultural material is made available more quickly	• System components not fully integrated under a unique ARCO system • Slow working of the virtual reality through Internet.

Table 7 – ARCO System SWOT analysis

5. Conclusions

This deliverable has presented an overview of the dissemination strategy planned by the ARCO Consortium and by each single partner. The document contains a number of references about possible events, meetings and publications.

Although the project is still at the beginning, a preliminary overview on the possible marketing strategy of the ARCO System has been proposed, complete with the description of the product line, and the outline of the potential. This part is going to represent the core theme on which the deliverable D20 *"ARCO exploitation agreement"* (due at month 18) will concentrate, where a complete business model and return of the investment table for the ARCO System is going to be developed.

Annex A – Standardisation Fora

This Annex contains the detailed description of the standards listed in paragraph 3.1.4.

- **SPECTRUM: the UK Museum Documentation Standard**

SPECTRUM: *The UK Museum Documentation Standard* represents a common understanding of good practice for museum documentation, established in partnership with the museum community. It contains procedures for documenting objects and the processes they undergo, as well as identifying and describing the information, which needs to be recorded to support the procedures.

Work began on SPECTRUM in 1991. It is unique in being the product of contributions from practitioners active in the field of documentation in museums throughout the United Kingdom. It draws directly on the expertise and experience of well over one hundred practising museum professionals and has sought advice and comment from an even greater number, both within and beyond the world of museums.

SPECTRUM contains all those functions that are common to most museums, to a level required by most practitioners. SPECTRUM gathers together the procedures and information needs common to a number of activities and shows how they work together. It also provides an external context to help fit SPECTRUM to the user institution. For example the section Documentation issues for collections management policies identifies points where you may need to make a decision about what to do in a particular procedure, depending on the environment in which the user institution operates.

Many museums have already, or are in the process of, implementing SPECTRUM; in so doing they have not needed to radically change direction. A dictionary definition of spectrum is "... a range of options and activities..." and the intention of SPECTRUM: *The UK Museum Documentation Standard* is to provide such a range of museums with a framework around which they can build their own, institution-specific procedures and which they can use to help identify their own information needs. As a statement of current 'real-life' good practice in museum documentation, SPECTRUM allows for an awareness of a multitude of implementations while at the same time ensuring a reliable and consistent approach which can be built upon in the future.

- **CEN/ISSS Metadata for Multimedia Information**

CEN/ISSS, in co-operation with the European Commission’s DG III & DG XIII has set up a working group to address European requirements for Educational Technology [GENI].

This working group aims to achieve a consensus view in this area through the following actions:

- the establishment of a steering group to guide and monitor progress within the project;

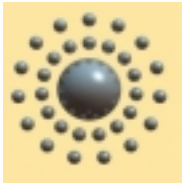
- a requirements gathering stage to discover the precise needs of European developers and users;
- consensus within a working group established under the TEISS (Telematics European Industry Standardisation Support) framework on the standardisation process for educational technology;
- coherent developments within metadata under the CEN/ISSS workshop process after this stage;
- coherent development of standards for interoperability which allow learning resources to work together and seamlessly with learning management systems;
- publication and transmission of recommendations by the work group to publishers, suppliers of hardware and services, telecommunications operators, industry bodies generally, standardisation bodies, the European Commission and international standards bodies.

The output from this work group will be in the form of:

- coherent proposals to European and International standardisation bodies on common standards supporting the development, storage and indexing of multimedia digital learning resources and delivery of services;
- Specific proposals on interoperability as defined above;
- Outputs for public dissemination shall be submitted to consensus of a CEN/ISSS workshop and published in the first instance as CEN workshop agreements.

To its credit - given the scale of standardisation activity ongoing globally for education - this group have decided to follow a course of examining standards emerging from international fora and assessing these for how well they will meeting the multicultural and multilingual requirements within Europe. Only in circumstances where there is a need identified that is not being addressed elsewhere, or an external standard (e.g. US based) needs extension for adoption in Europe, will they embark on creating something afresh. A number of the participants in this group are also active in the various international fora and they thus maintain a liaison with these groups. This working group only held its first working meeting in July so it is still early days for any outputs.

- ## Dublin Core



The Dublin Core is a metadata element set intended to facilitate discovery of electronic resources. Originally conceived for author-generated description of Web resources, it has attracted the attention of formal resource description communities such as museums, libraries, government agencies, and commercial organisations [DCDE].

The characteristics of the Dublin Core that distinguish it as a prominent candidate for description of electronic resources fall into several categories [Mill,99]:

- *Simplicity:* the Dublin Core is intended to be usable by non-cataloguers as well as resource description specialists. Most of the elements have a commonly understood semantics of roughly the complexity of a library catalogue card.
- *Semantic Interoperability*: in the Internet Commons, disparate description models interfere with the ability to search across discipline boundaries. Promoting a commonly understood set of descriptors that helps to unify other data content standards increases the possibility of semantic interoperability across disciplines.
- *International Consensus*: recognition of the international scope of resource discovery on the Web is critical to the development of effective discovery infrastructure. The Dublin Core benefits from active participation and promotion in some 20 countries in North America, Europe, Australia, and Asia.
- *Extensibility*: the Dublin Core provides an economical alternative to more elaborate description models such as the full MARC cataloguing of the library world. Additionally, it includes sufficient flexibility and extensibility to encode the structure and more elaborate semantics inherent in richer description standards.
- *Metadata Modularity on the Web*: the diversity of metadata needs on the Web requires an infrastructure that supports the coexistence of complementary, independently maintained metadata packages. The World Wide Web Consortium (W3C) has begun implementing an architecture for metadata for the Web. The Resource Description Framework, or RDF, is designed to support the many different metadata needs of vendors and information providers. Representatives of the Dublin Core effort are actively involved in the development of this architecture, bringing the digital library perspective to bear on this important component of the Web infrastructure.

There are several working groups on Dublin Core metadata: working groups are formed and dissolved as dictated by the work at hand and the availability of expertise to accomplish such work and are organised around specific problem domains. The three main working groups are:

- *Element Working Groups* These groups are working on how to apply specific Dublin Core element(s) across domains;
- *Architecture Working Groups* These groups are working on issues that provide support and structure to the Dublin Core Metadata Initiative as a whole;
- *Domain Centred Working Groups* These groups are working to apply the Dublin Core Element Set within a specific area of interest.

The Dublin Core Group has recently announced their intention to set up an Education working group. The Dublin Core elements were originally defined from the data that was perceived to be widely used or common across metadata communities (e.g. libraries, museums, archives, and graphical information systems) and the myriad of metadata schemas in existence (e.g. UKMARC, USMARC, CIMI). These core elements have been widely adopted by various bodies (e.g. European SchoolNet, IEEE/IMS Learning Object Metadata Group, US Gateway to Educational Materials) as the starting point for defining their own metadata to describe online educational resources. Inevitably, as these schemas have evolved, they have diverged somewhat from the original DC concepts and DC itself has changed from its original unqualified, general purpose model to now developing DC qualifiers so that data represented within DC elements can be more accurately interpreted.

This more ambitious role for DC is largely unproven, but given its widespread support and their collaboration with the INDECS project working on content IPR description and handling, it is the direction favoured by many for achieving cross-domain search capability in the future. The DC Educational working group will hopefully give a steer on how the educational community should support DC, both in its current form and for the future as DC v2.0 emerges.

- **W3C**

The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software and tools) to lead the Web to its full potential as a forum for information, commerce, communication and collective understanding. The W3C was created in October 1994 to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability.

By promoting interoperability and encouraging an open forum for discussion, W3C commits to leading the technical evolution of the Web. In just over five years, W3C has developed more than 35 technical specifications for the Web's infrastructure. To meet the growing expectations of users and the increasing power of machines, W3C is already laying the foundations for the next generation of the Web.

In particular, W3C's long term goals for the Web are:

- Universal Access: To make the Web accessible to all by promoting technologies that take into account the vast differences in culture, education, ability, material resources, and physical limitations of users on all continents;
- Semantic Web: To develop a software environment that permits each user to make the best use of the resources available on the Web;
- Web of Trust: To guide the Web's development with careful consideration for the novel legal, commercial, and social issues raised by this technology.

W3C Activities are generally organized into groups: Working Groups (for technical developments), Interest Groups (for more general work), and Coordination Groups (for communication among related groups). Those groups, made up of representatives from Member organizations, the Team, and invited experts, produce the bulk of W3C's results: technical reports, open source software, and services (e.g., validation services). They also ensure coordination with other standards bodies and technical communities. There are currently over thirty W3C Working Groups.

The Team organizes W3C Activities and other work into five main domains:

- **Architecture Domain**

The Architecture Domain develops the underlying technologies of the Web.

- **Document Formats Domain**

The Document Formats Domain works on formats and languages that will present information to users with accuracy, beauty, and a higher level of control.

- **Interaction Domain**

The Interaction Domain seeks to improve user interaction with the Web, and to facilitate single Web authoring to benefit users and content providers alike.

- **Technology and Society Domain**

The W3C Technology and Society Domain seeks to develop Web infrastructure to address social, legal, and public policy concerns.

- **Web Accessibility Initiative (WAI)**

W3C's commitment to lead the Web to its full potential includes promoting a high degree of usability for people with disabilities. The Web Accessibility Initiative (WAI), is pursuing accessibility of the Web through five primary areas of work: technology, guidelines, tools, education and outreach, and research and development.

- **ISBN**

International Standard Book Number System for Books, Software, Mixed Media etc. in Publishing, Distribution and Library Practices.

The administration of the ISBN system is carried out on three levels: *International agency*, *Group agencies*, *Publisher level*. The International ISBN Agency is located within the State Library Berlin:

The main functions of the International ISBN Agency are:

- the promotion, coordination and supervision the world-wide use of the ISBN system.
- the approval and the definition and structure of group agencies.
- the allocation of group identifiers to group agencies.
- to advise on the establishment and functioning of group agencies.
- to advise group agencies on the allocation of international publisher identifiers.
- the publishing of the assigned group numbers and publishers prefixes in up-to-date form.

The target ISBN addresses to is made up of the following categories:

- *Publishing houses*, for monographic publications, from manuscript through all editorial and manufacture processes until the item is finished, stock control, ordering, accounting, handling or returns, sales data monitoring, right and royalty management.
- *Book traders*, for ordering/teleordering, accounting and billing, bibliographic searches, stock control, electronic point-of-sale systems, Books in Print directories.
- *Libraries*, for ordering, information retrieval, copy cataloguing, circulation and interlending, national lending rights, the national bibliography.

- **Z39.50**

The Z39.50 is a client/server-based network protocol which allows the searching of (usually remote) heterogeneous databases and retrieval of data, via one user interface. It is most often used for retrieving bibliographic records, although there are also some non-bibliographic implementations.

"Z39.50" refers to the International Standard, ISO 23950: "Information Retrieval (Z39.50): Application Service Definition and Protocol Specification", and to ANSI/NISO Z39.50.

The Library of Congress is the Maintenance Agency and Registration Authority for both standards, which are technically identical (though with minor editorial differences).
The main elements that render it an important protocol are: powerful searching; the presence of a local and familiar user interface; the retrieving of structured data; the facilitation of distributed applications.

The latest version is Z39.50-1995, or Version 3, which has been approved by ANSI at the end of 1995. Technical development of the standard is taken forward by the Z39.50 Implementers' Group (ZIG), consisting of interested individuals from institutions and companies. The majority of these are North American, but there is an increasing number of European activists. Z39.50 version 3 was accepted as an ISO standard in March 1997. The new protocol will be known as ISO 23950.

Annex B – Proposed contents of the ARCO project brochure

This Annex presents the contents of the proposed ARCO brochure.

The ARCO R&D Project

ARCO (Augmented Representation of Cultural Objects) is a three-year European project that started in October 2001. Its global investment amounts to 2.8 MEuros and is co-funded by the Commission of the European Community within the Fifth Framework of the Information Society Technologies programme. ARCO involves seven partners from 4 European Countries, in a multidisciplinary partnership with participants from industrial, academic, research and cultural sectors.

The ARCO vision

There are many hundreds of European cultural heritage collections of special scientific and cultural interest. If you consider all the museums nationwide, then again European wide, we see the extensive, almost unimaginable size of the cultural collections that exist. We can clearly see a European wide need to preserve, study and protect these heritage collections, while at the same time making them available to the scientists, archaeologists, curators, historians and the European citizens for their enjoyment and learning, as well to other people to familiarize them with the European culture. The vision of ARCO is to develop both the technology and the expertise to help create, manipulate, manage and present these cultural collections, and make available cultural heritage to European citizens and the world.

The ARCO main goals

The ARCO project will analyse and provide innovative but simple to use technical solutions for making virtual museum objects using Image Based Modelling through photogrammetry. Manipulation of cultural objects will be through Interactive Model Refinement and Rendering, and management of these objects (virtual representations) through an XML driven Cultural Object Relational Database. Presentation technology will be based on an Augmented Reality Interface or Web Browser. All will be developed in this project.
All system components will be integrated through XML providing data exchange and interoperability. The project will demonstrate its results through a series of prototype system components leading to a final integrated system that will be evaluated both technically and socio-economically. ARCO will address user (museum researcher and public) requirements, by involving them through the MCSG (Museum Curatorial Steering Group). In this way, ARCO will focus on serving the end-users.

The ARCO approach

ARCO is a project that will simplify the digital capture of 3D objects (in the project cultural objects held in museum collections) through the use of photogrammetry, thus eliminating expensive laser based methods. The output from the digital capture process will be a standard XML polygon mesh description of the object. The cultural objects will be then refined and rendered to produce an XML based virtual representation, which will be stored in an object relational database. The virtual representation will be then presented to the viewer (museum researcher or public) through a web browser designed with X-VRML and HTML or screen browser using XML and OpenGL through the augmented reality interface. XML will be the key integrating technology for encapsulating cultural object descriptions and will be the interface mechanism between system components. The use of the XML standard, an XML driven database and interfaces will ensure efficient data exchange and interoperability between systems components, distributed cultural object databases, and the presentation of cultural

objects on the web. Selection of Oracle or similar database architectures such as Tamino with XML development tools means standardisation and compatibility will be assured. The project will contribute to international standards efforts in XML and other metadata, particularly museum focused standards like CIMI (Computer Interchange of Museum Information), and EMII (European Museums Information Institute). The museums (through the Museum Curatorial Steering Group) will contribute a cultural knowledge base at the XML description level at most stages of the project using XML editing tools. The project will produce several prototypes defined by the museum requirements and specifications, with the final prototype undergoing system integration and evaluation.
The project plans major dissemination and exploitation activity designed to ensure maximum uptake of results of the system and its components. Standard project management techniques will be employed throughout the project to ensure its smooth running and success.

The ARCO Key Issues

- **Object Modelling Tool** based on current state-of-the-art photogrammetry techniques for the acquisition of 3D digital cultural objects.
- **Interactive Model Refinement and Rendering Tool** for an easy manipulation and refinement of the virtual representations.
- **XML Descriptions of Archives** for study and adoption by the museum user community, and deposit **XML DTDs or XML Schemas** with appropriate registry authorities.
- Standardised distributed **Cultural Object Relational Database** exploiting emerging meta-language technologies.
- **Augmented Reality Interface** to the database based on a web browser using X-VRML and HTML, and a screen browser using XML and OpenGL

The ARCO project consortium

University of Sussex (UoS), Sussex Archaeological Society (Sussex Past) as assistant contactor to UoS, the Department of Information Technology of the Poznan University of Economics (PUE), Commissariat à l'Energie Atomique (CEA-LIST), Giunti Gruppo Editoriale (GIUNTI), the UK Office for Library and Information Management at the University of Bath, (UKOLN), and the Victoria & Albert Museum (VAM) as assistant contractor to UKOLN.

Information

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ARCO-COORD@JISCMAIL.AC.UK
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www.arco-web.org
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Annex C – R&D projects and Organisations for possible clustering

This Annex presents a short description of those selected R&D projects and Organisations for possible clustering with ARCO.

- **EUROPEAN VISUAL ARCHIVE (EVA)**

  Access to Europe's photographic heritage from the desk-top

The EVA project ended February 2001. During the course of the project, the main objective was to open up the photographic archives of two European cities, Antwerp and London, by means of a framework for the easy access to photographic collections. The project team has also concentrated also on critical issues including copyright protection, open access, language differences, pricing and paying for digital images. In other words, the project ***E**uropean **V**isual **A**rchive* (EVA) covered all activities required to facilitate the access to the photograph collection of public archives.

During the project an information system - the EVA system - has been developed. The application is accessible via the Web. The threshold for other collections to join the system has been kept as low as possible. It can be defined as a searchable image resource containing historical photographs dating from 1840 up to today. The photographs originate from the collections of the London Metropolitan Archives and the Stadsarchief Antwerpen. Currently EVA contains 16.957 descriptions of digitised photographs.

- **ARTISTE**

The objective of the project is to develop and prove the value of an integrated art analysis and navigation environment aimed at supporting the work of professional users in the fine arts.
The environment exploits advanced image content analysis techniques, distributed hyperlink-based navigation methods, and object relational database technologies. It is built on existing metadata standards and indexing schemes.
The objective of the project is the research, development and prove the value of an integrated art analysis and navigation environment, with the possibility to do a query by content on paintings. The project addresses therefore content analysis and classification, navigation and access, and the exploitation of these technologies.

In particular, the project will:

- research and develop advanced image content analysis algorithms for multimedia collections;
- develop techniques to automatically categorise art works using these algorithms;
- develop metadata representations for image categorisation (both automatically through the use of image content analysis and externally generated categorisation);
- develop seamless distributed access to multiple collections;

- develop distributed content-based navigation methods for art collections;
- build and prove the value of a robust and scalable integrated environment that incorporates the above components using an object-relational database;
- establish business models that give the content owners direct control over the distributed representation, access and exploitation of digital multimedia content and metadata; and
- identify how the technical systems developed in the project can be deployed and exploited in a number of sectors.

- **COVAX**

COVAX -Contemporary Culture Virtual Archives in XML- project plans to combine document descriptions and digitised surrogates from libraries, archives and museums to build a system for search and retrieval. In this way, widely distributed primary documents are going to be accessed regardless of their location.

Technically speaking, the purpose of COVAX is to analyse and draw up the technical solutions required to provide access through the Internet to homogeneously-encoded document descriptions of archive, library and museum collections based in the application of SGML/XML. The project feasibility will be demonstrated through a prototype containing a meaningful sample of all the different types of documents to build a global system for search and retrieval.

COVAX has four basic aims: dissemination of European Culture Heritage, facilitating access for European citizens to primary sources of intellectual, cultural and scientific heritage stored in archives, libraries and museums; exploitation over the Internet of existing cultural infrastructures; the use of standards in the field of information structure and retrieval and interoperability between systems based on the complementary capabilities of each partner.

- **ARCHEOGUIDE**
  Augmented reality-based cultural-heritage on-site guide

ARCHEOGUIDE will build a system providing new ways of information access at cultural heritage sites in a compelling, user-friendly way through the use of advanced IT including augmented reality, 3D-visualization, mobile computing, and multi-modal interaction. The system will provide the following features to visitors:

a) Accessing information in context with the exploration of the site through position and orientation tracking
b) Personalised and thematic navigation aids in physical and information space through the use of visitor and tour profiles taking into account cultural and linguistic background, age and skills.
c) Visualization in 3D of missing artefacts and reconstructed parts of damaged sites on Head Mount Displays.
d) User friendly multi-modal interaction for obtaining information on real and virtual objects through gestures and speech. In addition, tools enabling site administrator to organize the presentation of site information in creative ways will be provided.

The ARCHEOGUIDE project intends to provide new approaches for accessing information at cultural heritage sites in a compelling, user-friendly way through the development of a system based on advanced IT including augmented reality, 3D-visualization, mobile computing, and multi-modal interaction techniques. The system will be tried out in one major European cultural heritage site. In this site particular emphasis will be given to virtual reconstruction of the remains.

- **3D MURALE**

Within the 3D Murale project (3D Measurement & Virtual Reconstruction of Ancient Lost Worlds of Europe), an international team of multimedia content creators led by Brunel University and with support from the European Union, is developing and using 3D Multimedia tools to measure, reconstruct and visualise archaeological ruins in virtual reality using as a test case the ancient city of Sagalassos in Turkey.

The 3D-Murale system consists of the Recording, Reconstruction, Database and Visualisation components. Recording tools will be developed for measuring terrain, stratigraphy, buildings, building blocks, pottery, pottery sherds and statues on the archaeological site. The results of these measurements will be stored in the 3D-Murale database system. Reconstruction systems will use a 3D graphics tool to combine the individual measured components and reconstruct building elements and buildings from building blocks, pottery from pottery sherds, statues from statue elements and stratigraphy from all finds within the excavation.

Any missing elements will be added later through archaeological hypothesis using 3D graphics tools and custom-built software. An integrated model will be built of the landscape, buildings, and artefacts for different eras, showing reconstructions of these periods or the current state. The model will be processed to prepare it for high quality stereoscopic visualisation and for lower quality Internet visualisation. The visual experience will also include the display of the stratigraphy. Any individual artefact (building element, building, pottery sherd, complete pottery, stones or statues) may be queried on the database and the outcome of the query visualised individually. Queries may be formed and remotely visualised over the Internet.

- **VIRARTIS**

This project called “VIRtual ART restoration, conservation and management training and information network for the Information Society “ refers to the E-learning on art restoration area of study.

VIRartis refers and aims at the ideation, design, implementation and validation of a model, applicable both at a national and international level, concerning the multimedia interactive distance training in the Cultural Heritage sector.

Practically, the project states the realisation of a telematic infrastructure in order to give way to an information and tele-training services on the basis of the following architectures: Toolkit ARTE (Art Restoration, Conservation and Management Training Taxonomy for Europe), VAN (Virartis Author Network), VDN (Virartis Delivery Network),

- **PAST –** ex**P**eriencing **A**rchaeology across **S**pace and **T**ime

The key strategic goals of PAST are:

- To revitalise archaeological sites, especially smaller ones, by making visits significantly more attractive and enjoyable, leveraging upon an approach which is information-intensive, active, interactive (two-ways), personalised, reactive and dynamic.
- To dramatically enhance the ability of visitors to understand the cultural heritage a site represent, by taking an enlarged perspective, beyond the boundaries of space and time.
- To capitalise on previous investments and efforts made in digital preservation of cultural heritage and on existing multimedia archaeological databases, by providing techniques and tools to enable distributed, remote access and effective fruition of their content by visitors of archaeological sites.

The PAST project intends to design, develop, test, validate in 3 pilot installations, and commercially exploit, an advanced ICT infrastructure (the PAST system) which will exploit a number of key technologies, among which, in particular: handheld PCs, wireless networks, voice-based Human-Computer interaction techniques, text-to-speech technologies, dynamic user profiling techniques, dynamic scheduling and planning techniques, XML technologies.

In the envisaged scenario, a person entering an archaeological site will be given an Handheld PC (connected via wireless network to a PAST Server at the site headquarter) to carry during the visit, through which he will register and provide few personal information about himself, his interests, the time available for the visit, etc. The PAST system, based upon such few data, will be able to profile the visitor and to organise a personalised plan for the visit. PAST will be able to calculate the current position of the visitor at any time, thus guiding him across the site, pointing him out specific items (e.g., a building, a ruin, etc.) and delivering via the handheld PC context-specific, relevant information (such as photographs, drawings, movies, text, etc. from existing multimedia archaeological databases). The amount of information, the level of details and the way of presenting them will not be fixed, but rather different for different visitors, based upon system knowledge of the visitor's profile.

- **DICEMAN**

DICEMAN intends to provide a solution to the problems facing the archive content industry and its consumers today. Content holders have vast quantities of material which they would like to sell.

DICEMAN will offer the content industry a modern business model by:

1) Opening up valuable databases of multimedia content by making them easier to search, using:

- advanced forms of descriptions and indexing
- advanced forms of user interfaces

2) Enabling the location of the best content for the purpose, both locally and globally, over electronic networks, using agent-based assistants to users and provider.

3) Enabling the exchange and trading of multimedia content over electronic networks using standardized interfaces to electronic databases.

Technically speaking, DICEMAN is an end-to-end chain for the indexing, storage, search and trading of digital AV content. The aim is to develop a technical reference model based, where possible, on existing and emerging standards. Technical work will focus on the elements of the DICEMAN system to produce a demonstrator that effectively shows the benefits of the DICEMAN approach in selected scenarios. In a few important ancillary areas, like electronic payment and rights management, the project will not actively develop technology, but will inform itself about technologies in these areas to ensure the DICEMAN system is sufficiently generic to accommodate them. It will also establish liaisons with relevant ACTS projects addressing them.

The Content Provider's Application (COPA) will integrate technologies for analysing and describing content before storing it in the DICEMAN database, a specialised database which is MPEG-7 aware. The application is intended to make the work of indexing material a less laborious task and encourage consistency and completeness of descriptions. A means to search for and retrieve content from the database will be provided for the consumer of content and a secure session protocol will be implemented. This protocol will provide mechanisms for identification and authentication of users wishing to access content databases to ensure transactions take place between trusted parties in a controllable way.

The use of agents in the DICEMAN system will be investigated to improve the usability of the system, particularly as the system scales to include simultaneous searches of multiple databases. Agents representing the content provider will attempt to interpret search requests intelligently, while agents representing content consumers will learn about user preferences and manage search results from multiple sources.

- **CIMI Consortium**

CIMI CONSORTIUM

CIMI is a consortium of cultural heritage institutions and organizations. Their mission is to work together to bring rich cultural information to the widest possible audience, and to remove barriers to sharing the most valuable cultural information
Their work involves *five* main key areas:

- Encouraging open and standards-based approaches for creating and sharing digital information;
- Applying standards to museum information in demonstration projects that invite member participation;
- Keeping their members up-to-date about the latest in digital technology and methods as they affect the cultural heritage community;
- Giving cultural heritage a voice in the shape of the digital future;
- Teaching the latest methods and technologies, so that they can be applied in real world settings.

- **TOURBOT - Interactive Museum Tele-presence Through Robotic Avatars**

TOURBOT is the acronym of a project entitled "Interactive Museum Tele-presence Through Robotic Avatrs", and represents a research and technological development activity aiming at developing alternative ways for interactive museum tele-presence, employing the novel approach of site viewing through the ‘eyes’ of robotic avatars.

The goal is the development of an interactive TOUr-guide RoBOT (TOURBOT) able to provide individual access to museums' exhibits and cultural heritage over the Internet. TOURBOT operates as the user's avatar in a museum by accepting commands over the Web that direct it to move in its workspace and visit specific exhibits. The imaged scene of the museum and the exhibits is communicated over the Internet to a remote visitor.

As a result, the user enjoys a personalized tele-presence to the museum, being able to choose the exhibits to visit, as well as the preferred viewing conditions (point of view, distance to the exhibit, resolution, etc). At the same time, TOURBOT is able to guide on-site museum visitors providing either group or personalized tours.

In order to realise the TOURBOT system, a multimedia Web interface will allow people to interact with the tour-guide system over the Internet. Furthermore, an on-board interface will facilitate interaction with on-site visitors of the museum. Using the Web interface, people all over the world will be able to tele-control the robot and to specify target positions for the TOURBOT system. Camera controls will be used to choose the part of the exhibition the user wants to inspect in more detail. The robotic tour-guide will possess a multimedia information base providing a variety of information about the exhibition at various levels of detail. Thus, the TOURBOT system will serve as an interactive and remotely controllable tour-guide, which provides personalized access to exhibits with a large amount of additional information.

A tele-operated interactive tour-guide robot requires a high degree of autonomy. Therefore, the project includes the development of a safe and reliable navigation system for TOURBOT. The robotic avatar will be equipped with a series of state-of-the-art sensors that allow it to acquire information about its environment. The navigation system uses this sensory information to adapt the robot's internal model of the environment and to plan the robot actions.

- **PISTE - Personalized, Immersive Sports TV Experience**

The PISTE (Personalized, Immersive Sports TV Experience) project aims at developing a system, addressing the needs of broadcasters and home viewers, which will transform TV watching into an immersive interactive experience during the coverage of sports events.

The main objectives of the project are the following:

- To build a system and accompanying services that will provide TV viewers an enhanced viewing experience during the coverage of sports events.
- To provide content-creation tools that will allow broadcasters to create enhanced content for event coverage. These tools will be based on digital video processing,

3D-visualisation and animation techniques. They will allow broadcasters to create 3D models of scenes from live video feeds originating from different cameras, produce scenes combining real and synthetic objects, and associate objects with information used to provide interactive content-based features.

- To demonstrate and assess the applicability and acceptability of the system through experiments and involvement of real actors, through the production of enhanced content and provision of enhanced viewing services in the context of the Athens 2004 Olympic games.

Clustering of ARCO and PISTE projects may be considered because both projects employ X-VRML technology developed by PUE for dynamic creation of content. Although X-VRML is being used in these projects in fairly different way, some exchange of ideas and experiences may be possible. This activity has been already initiated during the BAVR Workshop organized by PUE in Poznan on April 25, 2002, where papers describing both the PISTE and ARCO projects have been presented.