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THE FUTURE OF DIGITAL MEMORY AND CULTURAL HERITAGE

Florence, 16-17 October 2003
CONFERENCE PROCEEDINGS

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PREFACE

We publish these proceedings a year after the European conference in Florence on the Future of Digital Memory and Cultural Heritage (16-17 October, 2003). Not, or not only, because presentation in book-form adds to the event - which proved extremely rich in how it presented the matter and clear in identifying the issues outstanding - an additional level of formal perfection, but also because digital preservation is such a complex and difficult matter that we have almost the impression that, a year after throwing down the gauntlet, the challenge has been accepted by (too) few.

To keep the spirit of the conference alive by making its principal conclusions available to all - cultural and conservation institutions, professionals of information and others in the sector, stakeholders and end-users - provides sufficient reason and a valid motivation for publishing these proceedings.

Also because - and I can say this with a careful but clear satisfaction - the need to focus on the issue and acquire a better conceptual understanding of its various problematic aspects, with their technical, organizational, political and legal implications, was on that occasion successfully accompanied by an effort to construct a common project.

The conference was promoted by the Italian Directorate General for Book Heritage and Cultural Institutes and the Region of Tuscany, while the Istituto per il Catalogo Unico delle Biblioteche Italiane e per le Informazioni Bibliografiche (ICCU) coordinated the event from both a practical and scientific point of view, and offered guidance for Italian action within the European framework: the Florence conference produced an agenda that sets a series of priorities, specific and shared objectives aimed at raising, within a short time-frame, awareness of the strategic role of document conservation and digital memory - a task that has always existed, but is now particularly risky and uncertain. The first European experts group was also created on that occasion, coordinated by the ICCU.

Since then the group has grown and now includes representa-

tives from almost every European country, covering all sectors of cultural heritage and often, where the experiences involved are more mature and have achieved better levels of coordination, represent functioning national networks or European consortia.

This means a lot and too little at the same time.

A lot considering the voluntary nature of this potentially operational network.

It means too little unless this "best practice" is translated into common currency: without a general acknowledgment of the fact that in our societies - which unquestionably suffer from a hypertrophy of information and data, available any moment and anywhere on the Web or through the Internet - the safe transmission of the remnants, records, sources and documents of the past to future generations cannot be taken for granted. Nor can it automatically be assumed that, as our societies move towards e-government and e-democracy, guarantees as to the certainty and breadth of citizens' rights will be protected, as will the probative function of the legal and administrative measures regarding them.

The nature and modes of knowledge production today - the tools of information technologies - make it impossible to separate the act of creating a record from that of protecting and preserving it.

Only where preservation needs are taken into account right from the moment of an object's creation can we have a real chance of keeping it reliably over the long-term.

Every digitisation project should fulfil all requirements for permanent preservation, if its core is truly that of ensuring the widest possible access to the digitised content. In this sense, digitisation and preservation cannot but be seen as two aspects of the same problem.

This century is perhaps unique in truly taking to its extreme conclusion what Walter Benjamin identified as the most salient characteristic of the current age: full "technical reproducibility". Our digital and virtual world is pushing us straight into an ancient paradox and into the enigma of becoming - which, as the ancient Greeks knew, swallows everything and consigns it to oblivion. Yet perhaps today more than ever we have to confront ourselves in practice with the fact that our tools for creating and preserving information and knowledge also happen to be themselves their greatest destroyers. And do we know *what* we are preserving *when* we are preserving it? The positivist credo that reality is something

more than its representation, and the myth of objectivity, appear more misleading to us than ever. Our "memory warehouses" are likely to store fewer and fewer tangible objects and analogue tools in future. "Saving the phenomena" was the task assigned to philosophy by Plato, and "saving the past" that of the first Greek historian Herodotus: for today's man it is maybe a question of saving the technical capability of representing contents - which are again nothing but representations, of facts, acts, events.

In practice, *what* do we do *when* we preserve a record? We must monitor its whole life cycle, and keep the bits that the record consists of alive (including all the descriptive and contextual metadata bestowing upon it individuality) through a process of continual migration to new formats and media, amenable to inevitable updates. It is a costly exercise, whose execution is worthwhile only for a carefully selected set of materials, and which requires responsible organizations and far-sighted policies.

Without going into the more technical details - which even the non-specialist can discover within the papers collected in this book - it should at this point be clear enough that today, in virtue of the quantity and quality of the skills and responsibilities at stake, preserving the future of the digital past is a challenge that the governments of our societies can only face together and on a broad scale.

Dr Bernard Smith's *Introduction to the Proceedings* offers a guide through the major issues debated at the conference, and highlights one of the most valuable aspects of the event: the effort to share those experiences both in the past and currently underway, identify the problematic elements, inadequacies, and crises, expressing the desiderata and weighing them in terms of the practical steps which need to be taken - an effort which, it might be added, turned the Florence conference into a real laboratory of a work in progress. This approach - of which the *Firenze Agenda* only represents a component - was also made possible by the existence of a common European position: the *Council Resolution of 25 June 2002* and the *Unesco Charter for the Preservation of Digital Heritage* are annexed to these proceedings, and represent a general framework for digital preservation actions promoted by the different European Union Presidencies. Moreover, within the wider ranging European Conference held in The Hague on the 16th and 17th of September 2004 , "Towards a Continuum of Digital Heritage. Strategies for a European Area of Digital Cultural Resources", a dedicated session

on preservation offered us a chance to move this process ahead step-by-step: it was on that occasion that ICCU decided to dedicate a part of its Web site to the preservation issue - creating a section where the activities of the European experts workgroup are presented and documented, an area which we intend to widen in structure and content.

Perhaps, a year after the event and considering what has been done since then, it is fair to ask: where are we going? Florence suggested something on this level - a suggestion which later proved to be correct and might be summed up as: "from projects to services", from the voluntary and often random nature of preservation efforts to the creation of more stable networks and national infrastructures, integrated at European or even international level. The ERPANET and MINERVA Projects could once again be of use by virtue of their technical and scientific knowledge, and their ability to act as coordinators at political and institutional levels. Yet, for such a task to be fulfilled, national governments and the government of Europe must be capable of expressing a clear policy on the matter, a coherent strategy, a common vision adequate to the scope of the issue, and must provide the needed human and financial resources. It is an ambitious but no less necessary objective: *hic Rhodus, hic saltus*, one should say.

Luciano Scala,
Director General for Book Heritage and Cultural Institutes

INTRODUCTION TO THE PROCEEDINGS

On the 16th and 17th of October 2003 more than 400 people met in Florence, Italy, to discuss the issue of digital memory preservation. This international conference was one of the events of the Italian Semester of EU Presidency, and was planned to be of direct interest to a wide range of people working in cultural heritage at the international level. The conference brought together practitioners and experts in the fields of digitations, digital formats and long-term storage and preservation, as well as funding organisations and other international coordinating bodies. This book collects together the contributions made during the two days, and thus provides a remarkably complete and up-to-date overview of what is a complex but compelling topic.

The event was organised by the Italian Ministries for Cultural Heritage and for Innovation and Technologies, by the Tuscany Region, and more specifically by the Istituto Centrale per il Catalogo Unico delle Biblioteche Italiane (ICCU) and the Istituto e Museo di Storia della Scienza of Florence. Beyond thanking them for the excellent logistics, we must applaud their courage in taking on the difficult and non-intuitive topic of digital preservation.

The choice of Florence, a city that is so evocative of past glories, provided a particularly good backdrop for the discussions on how to preserve our future digital memory. Many people see digital technologies as a catalyst for a new era in creativity and cultural expression. We clearly saw that the Tuscany Region is determined to position itself as a centre of leadership and expertise in the new digital Renaissance.

The objective of the conference was aptly summed in the opening speech of PROF FRANCESCO SICILIA, Director General for Book Heritage in the Italian Ministry of Culture. He set the tone for the two days by asking us all to work *together* and avoid "the risk that our century, which produced the greatest quantity of tools for cultural dissemination, will be the one transmitting the least to generations to come". One key feature running throughout the entire conference was the resolute intention of the hosts to share practical experience and to focus on practical suggestions and tools to help cultural institutions face up to this challenge over the coming 1-2 years. Many conferences leave at best an ephemeral record of what happened, whereas this conference created a living document in the form of a *Firenze Agenda*, which is provided as an appendix to this

book and is also available on ICCU's Web site[1]. Still today this agenda continues to bring together the intellectual efforts of experts from around the world.

If you are still reading this introduction, then I am certain that you are both a non-expert (for experts will have certainly already moved on to read specific contributions) and beginning to ask the ever so important question: "So, what it is this really all about?" Or even more provocatively: "Who cares?"

Firstly, the topic of long-term digital preservation is about recognising the fundamental importance of digital information in our modern society, understanding the fragility of technologies and media formats used, and accepting that positive action is needed to ensure that the information is not irremediably lost for future generations. A Resolution of the Council of the European Union clearly describes the issue and suggests some basic actions[2].

As such everyone should care because "digital content will not survive by accident". During this meeting in Florence participants heard about databases becoming inaccessible, unique film heritage that will disappear in the next 20-30 years, and the paradox where in certain parts of the world we fight to protect every individual "corpuscle" of our heritage and in others parts reams are sent daily for pulping. We also heard about the efforts being made by different cultural institutions and international organisations to create awareness around the problem, to develop techniques and tools to combat "digital erosion", and what it might mean to keep everything for ever. We were told that in a society in which more than 90% of information is born-digital we still "count on occasional and random factors, as oral memory and industrial archaeology, to ensure the transmission of present memory to future generations".

What we need is an example, and DR LUCIANO SCALA (see below) kindly provided one about a "Neapolis" database containing environmental and artistic resources of the Vesuvian area near Naples in Italy. We heard that things started with the spending of €18 million (1987 prices) to build a high-tech documentation centre that integrated "geographic" information (information and images), maps and excavation diaries. Then we heard that it was almost im-

[1] http://www.iccu.sbn.it/conserdigit.html

[2] The full text of the Resolution can be found in the appendix to this book. For a digital version, see:
http://europa.eu.int/eurlex/pri/en/oj/dat/2002/c_162/c_16220020706en00040005.pdf

mediately shut down due to a lack of financial and human resources. Then in 1999 it was decided to recover the information gathered during the original project and still stored on old computer tapes. It turned out that this was only possible due to an extraordinary set of circumstances. Firstly, they found a mainframe computer system complete with an original tape drive that was very similar to the one used in 1987. Secondly, they found some of the people who had worked on the original project, thus highlighting the absolute value of "oral memory". And last, but not least, the Italian authorities were willing to foot the bill, and promise to continue to maintain and enhance the original collection.

No matter how you look at it, finding viable sustainable solutions for long-term digital preservation will be a costly process and almost certainly will involve a substantial mutation in our traditional cultural institutions such as libraries, museums and archives. So long-term digital preservation is a problem we all should care about.

The conference agenda was organised along very simple, classical lines. The first session looked at how different international cultural organisations see this challenge. The second session brought in new evidence about how fragile digital information is and how certain leading institutions are facing up to the challenge. The third session looked at the "back-shop" of technologies, standards and methods. The fourth and final session looked at what different projects were doing, and how they might be brought to work together. The presentations were not really conceived as summary papers or static "state-of-the-art" presentations, but the focus was placed on "work in progress" and on the ability of the speakers to be provocative and even controversial.

In the first session, entitled "Cultural Heritage and the Preservation of Digital Memory", we saw how different international professional cultural organisations are approaching the problem. We were very fortunate to have presentations from the International Council on Archives, the International Federation of Television Archives, the International Council of Museums, and UNESCO.

The Deputy President of the Spanish State Archives and President of the International Council on Archives (ICA), DR ELISA CAROLINA DE SANTOS CANALEJO, kicked things off by reiterating the fundamental principles shared by the archive community - freedom of access, relevant content, freedom of expression and protection of privacy. But in addition she added the increasingly important notion that "being informed is not enough, people need to know".

In this sense, archives must deal with the two main challenges of digital information: born-digital records and digital records as an alternative medium to original records. Dr de Santos rightly underlined the fact that e-administration is taking the place of paper originals and hand-written signatures - with new problems of authenticity, integrity and trustworthiness. She also informed us that electronic records and e-administration are now central issues in almost all recent archive forums, and that ICA is responding to this with the drafting of a *Guide for Managing Electronic Records under an Archive Perspective.*

On the other hand, DR PETER DUSEK, Deputy President of the International Federation of Television Archives, offered an alternative view by highlighting the fact that we appear to increasingly rely on the exterior and alluring factors of "events" and "packaging", and that this could lead to an increasing superficiality of expectation and analysis. On top of that he claimed that we are still ignoring the fact that we are undergoing a major crisis in cultural education. For him "archivists' and historians' associations haven't yet succeeded in sa- feguarding audiovisual sources, a hundred years after their birth", but at least the TV archives appear now to know where they are going.

Maintaining his controversial position Dr Dusek went on to say that "while we're here debating how to transfer our cultural heritage on digital media, in Africa, Latin America or Asia the traditions of the audiovisual information society are pulped". It is a shame that this paradox was not more actively discussed in this conference, but it is certainly a problem that would merit in itself a dedicated event with a dedicated agenda of action. Dr Dusek left the audience with the rather challenging statement that "the digital future of audiovisual archives hasn't indeed started, at all!"

We then moved on to hear about how a museum might view digital material in a significantly different way from an archive or library. DR CARY KARP, of the Swedish Museum of Natural History and Director of Internet Strategy and Technology within the International Council of Museums (ICOM), admitted that dealing with the emergence of Internet was challenging the well-developed methodologies for the conservation, documentation and curation of the physical objects that are entrusted to them. Provocatively he noted that the museum community is still deeply entrenched in the centuries-long tradition of regarding tangible objects as the exclusive bearers of cultural significance, and that the tools of the intangible

are still regarded at best as a nonessential affair. Dr Karp clearly sided for the need to extend the principles of museology to include born-digital objects. But he equally highlighted the fact that today "on the Internet, nobody knows you're a *bona fide* member of the heritage management community" and it remains difficult to understand the quality and authenticity of the material you see on the Web.

Dr Karp noted that ICOM members were active in building institutional consensus, on digitising and migrating their collections, on experimenting with new digital storage media, and on how to develop innovative and attractive Web applications. He closed by defining the challenge of establishing "some perimeter of trust, (…) within which it is possible to recognize the activities of the established heritage management sector, and the provenience and authenticity of the material that is placed there so that it can easily be verified".

The session was closed by MR ABDELAZIZ ABID, of UNESCO, who presented the General Conference Resolution on the need for an international campaign to safeguard endangered digital memory. He introduced a set of UNESCO sponsored guidelines, prepared by the National Library of Australia, which identify the key principles that can serve as a checklist of issues and possibilities that national and regional programmes need to take into account. Perhaps more importantly, in the context of this conference, Mr Abid underlined the importance of "scientific heritage" and the need to provide for the safe keeping of scientific and technical data, results and knowledge capital that is so essential for education and for feeding the search for new discoveries.

I want here to set the reader's mind at rest and inform you that I do not intend to summarise each and every presentation made during the conference. Each contribution is rich in detail and thought provoking in its analysis, and each merits the full attention of the reader in order to extract its full significance. However, I felt that it was important to try to summarise the state of readiness of our traditional cultural institutions to deal with the challenge of long-term digital preservation. Some would consider that they still have a lot to do and a long way to go. I personally prefer to see the positive signs. Firstly, there are an increasing number of projects concerning long-term digital preservation, each highly professional and driven by highly motivated teams of specialists. We will see later that some leading institutions and consortia are now actively developing guide-

lines, tools, and services. And finally we can see that all the important international professional organisations have recognised the problem and are developing long-term strategies to deal with the preservation of our future digital memory.

Having said that I would not continue to summarise every presentation, I will immediately contradict myself and tell you about the two linked presentations of Dr Luciano Scala and Prof Mariella Guercio in the second session entitled "Strategies, Regulations and Organisational Models".

Firstly DR LUCIANO SCALA, Director of ICCU, described the results of a survey on risks and emergencies in the domain of digital memory. He noted that even if the focus was on governmental cases for which official documents were available, nevertheless they often found it hard, if not impossible, to gather enough information to create a comprehensive record of the problem in question. Dr Scala rightly said that the report "only shows the outline of the tip of the iceberg" and that many other significant experiences of total loss of digital memory remain undocumented. Perhaps the most telling fact is that some cases had not been properly documented simply because people, when the emergency occurred, were not even aware that a problem existed. The problem of the lack of adequate documentation emerged even more dramatically as it came out that the emergency had often been sorted out by turning to "oral memory": tracing the protagonists of the processes in question and asking them what they still remembered about the details of the creation of the files and archives to be recovered.

I think we can all concur with Dr Scala when he says that it is difficult to admit that the successful transmission of present memory to future generations is still dependent upon occasional and random factors, such as oral memory and industrial archaeology.

The report includes six case studies, which Dr Scala elegantly noted represent both the complexity of digital preservation and, at the same time, its dramatic simplicity. He concluded that in order to conserve and transmit digital memory, institutions face a troubling variety of technical and organizational challenges, which cannot be managed using purely technological solutions. Whatever the ultimate answer is, it will certainly involve the defining of standards for producing persistent formats and identifying procedure workflows and handbooks, and the creation of trusted digital repositories for long-term preservation. And we should never forget that we will al-

ways need software and hardware repositories and a wide range of *ad-hoc* tools in order to solve the inevitable last minute emergencies.

Secondly, PROF MARIA GUERCIO, from the University of Urbino, gave us some details about the results of 47 questionnaires returned from national institutions, with a particular focus on regulations and legislation.

She starts by setting the scene. It is one in which cultural institutions are still learning about the critical advantages of interoperability, immediate access, and global communication, and have still to fully understand that whilst it maybe easy and cheap to create digital content, it is more complex and potentially more expensive to preserve it. Prof Guercio goes on to say that digital memory preservation has long been an open issue, but has lacked a clear and established framework, operational tools, reference points, and tried and shared best practices. She feels that it is no longer sufficient to build advocacy and develop research programmes, as what is needed now are "national, regional, local regulations, guidelines and plans, internal codes, procedure and workflow manuals and a coherent approach amongst European Union countries". Prof Guercio is also rightly critical of the focus on "specific projects rather than the creation of durable services". She also accurately highlights the fact that authors and creators of new digital materials need urgently precise and detailed information about how to create digital content that is long-term preservation friendly.

The report looks at both national/regional/local regulations and at the internal policies for digital memory preservation institutions. It would be out of place here to try to summarise the complex set of conclusions and recommendations made in the report. However the first area looks at government responsibility and accountability, and the second area at requirements for specific sectors of cultural heritage. It is worth mentioning that Prof Guercio specifically identified the procedures that require the deposit of *only one copy* as creating new forms of risk concerning authenticity, integrity, and access to the deposited materials. She stated that regulations must forbid the use of encryption techniques and access restriction mechanisms for deposit material that could make impossible necessary migration activities. Naturally this will require a balance between intellectual property/copyright protection needs and permanent archival preservation needs: no European Union country has consistent regulations in this sector. On the one hand, some countries have extremely detailed regulatory solutions for the legal deposit of online

and off-line electronic publications, including the need to maintain over time the validity of electronic records. On the other hand, the acquisition and management of new dynamic materials is still rife with divergent experiments and solutions. And the technological, organizational and legal framework and tools currently available for Web-archiving leave a lot to be desired, and are considered by some as positively disruptive.

The presentation of Prof Guercio goes on to discuss the internal policies and plans of digital heritage preservation institutions. Firstly, she states that "the need to regulate a system of digital repositories management rules and procedural models is not usually perceived as a priority". Despite some good examples, Prof Guercio concludes that currently there are only a few specific regulations that concern records creators (public administrations and companies in relation to their digital repositories, publishers and documentation centres in relation to electronic publications, etc.).

I would like here to highlight some of her conclusions, namely:

- Cooperation and partnership initiatives between document creators and institutional repositories is indispensable, and requires the adoption of shared regulation.

- National regulations and internal policies are essential in prompting creators to take an active role in preserving large quantities of high-quality materials at a reasonable cost.

- There is a proliferation of metadata and standards, which, on the one hand, is necessary, but, on the other hand, may actually hinder the process that these tools were born to support; it is important to develop a coherent, if not common, reference framework, which many States and sectors need to rely upon.

- The availability of adequate human resources and of their continuing education is another issue just as important as the technical challenges discussed here.

This second session closed with two valuable presentations on policies and practices in both the Archives de France and the National Archives and Records Administration in the United States. DR JOËL POIVRE, Chief Curator and Chief of the Office for Archival Treatment and Computerisation within the Archives de France,

talked about the need to convince decision-makers that electronic archiving and electronic administration have to proceed together. He called for a "big-bang" in the archive universe generated by a coherent set of national, European and international initiatives. DR KENNETH THIBODEAU, Director of the Electronic Records Archives (ERA) Program Management Office in the US National Archives and Records Administration (NARA), went on to call for the creation of "a dynamic intellectual edifice, one which has pathways for systematically collecting and organizing empirical information about new types of electronic records and new ways that technology is applied in the conduct of business; one which has conceptual spaces suitable for analyzing such information, not only for its impact within the domain of the management of records, but also for what it reveals concerning changes in business processes and in the relationships between these processes and records; and one which is capable of integrating the results of such analysis into the solid foundations of archival science and the effective application of archival methods in automated systems".

The third session was entitled "Technologies, Standards and Methods: the State-of-the-Art in Europe". If the second session defies summarisation because of the depth and authority of the analysis provided, then the third session defies review largely because of the range of topics discussed. These spanned copyright protection through sound, cinema and audiovisual archives, to the international debate on metadata. The session was introduced by DR ARMIDA BATORI, who immediately identified three open issues. The first is the need for interdisciplinary and international forms of cooperation. The second is the issue of copyright protection. And the third issue is standards and metadata. Dr Batori was particularly eloquent in promoting the central role that metadata had in identification, use, and preservation.

MR NEIL BEAGRIE, Programme Director of the Joint Information Science Committee and Secretary of the UK-based Digital Preservation Coalition, presented three major UK initiatives – the Digital Preservation Coalition, the Digital Curation Centre, and the UK Web-archiving consortium and testbed. He was followed by PROF VITO CAPPELLINI, Department of Electronics and Telecommunication, University of Florence, who highlighted the increasingly important role of copyright protection. In particular, he stressed the need to define efficient and robust 3D digital marking techniques for 3D objects, such as statues, archaeology items and monuments,

especially when their virtual content is distributed through communication networks. Then we heard PROF GIOVAN C. PROFITA, Director General for Cinema in the Italian Ministry of Culture, discuss the different facets of cinema - as an industry, as an art form, and as a document. Interestingly, Prof Profita interpreted cinema preservation as including the reconstruction of the technical conditions in which a film was conceived and enjoyed, including bringing restored films back to theatres, where they can be correctly and fully appreciated. Passing on to sound archives, DR DIETRICH SCHÜLLER, Phonogrammarchiv of the Austrian Academy of Sciences, noted that the most attractive parts of sound heritage worldwide were still outside the reach of national and international digitisation programmes. In fact, he claimed that 80% of sound materials related to cultural and linguistic diversity are outside proper archival custody. It would appear that private collections and small research/cultural collections are unaware of necessary preservation measures and often lack the necessary financial and personnel resources. He frightened everyone by telling them that today there are unique collections covering the last 50 years that are left unattended and will rot away within 10-30 years (particularly true for collections in many of the new EU Member States). The answer is a considerable infrastructural investment on a national and European scale. But Dr Schüller went on to admit that "there is an ever increasing gap between the available technical solutions and their implementation on a broad scale". What is the best scientific approach, or combination of approaches, for ensuring long-term digital preservation? The presentation of MS JACQUELINE SLATS, the Program Manager of the Dutch Digital Preservation Testbed, focused on this issue. She told us that the Dutch aim to carry out 65% of their transactions between government and citizens through digital means by 2006, so increasingly strategies, methods, techniques and tools will be needed to secure the sustained accessibility to reliable government information. Ms Slats explores the different possibilities for preserving text documents and spreadsheets, including context, content, appearance, structure and behaviour. However, databases are more complex since it is unclear "what is the archival record". Is it the whole database system, or only the records and different tables, and does it include the appearance of the application and its behaviour? There is clearly still a lot of work to be done, and for Ms Slats the most important problem in preserving digital memory remains that of technological obsolescence. We then jumped back to audiovisual heri-

tage when MS BARBARA SCARAMUCCI, Director of the Audiovideoteche RAI, noted that in 1997 the RAI had already stopped migrating materials from obsolete media and documenting the news only with text documents, and had already shifted to multimedia cataloguing of materials transmitted via radio and television. We heard that the catalogue now holds more than 200,000 hours of TV materials and 350,000 hours of radio materials for both preview and listening. The result is that RAI is now leader, at the European level, in the field of audiovisual cataloguing systems. In addition, RAI has also developed a rights catalogue with a complete list of all RAI's radio and television transmissions with their relevant rights, both for acquired products and for in-house productions. Ms Scaramucci rightly stressed that such catalogues represent a new economic asset for the company in that they help add value to existing products and support the use of new distribution platforms (satellites, Web, CD-ROM, DVD, etc). DR CRISTINA MAGLIANO, Coordinator of the Italian National Group on Metadata and Italian Representative in the IFLA Cataloguing Section, looked at the crucial issue of selecting what resources to catalogue. She noted that selection must depend on the type of institution involved, on users demand and on the institution's material and practical resources. For her the crucial issues are the development of metadata schemes providing a more precise definition of electronic resources, new technologies for information retrieval that are independent of the origin of the information, and ways to guarantee the permanency of digital media.

The fourth and final session was a round table entitled "EU Strategies and Policies for Long-Term Preservation of Digital Memory of Cultural Heritage: the Firenze Agenda". I will be particular brief concerning this session, largely because it described "work in progress" and it would be certainly advisable to search for the most up-to-date sources of information on the different initiatives. Firstly, MR MAURIZIO LUNGHI introduced the *Firenze Agenda* which, as I said earlier in this text, is a kind of living document bringing together the intellectual efforts of experts from around the world[3]. Then PROF SEAMUS ROSS, Director of the Humanities Advanced Technology and Information Institute, described the work done in the EU-funded project ERPANET[4]. The project addresses the lack of awareness, fragmentation of knowledge and skills amongst the

[3] http://www.iccu.sbn.it/PDF/gruppo_consdigit.pdf
[4] http://www.erpanet.org

stakeholder communities about how to handle existing digital preservation problems. Prof Ross claims that knowledge will be Europe's next generation of renewable resources, and ERPANET is helping to understand how to develop the skills and know-how to protect that digital knowledge over time. He was followed by PROF VINCENZO FORTUNATO, working with the Italian Minister for Innovation and Technology, who talked about the feasibility and development of a national digital library[5]. Digitisation was the focus of MR GIANBRUNO RAVENNI in talking about the training policies of the Tuscany Region. He highlighted a recent survey on regional digitisation projects, the need for improved coordination of the economic and human resources involved, and the adoption of a set of recognised standards. He closed by stressing the absolute importance of institutional cooperation around a commonly agreed programme of work. Cooperation was also a key message from DR ANTONIA IDA FONTANA, director of the Biblioteca Nazionale Centrale of Florence, in understanding how to archive the Web. She described six work groups, created within the International Internet Preservation Consortium and looking at*:* a framework for Web archiving, dealing with the deep Web, users access tools and expectations concerning queries, content management, and how to measure and control the process of Web-archiving. The MINERVA[6] project (Ministerial Network for Valorising Activities in digitisation) was the topic of the presentation of DR ROSSELLA CAFFO. Whereas MR MARIUS SNYDERS, from the Dutch Ministry of Education, Culture and Science, presented the priorities of the Dutch Presidency for July-December 2004. The meeting planned has already taken place and details can be found on the Web[7]. Beyond describing the Dutch national investment of 9€ million annually, Mr Snyders went on to challenge the actors to "tighten" policies and initiatives, making them better focused and for once financially secure. He felt that 2004 was the year to achieve that objective.

Finally, the 50€ million Greek national digitisation programme was described by DR COSTIS DALLAS, member of the steering committee of the DigiCult Forum and chairman of the Greek company Critical Publics. He rightly stressed that a stronger focus should be given to public access to preserved digital collections, and

[5]More information on this project can be found at: http://www.iccu.sbn.it/Ebdi.htm
[6] http://www.minervaeurope.org
[7]http://eu2004.digitaliseringerfgoed.nl/cultuurtechnologie/cultuurtechnologie/i000264.html

that preservation must become a grassroots affair enlisting all types of cultural institutions and all types of cultural professionals.

As I said at the beginning of this introduction, the complexity and novelty of long-term digital preservation almost defies summarisation. Equally, I do not think that this is the place, nor the time, to draw extensive conclusions. However I do feel that a few words on future challenges are justified. Clearly our cultural institutions aim to guarantee accessibility and use over time of our collective cultural and scientific heritage, and this now explicitly includes digital resources. Thus our institutions require a continuous stream of novel concepts, techniques and tools to enable new enriched conceptual representations of complex (hybrid physical-digital) cultural and scientific objects and repositories, with a guaranteed availability over time. Yet we must also retain the curatorial skills of our domain experts, help cultural institutions to mutate gracefully, and not just retain, but enhance, quality public access. Today the only sensible way forward is to develop fully operational large-scale test beds and systems that support the availability and accessibility of digital resources from any source, in any location, in any format and with any level of interactivity. Only such large-scale initiatives will provide a reference infrastructure where all the technical, organisational and financial challenges can be addressed together.

I will leave the reader with a final quote from Prof Guercio: "It is a world that moves cautiously, slowly, too slowly compared to the existing risks and to the loss of materials that occurs every day without us even noticing it; *and yet it moves*".

Bernard Smith
European Commission,
Directorate General Information Society

FIRST SESSION

CULTURAL HERITAGE
AND THE PRESERVATION OF DIGITAL MEMORY

INTRODUCTORY REMARKS

Francesco Sicilia
Director General for Book Heritage and Cultural Institutes,
Ministry for Cultural Heritage and Activities (IT)

President, Councillor, Mayor, Authorities, Ladies and Gentlemen,

I am extremely pleased to have the opportunity to welcome everybody to this international conference, promoted by our Ministry for Cultural Heritage and Activities and by the Tuscany Region, in cooperation with the European Commission DG Information Society and with the Minister for Innovation and Technologies, and realised with the contribution of the MINERVA and ERPANET European Projects, the Istituto Centrale per il Catalogo Unico delle Biblioteche Italiane and the Istituto e Museo di Storia della Scienza.

A conference Italy has chosen to organize within the framework of events of the Italian Semester of EU Presidency, aware that the issue of digital memory preservation directly concerns a wide range of institutions working for cultural heritage at the international level.

I wish to greet and thank in particular the representatives of European institutions who have joined this initiative, proving that the notion of cultural heritage has eventually broadened, being now perceived as a national resource but also, more and more, as a European resource and a resource of all humankind.

Today, discussing of digital memory preservation of heritage means facing issues that *globally* and *transversally* invest all domains of cultural heritage management. Under this perspective, during the last two decades the European framework for safeguarding, enhancing and promoting cultural heritage has been radically transformed by electronic and telematic technologies. Thanks to the great opportunities for management and service delivery offered by new technologies, to the evolution of *information society* into *knowledge society* and to the community's ability of integrating resources at the international level, digital technologies for cultural heritage are now the privileged field of increasing investments and projects.

This can be clearly seen by considering the specific technological shape of criteria at the basis of European projects, characteriz-

ing international cooperation since the 1980s. I can mention, for example, the framework programmes for research and technologies focusing on cultural heritage and the Culture 2000 Programme, which have all emphasized on the use of modern technologies as an admission requirement and an important element of project planning.

In this sense, I wish to stress how important it is to have here with us the representatives of the MINERVA and ERPANET Projects, who will take the conclusions of our conference for further discussion at the Conference "Quality for Cultural Web Sites" that will be held in Parma on the 21st and 22nd of November 2003.

The exponential development of cataloguing and digitisation projects for databases, the variety of technological applications, and the way professions are radically evolving, are all elements which, nowadays, transversally characterize the activities of libraries, archives, museums and other cultural and scientific institutions.

Nevertheless, there is no doubt that these changes are bringing about new problems, related to the preservation of data that settled on new digital media throughout time, and to procedures that progressively found their better and were replaced, as a consequence of ever-improving technology. In other words, we are now facing the issue of deterioration of digital media and of technologies for decoding them. It is a universal issue, which explains the wide investments and the availability of technological resources in Europe and worldwide.

I believe that the quality and quantity of presentations scheduled for the next two days prove the desire, or I may say the need, of a deeper dialogue on these common issues and of laying down a common set of proposals that may lead to the beginning of a structured action at the European and international level.

In this sense, we may already start thinking of some major proposals, such as creating archives or repositories for preserving and sharing, in the long term, hardware which can be transmitted to future generations as reliable and documented memory of our computer systems.

To face the matter in all its different and complex aspects, considering national experiences as our common factor, the Conference is made of four sessions. In the opening session, we shall hear the representatives from UNESCO and from libraries, archives, museums and audiovisual federations and international organiza-

tions, whom I all wish to greet and thank once more for being here. During the afternoon session, we shall discuss regulations and organisational models for digital heritage preservation. Whereas in tomorrow's two sessions we shall first focus on technologies, standards and methods at the European level, then move to discuss the possible strategies and policies of the European Union for safeguarding the digital memory of cultural heritage.

I would like to greet again all participants, with the hope that this Conference will provide us with suggestions and tools for working *together* and avoiding the risk that our century, which produced the greatest quantity of tools for cultural dissemination, will be the one transmitting the least to generations to come.

OPENING PRESENTATION BY THE REGION OF TUSCANY

CARLA GUIDI
COUNCILLOR IN CHARGE
FOR THE REGIONAL INFORMATION SYSTEM,
REGION OF TUSCANY

Dear Guests, Ladies and Gentlemen,

I am very pleased to welcome you to this important International Conference, organised within the European Semester of Italian Presidency, and promoted by the Directorate General for Book Heritage and Cultural Institutes of the Italian Ministry for Cultural Heritage and Activities and by the Tuscany Region, in cooperation with the DG Information Society of the European Commission and with the Minister for Innovation and Technologies. The key issues that will be here discussed are of strategic relevance for the future, and contributing to this event and hosting it was an honour for both the Tuscany Region and the City of Florence.

Before the different sessions begin, let me briefly draw you a picture of the vision and activities of the Tuscany Region on the issue of preservation of and access to our digital cultural heritage.

INTRODUCTION

The development of the Information Society implies deep changes in the ways of accessing and using the world's cultural heritage. Many national and international initiatives (specifically, those undertaken by the European Union and the G7 and G8 Inter-Ministerial Conferences) are aimed at placing heritage on networks, so as to promote the development of electronic networks, support widespread dissemination and culturally characterize networks, and enhance local cultural identities - turning them into a strategic resource for social and economic development at the local level.

Under a museology and museographic perspective this issue is particularly relevant. Museum institutions were created, in the 18th century, as a countermeasure to the ageing of the world's cultural heritage - which from then on was to be safeguarded in places

dedicated to the preservation of arts and knowledge. But the concept itself of cultural heritage, as defined by the Enlightenment philosophy, has ended up creating an increasing distance between cultural heritage and its historical and geographical context of origin. With the result that, today, a complex process of historical and critical re-interpretation is necessary to retrieve the meaning of cultural objects and artworks kept in museums.

Information and communication technologies can play a revolutionary role for what concerns the need of virtually re-contextualizing heritage and fostering its dissemination at mass level - without putting it at risk. We can imagine, first of all, that in the future museums will become the major centres for collecting all the relevant scientific and cultural documentation on the assets they keep. To do so, they will need to work with their own electronic records management systems and with computerised systems for disseminating their cultural resources at a mass level. Moreover, telecommunication networks will soon make it possible to transmit in real time and with limited costs sizeable volumes of information (data, texts, still images, graphic documents, etc.) and, within acceptable transfer-times, also multimedia files at high resolution (video, audio, moving graphics, 3D images, virtual reality, etc.).

In this field, the Tuscany Region has set up centres and networks of excellence, which are now busy in placing our regional information heritage on the Net - an information which, on the contrary, is now dispersed over various local or marginal State bodies. Moreover, thanks to various initiatives which have been undertaken throughout the years in collateral sectors such as libraries and tourism, we can now start designing and implementing a "connection system": a system where the submerged fonds of local and State museums, the State and private libraries, and the architectural, urban, natural and environmental heritage of the region, can all play a major role in developing and promoting Tuscany's economy and productivity.

WHAT IS TO BE DONE?

All our local, regional and national institutions should cooperate in overcoming the current fragmentation of expertise within the information domain, and should implement a project aimed at placing on the Net all the information and knowledge available on

our cultural heritage resources. This would significantly support our local economic development and, more in general, the development of the Information and Knowledge Society.

The project, which could be implemented within the wider framework of national and international initiatives for information society and e-government, and would support Tuscany's autonomous legal status as a region, could have the main objective of producing a distributed platform for cultural heritage - conceived both for the needs of professionals (local government actors, art historians, scholars and researchers) and of generic users (citizens, tourists). For building up this platform, we could integrate the Regional Information System databases (covering both cultural heritage contents and tourism-oriented contents created by the Region and the various local bodies), with those of the Istituto per il Catalogo e la Documentazione (covering cultural heritage contents) and of other public and private agencies. Such a tool would help us overcoming the current situation, where that portion of our heritage that has been digitised within the framework of national programs (with successes and failures) is held by different institutions and, hence, is not fully accessible.

The Italian cultural heritage sector is a little backward for what concerns the use of technologies, particularly software applications. But our unique cultural heritage can stimulate research and professional capacity-building - two aspects that would add value, in terms of both contents and services, to our electronic and multimedia products. The fragmentation of the organizational model, a logic of separation in data management and delivery, and the fact that our cultural heritage isn't fully exploited as a resource for local social and economic development, are only a few of the many reasons why the potentials of the "cultural heritage resource" remain unexpressed.

SERVICES TO BE CREATED

Some of the possible services could cover:

a. Digital acquisition of cultural assets at high resolution; these digitised materials should then be archived, certified and made available online.
b. Creation of innovative services for the integration of the cultural heritage sector with the tourism sector.

c. Integration, within a unified access system, of the information of Heritage Offices and other State and local institutions and organizations.
d. Identification of methods and techniques for disseminating multi-channel platforms (Internet, telephone, messages, etc.), equipped with adequate devices for guaranteeing security, privacy and copyright protection.

TOWARDS AN ARCHITECTURE OF CONTENTS

By building up a "highly connected" public administration - and getting over the technological barriers now existing between local, regional and national administrations - it will be easier for our administrations to share data and records and have a common strategy for cultural heritage management. Citizens would benefit all this, and so would the local social and economic development, and costs would be reduced.

Thanks to the existing infrastructure - the Rete Telematica Regione Toscana (RTRT)[1] - the databases of Heritage Offices, local government bodies and all the other project's participants (Istituto per il Catalogo e la Documentazione included) could be incorporated in an open, distributed and scalable networked architecture, which would be easy to update. Contents would be decentralized, and by the very nature of this approach other databases could be made accessible in the future with minimum efforts and lower costs, if compared with the efforts and costs required by any centralized or semi-distributed approach.

Creating protection systems for cultural assets in digitised form is an essential pre-condition for their distribution, as many of these assets are of private or ecclesiastical property. Those systems should always ensure that copyright on digital contents is respected. This would be possible by using digital watermarks and signatures; the Tuscany Region and its local bodies have access to these applications and have already successfully used them for creating and managing the Photographic Archive and for classifying access to our regional databases. Moreover, for "cultural objects" to be used not just by administrations, we must shift to a semantic description of cultural contents - in an open, distributed, shared and updatable way, going beyond the many bureaucratic and ad-

[1] Telematic Network of the Tuscany Region.

ministrative rules (set of forms, catalogue standards, etc.) that have, up to now, left space only for formal and analytical descriptions to be made. All this would support an integrated use of cultural heritage contents: the different levels of information research would be inter-connected and virtual visits would be possible.

Currently, the relation between cultural heritage and tourism is scarcely investigated. We know that cultural heritage is a driving force for tourism and vice versa, but nothing has ever been done to integrate technologies within these two sectors. Sharing our technological infrastructures, services and networks of contents would be a way for going beyond such a sector-specific approach, and let our cultural heritage be a driving force in the building up of networks of knowledge and in promoting Tuscany's social and economic development.

TUSCANY TODAY: TOWARDS A SYSTEM OF EXCELLENCE

That of the impact of new technologies in the cultural heritage sector has become a very interesting issue - especially in a region like Tuscany, whose heritage is huge.

There are various types of technologies which are extremely relevant in this field, and for the sake of simplicity we may identify two major categories:

a. material technologies;
b. information technologies.

INFRASTRUCTURES

In terms of infrastructures, Tuscany has its Regional Telematic Network (RTRT). It is an innovative, widespread, efficient and secure network - one of the best networks at both national and European level. Many useful services for the cultural heritage sector are delivered through the RTRT, included those related to digital signatures - both the application for signing electronic records and the one for online access to electronic services can be accessed through the network.

Moreover, within the framework of the RTRT, a virtual network of public local libraries has been developed: it gathers about 13 State libraries of the region, providing a unified Web access and other functions such as by-cataloguing and management of inter

library loans. And we also have a network of museums, where museums can directly update all relevant information and which provides users with a unified access to all Tuscany museums.

MATERIAL TECHNOLOGIES

These include many important types of technologies:

a. chemical technologies, specifically technologies for restoring, cleaning and protecting works of art (paintings, frescos, monuments, etc.) from external agents;
b. optoelectronic technologies, basically based on laser, for cleaning and restoring works of art, objects, surfaces, monuments.

In this field, there are highly qualified professionals within the universities, research and cultural institutes of the region, as well as within its industry - guaranteeing Tuscany a leading role at national and European level.

INFORMATION TECHNOLOGIES

Information technologies (IT) include all technologies related to data processing and telematics. At the regional level, some important and innovative ITs have been designed for the cultural heritage sector:

a. Technologies for performing high quality (high spatial resolution, good chromatic fidelity) digital acquisitions (2D, 3D) of cultural assets.
b. Technologies for creating efficient databases, containing cards, images and even vocal and music pieces.
c. Technologies for performing virtual or electronic restorations, simulating the material restoration of deteriorated or damaged works, before practically carrying out the restoration itself.
d. Technologies for visualising and reconstructing three-dimensional (3D) environments: it is possible to by-pass spatial barriers and visit, even from remote locations, cultural heritage environments or surf in the 3D reality of such environments (museum rooms, galleries, monu-

ments, archaeology sites). This can be done through multimedia terminals (which can treat text, data, vocal-music and image files).

e. Telematic technologies for museums and galleries, by which collections of works of art can be reconstructed when the pieces are physically kept in different places; you can reconstruct collections of a single artist, a school, an artistic movement or a specific era.
f. Technologies for e-commerce procedures - e.g. creating digital information of high quality on works of art and historical records, and distributing that information through the Internet.

Tuscany is also at the forefront in Italy and Europe for what regards the latest technological applications, such as:

a. technologies for the protection of intellectual property;
b. integrated digital archives;
c. electronic or virtual restorations; and,
d. virtual museums.

TECHNOLOGIES FOR THE PROTECTION OF INTELLECTUAL PROPERTY

The issue of copyright is of great interest when we look at the multiple applications of information technologies and telematics networks in the cultural sector. The word "copyright" is often pronounced when it comes to various and important aspects of heritage management, such as:

a. identifying the competent authority or the information's owner (single individual, government or private body, museum, archive, etc.);
b. protecting the confidential nature of a piece of information (classified access);
c. respecting copyright, in the sense of asking permit for using a work and/or paying the amount due to the owner.

Electronic watermarking is very important for copyright protection. An electronic or digital watermark is an identification code

which carries the information on the author, owner, distributor and authorized consumer of a product (specifically, it contains the author's signature, the company's logo, etc.). The watermark is perfectly impressed on the digital record with the exact purpose of protecting the rights of the author.

Integrated Digital Archives

Another significant evolution is that of integrated digital archives, providing easy and interactive forms of access to cultural heritage of all kind in hypertext format.

These archives cannot be simply built on the basis of a comprehensive electronic inventory: databases on real or virtual objects must also be developed, containing chromatic digital images at high resolution of those objects matched with descriptive cards, or digital images and virtual descriptions. Multimedia archives can also contain three-dimensional representations (3D) of the objects in question, created by means of various techniques (stereoscopy, laser scanning, digital photographs mapping, oleographs, etc.), and music-voice files illustrating the materials.

Integrated archives are particularly important in that they make it easier to access contents. For example, when carrying out a query on a painting users can surf quickly and efficiently through the hypermedia materials of the various archives and access papers about the author, or links to museums and palaces that keep other works by that author.

Finally, let me mention the Progetto Parnaso IDAPP (Archivi Digitali Integrati nella Provincia di Pistoia), an innovative project about integrated digital archives which we are currently developing.

Technologies for Electronic or Virtual Restoration

Another significant technological application, largely in use in Tuscany, is that of virtual or electronic restoration. Electronic restorations can be carried out to simulate the physical restoration of works of art of all kinds (paintings, frescos, statues, monuments, etc.), and have a double utility. First of all, it provides a useful guide to the process of physical restoration, in the sense that you can know in advance what the results of the physical restoration will be, or have at least some relevant indication. Plus, it can be an

important tool for studying the work in question, even when it hasn't been physically restored. In Tuscany we used these techniques for simulating the restorations of many paintings, frescos and monuments (e.g. pieces from the Galleria degli Uffizi collections, some frescos of Cappella Brancaccio, the façade of Palazzo Rucellai).

VIRTUAL MUSEUMS

An important technological development is that of "virtual museums". These are first of all represented by the electronic documentation of real museums (e.g. cards and images of works of art). Considering the high rate at which information technologies are evolving, virtual museums are becoming more and more important, for two major reasons:

1. You can represent works of art at very high resolution (thousands of pixel in a single direction, colours adjusted), and virtually represent the three dimensions of works of art (vases, statutes, etc.) and of exposition rooms.
2. You can access the Virtual Museum form anywhere on the globe, through electronic networks (particularly, Internet) which enable fast hypermedia interactive surfing (even 3D surfing).

Technologies for 3D virtual reality, enabling 3D reconstruction of works of art (e.g. sculptures and monuments) or of environments (e.g. real or virtual exposition rooms), have already proved to work very well. With an efficient network of connection, a virtual museum can also virtually reassemble artistic or historical assets which are physically kept in different museums and sites (for example, all works of an important artist or a specific era).

Remote fruition of museums' holdings is likely to increase in the future - even from people's own houses or from mobile terminals. And soon in the future, people might be able to access the virtual museum in any moment and from anywhere. Together with fixed electronic networks (optical fibres in particular), another field of great interest is that of networks with mobile terminals, larger bandwidth and increasing complexity in mobile multimedia systems. At the international level, the UMTS (Universal Mobile

Telecommunication System) standard has already been defined, and the GPRS (General Packet Radio Service) preliminary system is already working - by which you can also send images.

The virtual museum is also an interesting way to develop education programmes, in the form of proper six-months or one-year classes or of shorter training programmes, aimed at specializing or updating staffs. Such programmes could be held inside museums or through e-learning activities.

Similar considerations can be made for what concerns electronic or virtual libraries, corresponding to real libraries where texts are physically available or to electronic information extracted from databases or specifically created for this kind of libraries.

Various high quality digitisation programmes, with colours adjusting, are now being implemented in Tuscany to build up virtual museums. A very interesting case is the DADDI Project of the Museo degli Uffizi, developed with the financial contribution of a Japanese company. And, as I said earlier, in Tuscany there is also the Telematic Regional Network, a very efficient and widespread network connecting many databases of different cultural institutions (libraries, museums, etc.). Through this network you can carry out online searches, that is to say queries and searches from your own working place (home or office) on different historical-esthetical-artistic aspects of works of art, but you also can perform various innovative activities: online data processing, electronic restoration, colour certification, etc..

All this could have a positive impact on the cultural heritage industry: publishing sector, tourism, producers of electronic documents, etc.. Publishing companies can increase multimedia production (written texts, CD-ROMs, DVDs, etc.) by getting the necessary materials (texts and chromatic images in particular) directly from State or private integrated archives, containing data on the works of interest - obviously, companies should take the necessary agreements and/or electronically pay for copyright reimbursement.

In Tuscany, as a matter of fact, the cultural heritage industry has become prominent in the last year and is often at the forefront at Italian and European level. First of all, thanks to the extraordinary skills developed in Tuscany for what concerns the restoration of paintings, statues, monuments, and palaces, we have now started some industrial activities for the carrying out of physical restorations with chemical materials and compounds (specifically, a special laser for "cleaning" objects and works of art has been de-

signed). Applied information technologies for the cultural heritage sector have also been developed: multimedia systems, high quality and colours control acquisition systems, systems for intelligent access to database contents, and copyright protection systems. Besides a number of major companies, also many small and medium enterprises (SME) have mushroomed, and their activities in these domains are very intense.

The information technologies here presented can on the long-term help us improving our knowledge and insight on cultural heritage, and support its full preservation, enhancement and dissemination. Tuscany is unquestionably at the forefront in the field, with significant projects at the regional and national level (Progetto Finalizzato Beni Culturali - C.N.R., PARNASO Project, etc.) as well as at the European level (with several EU-funded projects on databases, multimedia systems, access to content, protection of copyright, etc.).

POLICIES AND INITIATIVES OF THE INTERNATIONAL COUNCIL ON ARCHIVES

Elisa Carolina de Santos Canalejo
President of the International Council on Archives (ICA)
Deputy President of the Spanish State Archives

As President of the International Council on Archives, it was an honour for me to receive the invitation of the Directorate General for Book Heritage and Cultural Institutes to this brilliant Conference organized under the Italian EU Presidency.

I wish to sincerely thank the organizers of this important event, which gives me a chance to express once more, on behalf of all archivists of the world, the full interest of archives in participating in all actions related to digital heritage, which represents a fundamental aspect of the memory of the past.

It was not so long ago that archivists were still asking themselves the reasoning behind the need for digitisation, and what were the differences and similarities between archives, libraries and museums in the digital era. We have come a long way to get to this point. And although it is true that libraries started the digitisation process earlier than archives did, and hence the interest of archives in digitisation grew slower, from now on archives will doubtfully be happy with playing a minor role in the so-called Information and Knowledge Society.

Archives share the fundamental principles stated last spring by the Intergovernmental Committee of the "Information for All" Programme - the principles of freedom of access, relevant content, freedom of expression and protection of privacy, and the idea that "being informed is not enough, people need to know". Working in this direction, archives are fully facing the two main challenges of digital information: born-digital records and digital records as alternative media to original records.

The internal developments of the International Council on Archives during the 1970s, and the issues faced at the International Congresses in Archives held during the 1980s, represent what we may call "the phase when archives met new technologies" - though it was already at the 1964 International Congress in Archives held in Paris that the issue of Informatics and Archives was dealt with for the first time. It was exactly one year later, during the tradi-

tional Round Table (or CITRA) held in Bohn in 1971, that ICA created a working group which would have then given birth to the Electronic Archives Committee. In 2000, in Seville, the Committee's name changed into Com-mittee of Current Archives in Electronic Environment- and, right earlier, the Committee on Image Technologies had been created.

Since 1988, the digitisation of archives has been a key issue of all International Congresses in Archives. In the recent years the impact of new technologies in the archival profession has also been discussed within other ICA Committees, such as the Committee on Descriptive Standards, the Committee on Professional Training and the Committee on Archival Legal Matters - not forgetting the events organized by our various sections and branches. In other words, practically all meetings, conferences and seminars of the last two years have faced the issue of electronic records, and discussed their impact on the relationship between archives and society. And it is worth noting that in most cases these events are not limited to a regional dimension, nor do they see only the participation of the archival world: such events bring together professionals from various continents and a variety of domains. All this proves how ICA is not impervious to the dizzy speed changes that the institutional world is undergoing.

Electronic administration is taking the place of paper originals and hand-written signatures - with new problems of authenticity, integrity and trustworthiness. Thus, the ICA Committee on Electronic Records is currently drafting a *Guide for Managing Electronic Records under an Archive Perspective*, which will be presented at the XVth International Congress in Archives that will be held in Vienna next year. The guide is an updated version of the one issued in 1997. This guide is obviously extremely important, and represents a fundamental contribution of the International Council and, hence, of all archivists and archives to the needs of the digital world. A tool to help ensuring that electronic archives and records, which are a crucial component of our documentary heritage, will be part of the memory of future generations. The possibility of preserving and using digital records in the future also depends on the very nature of records and on how they are created. In this sense, the Council encourages archivists in participating to multidisciplinary events and actions on electronic records management, preservation and recovery.

This is why the Council follows with great interest international

initiatives such as MoReq (Model Requirements for the Management of Electronic Records), promoted by the European Commission within the IDA Programme (Interchange of Data within Administrations); and the interPARES Project (International Research on Permanent Authentic Records in Electronic Systems), directed by the University of British Columbia (Canada).

Last spring EURBICA, the ICA European branch, run a seminar in Poland. The different ICA Committees illustrated their work on electronic records, and various ongoing European projects and action plans were presented (ERPANET, MINERVA, eEurope), so as to share efforts and integrate the different activities within the framework of the European Union.

As you can see, electronic records and e-administration are a central issue in almost all recent archival forums, with the hope of contributing in bridging the gaps in the Knowledge Society - a society where information does not reach everybody equally.

At the end of this year the World Summit on Information Society will be held, supported by UNESCO. As President of ICA, I have had a chance to attend various preparatory events; one of those is the UNESCO seminar that was held in Beijing a year ago, to which I participated together with the ICA Executive Board members and our Southern East Asia representatives. The principles and actions that were discussed on that occasion represent the main ICA contribution to the World Summit.

Last year I also attended, in the UNESCO headquarters, the presentation of the "Information for All" Programme. The Intergovernmental Committee of this programme is drafting a Charter on the Preservation of Digital Heritage, which sets some very clear objectives: preserving information and ensuring universal access to it and, furthermore, ensuring the participation of all in information society.

The programme focuses on digital information created for being distributed on the Web, but also forms a starting point for multidisciplinary working groups to tackle the different aspects of digital documentary heritage. Similar groups are, on the other hand, already at work at the European level.

Archives also wish, as public information centres, to be a driving force towards the achievement of universal on-line access to the information heritage they keep. The networking of archives is actually one of the objectives set in the year 2000 by the Ten Year Action Plan of the Council. In this sense, Spain's major contribu-

tion towards the ICA Presidency has been that of experimenting an archives network. The State Archives Network Project (AER project) was presented last March to the Intergovernmental Committee of UNESCO's Information Society Programme, and will be fully illustrated at the 2004 Vienna International Congress.

Spain also proved itself as a pioneer in the field by digitising the General Archives of the Indies. ICA hoped that this experience would provide momentum for creating an international project under the guide of the European Council, as was done in the case of the digitisation of the Komintern Archives.

There is no doubt that digitisation has created new possibilities for archives to cooperate and disseminate their fonds, and has brought many important issues into light, such as multilingualism, intellectual property and free and open access. This is what brings us here today: this Conference is the answer to the anxieties of recent times, as new technologies appeared on the scene. And I am sure that it will be a successful meeting and it will positively influence the European Commission in setting priorities for digital heritage preservation.

I therefore wish to express my congratulations for this initiative of the Italian Presidency of the European Council. An initiative that will provide cultural institutions and archives with an agenda for the preservation and dissemination of digital heritage, supporting their participation to the programmes, initiatives and actions of the European Union.

TELEVISION ARCHIVES: THE FUTURE HASN'T YET STARTED

Peter Dusek
Deputy President of the International Federation of Television Archives (IFTA)
Director of the ORF Archives

Like a Fox Guarding the Chicken Coop

I too feel obliged to begin by thanking the organizers of this Conference.

I am here as Deputy President of the International Federation of Television Archives, but I shall also speak as Director of the ORF Archives (*Österreichischer Rundfunk*, the Austrian television). And I'm also feeling a little like the fox guarding the chicken coop, because the earlier presentations have maybe expressed too much euphoria for the digital revolution and the educational capacities of the Internet society. I do not wish to undervalue the new digital opportunities, yet I have some doubts that all this really corresponds to the present reality, myself feeling part of an *Event-und Verpackungsgesellschaft* (a society that relies on the exterior and alluring factors of "events" and "packaging"), surrendering itself more and more to superficiality, being held hostage to clichés, undergoing a crisis in cultural education.

I would like to start by commenting on the previous presentation, that illustrated the important initiatives taken by the International Council on Archives. And indeed what the Council does is extraordinary: the great conferences it organizes every four years see the participation of 3,000 to 4,000 people, and its members can be found in almost every country of the world.

Huge numbers, compared to the 150 members of the Federation of Television Archives, only a half of which represent proper TV archives - and no doubt that there's a lot more to be found in the television world, yet media archives often live a difficult situation. After illustrating the example of the ORF television archive, I shall end my presentation with some remarks more closely related to current developments. Still, at the general level it must be said that archivists' and historians' associations haven't yet succeeded in safeguarding audiovisual sources, a hundred years after their birth.

As a consequence of this lack of awareness, 20 or 30 years ago the state of cinema, television, radio archives all around the world was problematic to say the least. If we compare the financial resources and know how that traditional archives and libraries receive from UNESCO, for example, with the resources of the tiny IFTA Federation, it is clear that such an intellectual misunderstanding is still leaving its mark. I'm trying to be honest: while we're here debating on how to transfer our cultural heritage on digital media, in Africa, Latin America or Asia the traditions of audiovisual information society are pulped.

And again I refer to my uneasy feelings towards the *Verpackungs-und Infotainment-Gesellschaft* ("Packaging and Infotainment Society"). I sincerely believe we're at a turning point. Every real and deep change in worldwide culture arises from a revolution in the modes of cultural education. When Stone Age nomadic peoples settled down to live as farmers or shepherds, they had to transmit their overall manual skills from one generation to the next. With the discovery of writing came the first explosion, and it was only from that moment on that a pure notion of culture could be conceived. After these two phases, the greatest revolution came with the beginning of modern times: the discoveries of print and of America marked an epoch-making change which turned everything upside down. The Mediterranean - Venice, for example - sank into a loss of meaning, Spanish Fleets were left overcome by small speedy English and Dutch ships, and ever since then the new world has been ruling the old one undisputedly. But here, in this 15th century room, I am urged to point out that even the European Renaissance underwent an incubation phase. In the decades just before the 15th century, in Florence's churches we can already find the first examples of modern western society. Perspective is taking the place of static Gothic and Byzantine style - and how did it happen that, as we all know, it was Florence itself that cradled modern thought?

In the year 1453, when the Turks conquered Constantinople, the thinkers of the Eastern Roman Empire sailed to Pisa and thence to Florence - where an intellectual dialogue between the elites of the past Byzantine Empire, the Arab thinkers and the Renaissance pioneers started. Florence henceforward shaped a revolution in European cultural education, creating the conditions for the explosion that followed. If we wish the digital revolution to bring about comparable in-depth changes, there must be a contamina-

tion of the old and the new. In this sense, I would now like to talk about the history of my Vienna television archive.

THE QUALITY OF THE COLLABORATORS IS THE ADVANTAGE: MOTIVATION IS ALL

There is no doubt that ORF, and more precisely its television archive, represents the biggest Austrian audiovisual media collection. Neither the radio, nor other media collections such as the Cinema Archive of Austria, the Cinema Museum or the Tape Library, reach similar sizes. The current state of the ORF Archive is the result of a reform process in which I've been involved for 25 years. At that time, the obstacles to using the archive were almost insurmountable. Collaborators were few. They were less qualified than clerical staff, and we only had screens for films projections, so videos couldn't be examined and evaluated at all. Nevertheless, it was about 25 years ago when we started to prepare for an historic anniversary. 25 years had passed since the *State Treaty*[1] had been stipulated, offering Chancellor Kreisky the opportunity to revisit contemporary Austrian history afresh, also in the educational system. Until that moment, in Austria, we had done nothing but evade and walk past the Nazifascist era. We felt sorry for ourselves, the Nazis "first victims", and removed and silenced the fact that many high rank national-socialists, concentration camp guards or informers were Austrians. With Memory Day, 40 years after the *Anschluss,*[2] and just two years before the 25th anniversary of the *State Treaty*, we started re-thinking our history. We produced four cases of information material on contemporary history, and realized that in our country the audiovisual tradition was full of gaps. The RAVAG[3] archive had been transferred in Berlin in 1938 and its traces were lost for ever. Also the *Ständestaates*[4] Newsreel had been taken to Berlin, and only two years ago copies were returned

1 The 1955 *Staatsvertag* provided for the four occupying powers to leave Austria, returning its independence to the country.

2 The "annexation" of Austria to Hitler's German Reich in 1938.

3 *Radio-Verkehrs-Aktiengesellschaft*, the radio-communication corporation, was the true ORF forefather. Founded in 1924, it was later taken over by the German Reich and then wound up in 1939, when Germany definitely bought its shares.

4 The *Corporative State* model, based on a sole party (the Christian-Socialists Party) and on representatives of all professional corporations, was the official form of government in Austria's First Republic, from 1933 to 1938.

to Austria. Austria as part of the Third Reich was not even a subject of research by the Federal Republic's media collections, and between 1945 and 1955 our country was split in four zones of occupation. The relevant audiovisual documentation is to be found in Washington, London, Paris or Moscow. In these conditions, 21 years ago Dr. Hugo Portisch, a prominent Austrian journalist, began producing a TV fiction in 36 chapters on the history of the First and Second Republic. It was the birth of the Historic Archive, which I organized according to the following principles:

Audiovisual sources had to be eventually considered as a legitimate source of auxiliary disciplines. Methods applied for recording imperial or papal documents had to be adapted to the cinema and photography world, and in the specific case to the video world, and new methods had to be developed. But for this to succeed, we had to let in professionals with journalistic skills on radio and television productions, and expertise on technologies and copyright.

This ambitious programme was fulfilled. I've been now teaching audiovisual sources studies for ten years at the Institute of Austrian History, and for the next winter semester there will be an additional specific module for educating media archivists.

The ORF Historical Archive has had a great success, since its beginning. We started programmes on contemporary history, published books, edited a history of radio - which had been ignored till then - and thanks to our targeted use of computers we were acknowledged as an ORF dynamic elite unit. As a result, 15 years ago I was appointed, with my team, for directing the old television archive, which was about to collapse under the great weight of its collected materials.

With 60 collaborators to begin with, I started the reform process - which was immediately appreciated at international level. This was how we were basically able to grow: by making it clear to the company that a good archive does not only improve the quality of broadcast programmes, but also functions - via the recycling method - as a way of reducing production costs. Evaluators were constantly coming to see us and examine our work. It always ended with the same line: "This archive is an example of how we can save money, by making supplementary investments while improving the quality of programmes."

During all this time, we never fully worked out the complex issue of the archive being "open to the outside world". At the beginning, the great obstacle was the old unused fonds. In addition,

data must be protected: people are constantly asking why our computerised information, at least, cannot be made available to the public. Our difficulty with this is that we must also protect personal information, or information on material that hasn't yet been broadcast, which also means protecting editorial secrets. The broad range of problems associated with digitisation comes on top of this. Even in our newsroom, transmission quality can be guaranteed for no longer than a month. In addition, tapes on analogical medium are still been produced, and they must be digitised. Hence, the magic words are: data reducing and key frames. For more than three years now we have been providing the so-called image bands for news and documentaries. It is a first visual approach to the programme's content, and the required digital capacities are so limited that we can bring outside this kind of specialized information. As long as we can overcome the legal obstacles previously illustrated.

The ORF television archive has long since accelerated its international cooperation. I have been for 13 years in the Presidency of the International Federation of Television Archives, an international association of which I was the President for four years and am now the Deputy President. We have been dealing for a long time now with the issues we're debating in this Conference. Thus, our institutes should be increasingly susceptible to public pressure asking why television archives are open only to television professionals.

In the Middle of the Digital Revolution

There is surely something like a demand for public right to culture and access. This debate is going on in all EU countries - except the answers aren't at all alike. In France, earlier than everywhere else, media archives were given the same importance as museums and collections of records of State archives. Television and radio companies have to file all produced materials with the Institut National de l'Audiovisuel (INA) after broadcasting them. And within a couple of years producers also loose their rights, as INA and its 1,500 collaborators aren't cheap at all. Not only the loss of copyright speaks against the INA model, but also something that we at ORF have achieved by installing our digital newsroom: in the future, modern media archives will have to start preserving relevant data while producing them. Up to now, the habit was in fact

that of producing with no budget limitations and then starting, almost from zero, an expensive research process on archival documentation. In the future, the amount of information to be recorded will exceed by far that of pure images: an almost exact picture of the overall rights administration will have to be recorded. But that will only be possible if digital documentation begins as soon as a programme is conceived. The INA model hence represents a specific French case.

In other TV companies things depend on their financial situation, which itself depends on a number of factors, such as audience size and language family of broadcasting. Great Britain and Italy are two examples of great State companies, which can rely on many more tools than smaller countries can. But differently from Norway, Denmark and Sweden, little Austria also has to face the competition of satellite German-speaking programmes. We have double trouble. Nevertheless, I can well see other promising fields: within five or ten years, old formats will be off the pitch, and not just because videotape lasts less than film. Machines are a major problem: they will no longer be available. Plus, public pressure is growing in the direction of "opening media collections". How shall we proceed?

The digital revolution proceeds slower than expected two or three years ago, still we cannot stop it. Internet and broad bands will help sorting out, under a strictly technical profile, the problem of access. What is lacking is information on rights and general conditions at the international level – for it will soon no longer be possible that the question: "How much longer will audiovisual collections remain closed?" receives different answers in different countries.

Within a couple of years, we will at least make it possible to access a "light version", with key frames and oral-textual description of our records, via Internet. The current cooperation model in archive matters between ORF and SWR (Swedish Radio and Television) or NDR (Dutch Radio and Television), will be the criteria of international cooperation. In this sense, we know where we have to go and we are going there. The digital future of audiovisual archives hasn't indeed started, at all!

MUSEUM INVOLVEMENT IN ENSURING THE FUTURE OF DIGITAL MEMORY AND CULTURAL HERITAGE

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The way digital material appears from the museum point of view differs significantly from the archive and library perspectives. An extrapolation of digital information from a three-dimensional object can replace far less of the inherent value of that object than would be the case, for example, when transferring a text message on one medium to a text message conveyed on another medium.

Museums can appear at numerous points in any discussion of digital memory. They assemble objects and they describe the circumstances of those objects' creation and use. They translate and interpret this complex material into something worth placing on a lasting record, reconstructing things that may be missing from that record and interpolating things that may be sketchy in it. They ensure that the record together with all of its source components is placed on a platform where it can be stored and presented without foreseeable limitations of time, and in a manner that enables it to be enhanced dynamically through the incorporation of future knowledge.

There is an extremely complex set of processes involved in taking an event such as the creation or use of an object, representing it with a sequence of ones and zeros, and putting that digital sequence on a storage medium. Then going back the other way, taking the digital stream off the storage medium, placing it on the Internet (the primary transport medium for digital material on our planet) and generating knowledge and insight from that transmitted bit stream. This contains daunting challenges for all of the museum disciplines; not least conservation, curation, and pedagogy. This is not simply a matter of keeping abreast of state-of-the-art digitization techniques, nor is it simply a matter of being aware of the impermanence of digital storage media.

I was responsible for twenty years for the curation of a medium size musical instrument collection which I believe was one of the first to have been involved with electronic musical instruments - synthesizers. It might seem reasonable for a museum in the best tradition to collect such things, put them on shelves, take them off shelves to exhibit - whatever might be necessary. But it became immediately obvious that these instruments were absolutely mute unless they were programmed. This involved digital storage media that were often manufactured solely for use with a single instrument and were intended rapidly to become obsolete, as an incentive to the purchase of newer synthesizers. All of this material needed to be stored in a museum context. Service manuals had to be acquired and stored together with the objects. Spare parts needed to be collected and documented at least as diligently as the objects that at some indeterminate date surely would require them.

If one of the problems in dealing with digital memory is hardware - "we have these tapes and believe that there is digital record of something on them, but we don't have the physical means for getting that message off the tapes" - it is an incumbent upon the museum community to acquire these tools and implements and treat them as primary cultural property in their own right. The underlying issue is not exclusively one of digital archaeology. It is also a matter of industrial archaeology at its most basic historiographic significance. Some institution somewhere needs to pay attention to the implements that have been used for the on-going digital annotation of human activity. In light of all of this, one would have expected a greater amount of insight already to have accrued within the museum community. This community is, however, deeply entrenched in centuries-long tradition of regarding its mandate as exclusively relating to tangible objects as the bearers of cultural significance. Although there may be a digital surrogate for an object, there is no such thing as digital creative work worthy of the same consideration by museums as is "the real thing". The significance of the tools of digitality is largely ignored. Even where it is recognized, it is likely to be regarded as peripheral concern.

Museums have existed in recognizably modern form for at least the past two centuries; arguably much longer than that. The International Council of Museums has represented the professional museum community for over the past fifty of those years. There are numerous discussions being conducted within the ICOM frame of reference. The same topics may also be under discussion

elsewhere within the professional community. Two of the things that flare up as subjects of heated debate at regular intervals are the basic definition of "museum" - what is a museum, what is the museum mission, why has humankind decided that museums are useful and necessary in the first place? The second is, do museums at long last somehow need to accommodate notions of digital heritage? Hopefully the speaker from UNESCO will go into something that that organization has recently imposed on the heritage sector non-governmental organizations: a clear directive for consideration to be given to intangible heritage, with the same priority as tangible material.

Museums tend to believe that intangible cultural heritage is the same thing as the digitized record of the tangible heritage. Indeed, it is not, but the community is having ever so much difficulty in coming to terms with this. Museums very well understand the physical realm in which they have so long worked and resided. They have well-developed methodologies for the conservation, documentation, and curation of the physical objects that are entrusted to them. Despite this, and despite the fact that museums have long since extended their activity into the digital realm, many museums are decidedly uncomfortable when asked to consider the implications of that beyond their Web sites and e-mailboxes. Basic concepts of intangible and digital have yet to be incorporated into the museological canon.

This is actually quite surprising given that museums do not simply collect objects. They gather contextual information about these objects. They synthesize what, depending on fashion, are often called stories. An object has a story to tell, but an object is mute. It is the task of the museum to speak on behalf of the object and tell its story. The full record of a physical object in a museum has, by definition, a tangible and an intangible component. The latter is now commonly captured and stored in digital format. This may include a digital surrogate for the object to the best resolution available with state-of-the-art technology. This is done in the full knowledge that any medium sized collection, once having been "digitized", will have to be digitized again because technology is improving at a rate that exceeds museums' ability to harness it. There is also a reverse situation. Injecting a term into the discussion that is rarely used, when dealing with born-digital cultural heritage, a physical surrogate of the digital object needs to be created in order to transmit it safely into the future.

There are clear pitfalls in all of this. Recording a digital object on a physical medium does not transform the need for concern with digital heritage into a familiar exercise in the conservation of physical objects. The documentary digitization of physical objects does not constitute the totality of museum concern with digital cultural heritage. There are also clear challenges in all of this. Tried and true basic principles of museology can, and must, be extended to include born-digital activity. This is not restricted to individual digital objects and includes collections of digital objects. It needs to accommodate the notion of a born-digital museum. This is an agency that appears in the networking environment exactly as a traditional museum might appear in the networking environment, but only deals with the presentation of material that lacks all corporeality. Such an organization does not hold physical objects from which digital records would need to be extracted although it might include digitized records in its collections. There is, in fact, any number of such agencies currently presenting collections of both digitized and born-digital material on the Internet, frequently using the metaphor "virtual museum".

How should the museum establishment, with its deep roots in the brick-and-mortar environment, regard the click-only newcomers? How does the ubiquitous click-and-mortar activity of physical museums map into this? There is an often-stated cliché, "on the Internet nobody knows you're a dog." This can readily be translated into the statement of a new problem, which may be the major one confronting most of us here today: "On the Internet, nobody knows you're a *bona fide* member of the heritage management community." Nor do they know if they can rely on the quality and authenticity of the material that you have placed on the Net.

Some perimeter of trust has to be established within which it is possible to recognize the activities of the established heritage management sector, and the provenience and authenticity of the material that is placed there so that it can easily be verified. One of the things that the professional community often forgets is that although a museum professional will immediately recognize a genuine museum Web site, far and away the largest proportion of the vast Internet user community lacks all such ability.

There are several ways in which the integrity of a digital document or group of documents can be certified. There are numerous competing schemes for doing this. These reliably associate that material with the agency or organization that produced it, but pro-

vide no similar information about the agency itself. Again with reference to what I hope will be said during the UNESCO presentation, an impassioned and knowledgeable amateur can make an extensive and compelling documentary record of a World Heritage Site and place it on the Internet. UNESCO does the exact same thing. On what basis does a non-specialist user recognize the clear authority of the UNESCO product and the utter absence of authority of the amateur product? This does not mean that the latter might not be scintillatingly attractive and useful, as well as extremely informative. There is, however, still need for the community entrusted with the maintenance of digital memory to be able to identify itself unequivocally on the Net, in competition with an uncountable number of other agencies with which it might be confused.

One of the problems with gaining support for including the notion of virtual museum in the professional establishment's frame of reference is that anybody can decide they want to be a virtual museum. All they need to do is set up a Web site, which may take as little time as half an hour. They can then go out and for $15 buy a domain name to put on it, say, www.unescoworldheritagesites.info. I suspect that UNESCO does not own this name, and even if they do, there would be something else similarly, or even deliberately, confusing available instead. This becomes massively more critical and complicated when dealing with original digital creative works. Here we are not simply talking about the relative scholarly merit of two sets of descriptive documentation. The named point of origin of a born-digital work is what determines its position in the body of intangible heritage.

Returning to the reason for my presence here. What is ICOM doing to improve the quality of the heritage sector's digital memory? It is supporting the debates to which I've made reference and it is trying to nudge the community at least into some consensus upon which establishment statements may reliably be based. Museums are hard at work digitizing their collections. They appreciate the need for migrating digital records to new platforms as more advanced technologies become available and as older ones become obsolete. They actively participate in countless initiatives dealing with the long-term preservation of digital storage media. Museums are also developing innovative applications of Internet-based technologies and eliminating the constraints that physical institutional boundaries impose on the growth of the digital memory. ICOM is

encouraging all this activity and it is attempting to establish a bounded community of trust in which the results, together with all other aspects of the museum community's digital memory, can easily be recognized and verified.

Every resource on the Internet is identified partially or entirely by a domain name. Moving beyond the hypothetical UNESCO example, the ICOM Web site is http://icom.museum and its calendar of events is http://icom.museum/calendar. Before this, it was icom.org and icom.org/calendar. The .org or the .net or the .com top-level domain cannot, however, inherently identify the museum sector. There is an icom.org, the owner of which has just been revealed. There is also an icom.net, an icom.com and an icom.info, none of which have anything to do with our ICOM's activities but any of which could, either by accident or design, be taken to do so. The .museum ("dot-museum") top-level domain identifies museums and nothing else. By its very structure and mandate, in order to hold a name in .museum an organization must be a museum, as defined by ICOM. This is extraordinarily convenient for ICOM and only slightly less convenient for other professional organizations within the museum community that might define museums in a slightly different manner (in actual practice, the members of all recognized professional museums associations are eligible to hold names in .museum, as are any unaffiliated agencies that otherwise fulfil the entry level requirements).

This bounded community of trust, of which .museum is the appellation, is maintained directly by the museum community. It serves as a basis for the provision and development of services that require the conferral of trust, and it establishes an unequivocal locus on the otherwise boundless Internet for the digital memory of museums. This domain was created as an explicit proof of concept of the applicability of a dedicated domain in enhancing the value of heritage sector activity on the Internet. It was equally explicitly foreseen as a seed initiative in the establishment of a "heritage cluster" of top-level domains. Whatever their exact names might be, it is hoped that a .library, .archive, .monuments, dot whatever might immediately translate into the UNESCO sphere of heritage sector NGOs.

The action providing impetus for all of this originated in Europe and is currently being taken forward via a Fifth Framework DG-IST Project within the Cultural Heritage Applications Program. This project, MUSENIC, the "Museum Network Infor-

mation Center - Europe", has conducted a series of events and presentations intended to raise awareness about .museum and the further value of the envisioned heritage cluster of top-level domains. The welcome page on the http://about.museum Web site provides an obvious click path to a list of the events in which the project has participated and the presentations it has made. Extensive multimedia documentation is available for many of them (today's presentation will be available there shortly).

In conclusion, I would like to express the hope that additional presentations made during the course of these two days will further highlight the need for establishing quality control criteria, including reliable means for verifying the origin of the documents that we are contributing to the shared digital memory of cultural heritage. However much technical discussion may be necessary, and for all notions of permanence and impermanence and long-term storage perspectives, it is imperative to recognize the need for trust being weighed into all action. It must be possible for someone who knows nothing about what we are doing not simply to be captivated by what we are placing on the Net, but to understand its origin and be able to trust that origin.

PRESERVING OUR DIGITAL HERITAGE: A UNESCO PERSPECTIVE

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A large part of the vast amounts of information produced in the world is born digital, and comes in a wide variety of formats: text, database, audio, film, image. For cultural institutions traditionally entrusted with collecting and preserving cultural heritage, the question has become extremely pressing as to which of these materials should be kept for future generations, and how to go about selecting and preserving them. This enormous trove of digital information may well be lost unless specific techniques and policies are developed to conserve it.

UNESCO has been examining these issues with a view to guide governments' preservation endeavours in the digital age. The General Conference adopted Resolution 34 at its 31st session, drawing attention to the ever-growing digital heritage in the world and the need for an international campaign to safeguard endangered digital memory. The General Conference also invited the Director General to prepare a discussion paper for the 2001 Spring session of the Executive Board containing elements of a draft charter on the preservation of born-digital documents, as well as to encourage the governmental and non-governmental organizations and international, national and private institutions to ensure that preservation of the digital heritage is given high priority at the national policy level.

During the meeting of the Organization's Executive Board in May 2001, Member States agreed on the need for rapid action to safeguard digital heritage. The debate was largely inspired by a discussion paper compiled for UNESCO by the European Commission on Preservation and Access (ECPA), a non-profit foundation based in Amsterdam, which outlined the issues involved in digital preservation.

The interest of UNESCO in this situation comes as no surprise. UNESCO exists in part to encourage and enable the preservation and enjoyment of the cultural, scientific and information heritage of the world's peoples. The growth of digital heritage and its vulnerability could hardly go unnoticed.

THE DOMAIN OF DIGITAL HERITAGE

In its traditional sense, heritage can be defined as all data (monuments, museum collections, archives, libraries…) or practices that a society inherits from its past, and which it intends to preserve and transmit to future generations, with the aim of constituting a common foundation of values and references on which a feeling of membership and sharing of common social values can be developed.

In the broadest sense, the great principles by which these assets are selected, which mark the limits of the domain and guide the actions of cultural and heritage organizations, rest on the fundamental characteristic of lasting value and significance.

A significant part of the digital heritage consists of the product of the digital reproduction of pre-existing works, which may consist of texts, images, sounds, or which may be of audiovisual, graphic, photographic or cinematographic nature, etc., recorded on a defined, stable material medium. This digital "double" does not claim to be an identical copy of the initial work, but contents itself with being a representation of it: it is a snapshot, a print, a trace at a given moment in time and, in every case, the result of a voluntary policy of digitization.

The second component of digital heritage comes from data which exist only in digital form, whether they are Internet sites, electronic publications, multimedia productions, or cultural or scientific databases containing and organizing textual or graphic documents, sounds, still images or audiovisual or multimedia productions.

This "born digital" heritage results from an "all-digital" process of initial production, the message being digitally encoded at the moment of its creation - as is the case, for example, of a collection of digital photographs of the planet Earth. With the spread of the use of computing and the rise in processing capacities, this production is constantly increasing.

Traditional preservation methods, such as the "legal deposit" used by national libraries to ensure that copies of all printed materials are kept, cannot be applied as such to digital material for a variety of reasons, notably because Web "publications" often draw on data stored on servers in different parts of the world. The sheer volume of data concerned also poses a problem. It is estimated that the Internet features one billion pages whose average lifespan

is extremely short, estimated at 44 days to two years.

Considered as the most democratic publishing medium ever, some argue that the ever-growing Internet deserves to be preserved as a whole as its pages and discussion forums can be considered a priceless mirror of society.

There are technical problems in ensuring that the digital material that is saved in archives remains accessible in its original form. Software and hardware are constantly replaced by more powerful new generations which ultimately become incompatible with their predecessors. This means that within just a few years, material - which often includes sound and moving graphics or pictures, as well as links to Internet sites and, or, databases - becomes inaccessible.

The sheer volume of data to be sifted in order to select what is worthy of preservation is staggering. "The world's total yearly production of print, film, optical, and magnetic content would require roughly 1.5 billion gigabytes of storage. This is the equivalent of 250 megabytes per person for each man, woman, and child on earth", according to a recent study by the School of Information Management and Systems at the University of California at Berkeley.

Another complex issue concerns copyright, including copyright of software required to access digital files. A dazzling array of rights may be associated with Web sites combining mixed materials from various sources, and agreement on the principle of "the right to copy for preservation" still has to be developed worldwide.

While valuable initiatives have been undertaken in many countries to preserve digital heritage, including Web sites, the ECPA study points to the limits of these efforts, arguing in favour of international standards.

The complexity of the problems involved means that the task of preservation must involve the creators of digital information, including software vendors, who should take conservation into consideration as they design their products. Obviously the days are gone when preservation was the sole responsibility of archival institutions.

Cooperation, guidance, leadership and sharing of tasks are all key elements for preservation of digital heritage. Cultural institutions need the cooperation of the creators of information and of software vendors. Adequate resources and support at policy level are indispensable to ensure that future generations continue to have access to the wealth of digital resources in whose creation we have invested so much over the past decades.

UNESCO'S CAMPAIGN

Based on the above findings, UNESCO has developed a strategy for the promotion of digital preservation. This strategy is centred on:

a. a wide consultation process with governments, policy makers, producers of information, heritage institutions and experts, and with the software industry as well as with standard-setting organisations;
b. dissemination of technical guidelines;
c. implementation of pilot projects; and,
d. adoption of an international charter on the preservation of digital heritage by the General Conference at its 32nd session, held in October 2003.

The Guidelines form part of a far-seeing campaign by UNESCO to improve access to digital heritage for all the world's peoples, and to ensure that the means of preserving their digital heritage are in the hands of every community. These Guidelines were prepared by the National Library of Australia under contract with UNESCO, and are based on extensive review of literature, the Library's own experience, and UNESCO-organised consultations in various regional centres.

The scope and ambition of the Guidelines are constrained. In such a rapidly evolving, but already extensive and complex field, they can only present a small amount of information. In the interests of offering guidance to individuals and organisations who are contemplating a responsibility for preserving digital heritage, it was decided to adopt a "principles approach" that might serve as a checklist of issues and possibilities that programmes need to take into account.

It is impossible to provide answers to every technical and practical question that will arise in managing digital preservation programmes, so the Guidelines will perhaps be more useful if seen as a guide to the questions that programme managers need to find answers to. However, they are based on a firm conviction that it is time to ask questions that can lead to positive action, rather than continuing to ask questions that merely highlight difficulties.

It is expected that the audience will include cultural and research organisations such as libraries, archives, museums, research

institutes, data archives, publishers, community groups, and others with an interest in and a potential responsibility for preserving digital heritage. Such an audience will include many with a long history of collecting and preserving the world's "memory heritage" of documents, records, publications, maps, manuscripts, artworks, images, sound recordings, moving imagery, cultural objects, and scientific, research and statistical information. It will also include many coming to digital preservation from a different background, less familiar with the preservation perspectives developed in "memory" organisations.

The Computerization of Society

The last fifty years have seen an extremely rapid development in the computerization of society. The phenomenon is so massive, and changes so much in the contours of our civilizations, that we now speak of the Information Society.

In four successive waves, the same impetus created all conditions and premises of digital heritage, and then, very quickly, caused its inflation:

- up to the 1970s: archiving of the first computing data from central sites and scientific calculators;

- in the 1980s: very rapid development of digital publishing media: first the audio CD, followed by multimedia CD-ROMs and video games on consoles;

- in the 1990s: the advent of digital television and radio by satellite;

- at the turn of the millennium: the generalized interconnection of networks and the meteoric development of the Internet, especially of its Web and mail applications.

A Paradigm Shift

Before the Internet developed, it was still possible to bide our time. Preserving these new disconcerting carriers in a more traditional form remained an option. Although digital technology was spreading very quickly in all spheres of creation and science, it was possible to circumvent it: the virtual was still often just another

stage in a circular process from reality to reality. Even the earliest virtual worlds, 3D productions, were finished on film or videotape to be made accessible to the public.

With the Internet, the question is clear: the time is close when we will no longer go out from these virtual spaces in order to be able to use them. We still often print out documents on paper, because reading from paper still feels a little more comfortable, but for how much longer? The Internet sharpens the issues of the digital world and heritage. It obliges us to reconsider all our certainties about the very meaning of the word "preserve", a meaning which comes us from the remotest of past ages, when humans for the first time inscribed what they knew on objects that were longer-lasting than they were, so that their memory could traverse the generations and reach us.

To those early humans, computer files would have been the worst possible materials on which to preserve memories: computer storage media are of poor quality, designed for mass distribution, not for being preserved. One machine drives out another to feed consumption cycles, file formats change, each new software version is held hostage of exacerbated competition. Within a few decades we shall have seen more standards for alphabetical characters than since the invention of carved stone.

Unless decision-makers quickly show enough political will and take measures commensurate with the issues at stake, there is a great risk that our entire information society will explode without leaving any more trace than the Internet bubble. Our information societies would be reduced to societies obsessed by the present, with only tiny amounts of working memory, self-centred in their frenzy to communicate and turning their backs on the generations to come, breaking the chain of transmission.

All matter tends to disappear gradually, to dissolve, to disintegrate, to yellow, to age - but not digital information. Information either is, or is not. Storing digital information will be like preserving the flame of a fire: you have to keep at it constantly, maintain it, nourish it, otherwise it will die out and be destroyed. On the other hand, it will remain eternally young.

This will not happen without significant change on the part of those institutions responsible for preserving documentary heritage. Letting documents lie on shelves in appropriate physical conditions was the best guarantee of preservation, and even allowing people to look at documents was long considered as the worst en-

emy of conservation. On the contrary, the ability to allow digital information to circulate rapidly on new carriers, to migrate from one carrier to another, will be the ultimate guarantee of its permanent existence.

If we are not careful, the information cycle, under pressure from technology cycles, will never have been shorter, and our societies risk witnessing whole areas of memory disappearing as we move further into the new millennium. The more we communicate, the less we shall transmit to posterity.

Fragile Heritage

As long as information used physical media in order to move around, it left traces. Even if one does nothing about it, something always remains of those traces, something which can be made into an archive. But the digital domain has one congenital defect: if you do not save something, you erase it. In other words, the preservation of heritage must henceforth be a deliberate, voluntary act, organized in the present.

Furthermore, the digital domain reverses those very propositions which seemed the most certain: the survival of a document is not dependent on how long the medium carrying it will last, but on the capacity of that document to be transferred from one medium to another as often as possible. A new preservation paradigm is born.

Preserving heritage in digital form could prove to be at once the best of things and the worst of things, according to what one makes of it:

- either a solution which will usher us in a new age for all aspects of preservation, and will make it possible to think through the problems of permanency, indeed of eternity, in completely new terms;

- or the anarchy of unrestricted information in an eternal present, giving rise to societies devoid of memory, erasing itself at the whim of the obsolescence of machines or formats.

In the Grip of Digital Technology

The digitization of all data produced by human intelligence, whatever their original form - the written word, sounds, fixed or

moving images - simultaneously affects the process of creating content, the way in which content is disseminated, and the ways in which it can be preserved over time.

This digitization is happening to a greater or lesser degree in all spheres of activity, in the production and marketing of goods and services, in artistic, intellectual and scientific creation, and in public administration.

It is related to the widespread improvement in computing performance levels, amplified in recent years by the development of the capacity of communication systems. The effects of these on our modes of production of and access to culture and knowledge cannot yet be fully measured.

From the development of the first computers to the invention of word processing, the design of the first virtual image software and desktop publication tools, and the manufacture of the first high-capacity digital CDs, there has been an uninterrupted succession of technological innovations which in recent decades has penetrated whole areas of cultural, scientific and artistic production, without us realizing it or even noticing it.

Currently, scientific institutions face the challenge of managing incredible quantities of diverse data - in some cases, several hundreds of gigabytes per day - resulting from laboratory experiments, life-size experiments or observations from various instruments (satellites, radar, telescopes, probes, sensors, microscopic cameras, etc.), some of which constitute actual historical events which can never be repeated. This is the case, for example, of meteorological phenomena, which must absolutely be preserved to allow the development of weather forecasting techniques by analysing data accumulated over several decades.

It could be argued that the safe keeping of this knowledge capital is just as important for the world of science as creating and interpreting that knowledge, which in many countries is still widely dispersed over a large number of laboratories, cannot be easily interpreted by others, and is thus not readily transmissible. In the absence of a specialized structure capable of coping with these growing masses of information, the perpetuation of "scientific heritage", itself a springboard for new discoveries, still remains a real challenge for our modern societies: its loss would be an irremediable decline.

TEXT

Gradually, the computer emerged from computing sites and became capable of managing text in day-to-day activities. The end of the 1970s and the beginning of the 1980s saw the birth of office automation, the illegitimate child of the typewriter as it became electronic, and of centralized computing as it made its way into the secretary's office with the transition to micro-computing.

After purely office activities, the world of publishing and the press were the next to be massively affected by this revolution in page design and printing.

Over the last few years, libraries have digitized their collections and put them online; ever more powerful search engines excavate millions of pages to satisfy our curiosity. A gigantic universal library is setting itself up before our very eyes. Still, the need remains for our societies to avoid being stricken with amnesia.

SOUND AND MUSIC

The extraordinary development of storage capacities will make it possible for computing to transform itself into digitization, and to enter new fields such as the world of images and sound.

Sound recording, a pioneer in the digital field, very early became open to the development of musical computing - initially for the production of synthesized sounds, which contributed to define the contours of a new musical space, and later in the elaboration and development of tools for computer-assisted composition, with the result that in the 1980s audio sampling software and other electronic "instrument factories" entered general use.

Concerning diffusion, the development of the Internet, combined with the widespread adoption of the compression standards MPEG and MP3, opened up new possibilities of online access to musical collections, to such an extent that today, music has become the largest cultural industry by number of files exchanged on the Internet (no less than 3 million MP3 files were exchanged every day in 2002).

VIRTUAL IMAGES

As in the case of music, digitization always begins with synthesis (synthesized sound, MIDI, 2D and 3D images) in non-real time, and later spreads to the recording, processing and reproduc-

tion of images and natural sounds.

For reasons of processing speed and storage capacity, digitization was initially limited to the processing of fixed images, while the development of scanners and image processing software made this increasingly accessible to the general public. Similarly, the relatively lighter weight of fixed image files very soon opened up the possibility for photographic agencies to circulate images across their networks.

It was by these techniques, which had evolved largely from techniques of military simulation and aeronautics, that digitization penetrated the audiovisual world. Rapid extension of these applications in the 1980s to the needs of television and cinema production led to the introduction of special effects - for example, "Tron", the first film made entirely with virtual images, was released in 1982 by Walt Disney Studios - and ultimately techniques of encoding and compressing film and video images made it possible to marry together, at the post-production stage, virtual and natural images.

From then on, and with the development of standards for digital compression and image processing - we are reminded here of the standardization work of the JPEG group (Joint Photographic Experts Group) for fixed images and the MPEG group for moving images, from the 1980s onwards - the digitization of the audiovisual system was set to affect all its components, albeit gradually, from production to editing, from editing to transmission control, from transmission control to broadcasting networks, and finally to the private individual's TV set.

E-COMMERCE AND E-GOVERNANCE

The bases of the Internet were established in 1969, and in 1989 Tim Berners-Lee (at CERN) invented the World Wide Web. The worldwide de facto standardization of communications protocols opened the way to the generalized interconnection of computers all over the world.

It is with this generalized interconnection that the adventure of digital heritage really starts. Before, the computer had only been a means of obtaining real-world results or creating real-world objects, which could then be filed in their final state, independent of their digital existence. The computer constituted a sort of transitory stage in a loop which went from reality to reality.

The Internet, which over the last five years has developed at a

meteoric rate, in particular in its Web and electronic mail applications, grew from 1998 to 2002 at a rate of 217% and has now entered adulthood. The Internet sharpens the issues of the digital domain and heritage:

- as a tool for finding information, it is the most gigantic data reservoir constituted by the dynamic interconnection of multiple databases trawled by powerful search engines;

- as a new vehicle for electronic publishing, supplementing and sometimes substituting for traditional modes of content distribution;

- as a tool for commercial distribution and intermediation, and for the provision of services, allowing direct interaction between the product or service and its potential purchaser or user;

- finally, as a tool for bringing about convergence, for merging texts, still and moving images, sounds and audiovisual creations to offer new modes of expression and formalization of human thought and creativity.

Around the middle of the 1990s, many governments adopted policies to encourage public administrations and services to computerize their activities, sometimes shaking up long-established working practices. One of the effects of modernity, perhaps, but more than that one detects in these policies a concern for improving relations with citizens, increasing the effectiveness of the services provided, and reducing costs.

Today, online public services and administration are well on the way to forming part of our landscape. They are however only the visible face of the process of computerization of organizations. In-house, e-mail and intranets are contributing to profound changes in methods of production and information flow. Traditional power centres, founded on the possession of rare and invaluable information, are being called into question, as are pyramidal work organizations which are losing ground to more collaborative ways of working.

Electronic communications between people cause a kind of smoothing of hierarchical relations, while decision-making mechanisms and the identification of responsibilities, formerly clearly

posted in organization charters or procedures manuals, are gradually diluted or at least become less visible. This dilution is not without affecting archiving practices. These are based for example on the origin and hierarchical position of the information creator: the higher the level in the hierarchy of the decision-makers, the greater the value of testimony of the documents they generate, and consequently the more they deserve to be preserved. Will the weakening of this selection criterion lead archivists to want to preserve everything, for fear of losing the essential?

E-CULTURE AND E-LEARNING

Drawing its strength from these attributes, the Internet thus naturally finds its place in the field of culture and education, permanently modifying circuits of access to information and knowledge while supporting the emergence of new cultural practices.

Virtual museums represent one of the most innovative manifestations of this, and their dynamism led to the creation in 2001 of the domain name ".mus" for museum (see the site of ICOM, the International Council of Museums), reserved for the museum community in order to allow them to improve their visibility and presence on the Internet. By facilitating access to their works and exhibitions, and by using teaching devices based on interactivity and hypermedia, they are contributing to a renewal of modes of appropriation and understanding of cultural assets. By reducing the barriers of geographical distance and by allowing new cultural practices to emerge, they provide powerful support to policies for the democratization of culture.

What is true for museums is also true for libraries, which for several years now have been exploiting the potentialities of the Internet to broaden access to their collections, by putting online their bibliographical databases and, gradually, their collections of digitized works. Moreover, they make it possible to access rare and invaluable works, often kept in storerooms so that they are not exposed to the risk of physical damage. Thus areas hitherto reserved for the few are made available for the greatest number to see.

One begins to see here all the benefit that this broader access to cultural sources can bring to the scientific and educational world. In particular, it opens the way to new modes of cooperation especially in the area of training, where e-campuses, virtual classes and e-learning programmes have been developed in recent years. As a

communication tool, the Internet also contributes, via dedicated Web sites and forums, to cementing communities of interest around a set of themes or areas of knowledge - these virtual communities exchange information, analyses and points of view on the subject which brings them together.

All this contributes to building an ever-increasing digital heritage.

INFINITE HERITAGE?

A constantly increasing proportion of the information produced today in almost all spheres of human activity is produced in digital form, as we have seen, either stabilized on a physical medium, or accessible online via the Internet or local intranets. Thus, from a quantitative point of view, the world's entire annual digital, or potentially digitizable, production can be estimated at more than 15,000 terabytes. This volume takes account, firstly, of all written materials produced with a view to being published (i.e. books, periodicals, grey literature), totalling 230 Tb, CD and DVD publishing, representing 31 Tb, cinematographic works, representing approximately 16 Tb, and finally radio productions amounting to 800 Tb and TV productions representing 14,000 Tb.

The Web itself can be estimated at 150 terabytes. The private activity of exchanging e-mails represents a much larger volume than that of the Web, and has been evaluated at between 10,000 and 20,000 terabytes per year.

It should be emphasized that these estimates do not take into account those immense scientific databases of several hundreds of terabytes each, which constitute what is commonly known as the "deep Web".

Important as it is, the problem of volume, from a purely technological point of view, is not without a solution, since progress in electronics is such as to allow a constant increase in the capacity of storage media, for a progressively lower cost per stored megabyte.

For all that, is all this production suitable material to become heritage? And even if it is, which avenues should it follow, which treatments should it undergo to enter the domain of heritage? Should it be randomly left to technological progress and the robustness of the tools with which the works were created, and which guarantee the continuance of its existence, or should it be the result of a voluntary, controlled heritage preservation process?

If we consider the production resulting from the digitization programmes of cultural institutions, we are clearly on a familiar ground: the works concerned are defined, identified, listed, even if the specialist techniques employed are not yet completely familiar. In fact, digitization operations such as these can be performed by the institution itself, within a specialized department created for that purpose, or sub-contracted to an outside service provider, in particular when the technical equipment required involves heavy investments in a sometimes still unstable technological universe, as it is currently the case for the digital copying of audiovisual collections.

These operations can be carried out systematically as new works are acquired, thus enriching already existing collections, or the priority may be the digitization of old collections, following an appraisal and once a selection strategy has been established.

The selection strategy should make it possible to define priorities based on three types of criteria: technical criteria - for example, the most fragile fonds will be digitized; criteria of content - for example, attention will be focused on entire collections; or criteria of use - for example, those documents the most in demand will be digitized.

Ultimately, and in every case, the objective is to end up with a duly described digital archive of each object, which will be recorded either on a movable physical medium or on a data server.

The Elusive Web

However, the approach is quite different when it comes to the Internet. Here, the unity of the document is lost in hyperlinks, flow replaces the finished object. In this universe, traditional methods of collection or acquisition no longer apply, and there are scarcely any other solutions available to heritage organizations than to set up automatic collection devices. These are based on software "harvesters" which traverse the Web, carrying out regular recordings. Their work is guided by a search plan which makes it possible to select the pages to be recorded in order to ensure their conservation. Various procedures can be employed. Thus, random samples may be taken, the search software then providing a snapshot of the temporary state of the Web at any given moment. This was how the American pioneers went about building up the first archive of the Web, the Brewster Kahle's Internet Archive.

Other heritage organizations have implemented selection strategies based on well-defined criteria, such as subject, form, language, or nationality. These make it possible to create partitions in the whole of the Web, so as to control its mass in the long term. They also make it possible to control the harvester robot inside a site, as it surfs from link to link.

When the archiving of the Web is undertaken by a State agency, for example within the framework of the application of legal deposit laws, the selection is carried out on the address of the domain name, which amounts to creating subsets of the Web by geographical territory. This is, for example, the practice of the Royal Library of Sweden, which collects sites emanating from Swedish domains. Selection can also be based on linguistic criteria. Thus, the Royal Library of Sweden supplements its national selection by archiving sites in the Swedish language. National archive services also comply with this logic of continuity of collections by taking account of the Web sites or Intranets of Ministries and public institutions.

Other collection strategies can be based on criteria of content or theme, which makes it possible to constitute specific archives. Lastly, this selection can be carried out according to formal criteria, by considering the form of expression as such, which returns us to the nature of the media present on Web sites. In France, for example, the Institut National de l'Audiovisuel (INA) plans to concentrate on the conservation of Web radio and TV, whereas the Bibliothèque National de France (BNF) is more interested in the products of electronic publishing.

In this digital universe, it can clearly be seen that all the efforts of heritage institutions will be concentrated on taming this flow, channelling it into thematic, geographical, linguistic or formal categories, and organizing this prolific and polymorphous data mine.

Throwaway Media

Digital data, whether manufactured or collected, become heritage only when they are stabilized, authenticated, referenced and kept accessible within the framework of a permanent archiving system.

From time immemorial, the methods and practices of documentary heritage conservation have given the highest priority to preservation of carriers: paper and ink, the various generations of computer disks, magnetic tapes or emulsions for film, photography or

microfilm.

With the advent of digitality, the family has grown in size, in particular with the arrival at the beginning of the 1980s of the audio CD, developed by Philips and Sony, followed by the computer CD (known generally as the CD-ROM and the CD-WORM), then the general public multimedia CDI, photo and video CDs and, finally, the arrival in 1996 of the DVD. Heritage institutions have had to integrate these new publishing and storage media within their collections.

But everyone knows that storage media are not eternal. According to studies by heritage institutions such as the Library of Congress and the BNF, it appears that the plastic used to manufacture audio CDs, CDIs, photo CDs and CD-ROMs pressed and duplicated from a master disk may only have a lifespan of about 10 to 25 years under average conditions of conservation and use. Rewritable disks may only have a lifespan of about 3 years before being burned (because of the ageing of the sensitive layer, comparable to that of a photographic film before exposure and development) and a lifespan of about 5 to 10 years once burned, before deterioration sets in. These findings come from live tests in laboratories, and are more pessimistic than the life spans announced by manufacturers. Tape- or disk-based magnetic media, for their part, offer the disadvantage of natural magnetic migration due to magnetic fields inside the sensitive layer. Thus the new media used for electronic documents are more fragile than the old media, have even shorter expected life spans, and therefore require actions to conserve, restore and periodically refresh them.

Ephemeral Formats

In the analogue universe, the transfer operations carried out to make backup copies always caused losses in quality of the content. But although digital technology makes it possible to avoid quality losses in the signal, it still cannot guarantee its survival. Indeed, it exposes the content to the risk of becoming "dull", even though its supporting medium may have remained intact, because it may have become impossible to decode it, given the considerable instability in encoding standards and formats when the document was born.

Since content consists of an encoding of the whole of the information, any loss of even a portion of the code can ultimately

make it impossible to read that content. It is thus necessary to preserve not only the storage medium, but also the format in which the data are physically organized.

However, code alone is not enough to guarantee long-term access. Coding brings into play a whole technical environment which intervenes not only in the creation phase but also during use, i.e. reading, by treating the code to make it understandable to the user, via for example a simple viewing interface. All these "technical layers" which treat the bit stream to make readable content out of them are particularly vulnerable to technological developments which limit their lifespan, rapidly rendering unusable certain digital contents as soon as these are transposed into a new environment. Thus, the lifespan of both software applications and technical platforms is often much shorter than that of the medium itself.

It should be further noted that publishers very often integrate anti-pirate devices into their products which further exacerbate the difficulties of their preservation.

Archiving will always be lagging behind technological development, which is little concerned with permanence, and which it only comes across it by chance.

Dematerialization

One of the most remarkable characteristics, and one which is evident to all, is the dematerialization of carriers. Indeed, can we really still speak about carriers, when they no longer have palpable material substance?

The encoding process is becoming increasingly opaque: written media can be read without any intermediary, but even if images on film are still directly perceptible, this is not the case with video or audio recordings on magnetic tape, and even less so when they are digitized. Reading requires a technical intermediary. This intermediation is a new point of vulnerability for our preservation efforts, as it implies that we should preserve the machine as well as the medium. But it is less and less practicable to preserve technical devices which cost considerable sums to develop and, contrary to the requirements for permanent safe-keeping, are designed with short life spans and for early replacement.

DELOCALIZATION: MEMORIES WITH NO FIXED ABODE

The system of interconnected servers known as the Internet exacerbates this dematerialization of messages. We now speak in general of *contents*, and no doubt we should understand that if we are now living in an era of *contents,* we are no longer in the era of *containers*, and that these two aspects of the message have been definitively separated.

TECHNOLOGICAL INSTABILITY

The Internet is in a state of permanent technological evolution. The price to pay for dematerialization, for an ever greater abstraction of code from carrier, for spatial as well as temporal apprehension of the messages, is this technological race. The physical effort to fix information on a carrier becomes negligible if one compares it to ancient steles, or even photographic films, rotary printing-presses or the pressing of vinyl discs. The turning of the technological wheel, and the rapid obsolescence of machines which ensues, is inversely proportional: megaliths lasted a few thousand years, books a few hundred years, audiovisual productions a few decades; and the network of networks has existed at most for just a few years. Such, approximately, are the life spans of technological innovation.

In other words, a given content published today on the Internet has no chance of being readable in ten years, unless regular format migrations are organized in the meantime.

The Internet has ushered us in a new dimension: it catalogues itself. Directories, search engines indexing the Web, indexes of indexes are emerging everywhere. After the great age of silent catalogues, a prolific, noisy era of indexes bulging with information has arrived. Full text engines and indexing systems were until recently reserved for the tiny world of documentation. From a computing point of view, this was a niche market compared with the world of relational databases for management. And then the development of the Web changed the deal. Today it is one of the most promising sectors, and one in which research is most flourishing. If the user is not to be met with a deluge of responses to the slightest query, search engines will have to develop relevance strategies, using for example semantic weighting techniques based on the hypertext environment of a group of words. All texts are no longer equal on the Internet: just as in a galaxy, some are close to the nu-

cleus, where hypertext links come and go, while others are in cold regions, or even in the unknown regions of the centre.

The Role of States

The control of transportation routes was the symbol of power over a territory, controlling movements for public safety purposes, to safeguard the integrity of one's territory or domestic market, but also, and for the same reasons, to control the means of communication. The reflexes that lead States to centralize, whether through laws on the press, broadcasting, or regulating the frequency spectrum, whether justified by the requirements of national security or to protect people (privacy, child welfare, repression of slander, etc.), have lead to the control of the territories of information, the ability to censor or to prohibit publications, to constrain information or to spread it, but also to protect authors, private individuals and pluralism of currents of thought and opinions.

The way the Internet burst on to the scene outside any traditional official capacity profoundly upset the exercise of public power, which was led to substitute in place of its capacity to regulate a role as a sort of co-regulator within an increasingly internationalized framework.

What is true for States is also true for each subdivision of power. In every company, e-mail systems shake up established, proven circuits. E-mail has borrowed both from traditional circuit of administrative mail and from the private telephone communication system. The second model, much more labile, is winning out in practice, and at the same time endangering all the certification and archiving systems of the company.

New Resistance to the Appropriation of Works

In 1777, Beaumarchais drew up the bases of an organization to defend the rights of authors, while in 1776 Condorcet had denounced copyright as contrary to the freedom of information. The technological escalation of networks has taken this debate between Beaumarchais and Condorcet further, but with perhaps unprecedented violence. Copyright was for a long time seen as the victim of history, crushed between authoritative and centralized regimes on the one hand, which reduced the individual appropriation of thoughts to a system for collective benefit, and liberal systems on

the other, which allowed the private alienability of intellectual or artistic works to develop as for any other goods.

But today copyright is in the dock, and we see an entire fringe of civil society challenging any obstacle to the free use of works, and deploying a wealth of inventiveness for the purpose. The heart of this inventiveness is the anonymity of individual movements on the network, and the dilution of places for information storage. This is an additional proof of the close connection between information storage and modes of appropriation.

The New Regime of Copying

The disappearance of the difference between original and copy, and the facility with which copies can be made, have led to thorough revisions in many legislations. Publishers, producers and authors are all increasingly mobilized around efforts to stop piracy, in general by means of encryption and anti-copying techniques and devices, in particular on DVDs. We are thus moving towards a return to the concept of the original, but an artificial original created by the voluntary downgrading of the possibility of copying. These protection systems are however likely to discontinue the exceptions traditionally made for private copying, and to make it more difficult for heritage preservation institutions to accomplish their mission.

A Memory with neither Beginning nor End

Since the invention of printing, we have been living in a regime in which texts are published in their final state. Later versions may revisit this final state, and authorize modifications or corrections, but the weight of the publishing system makes this difficult in practice. Computing has reopened text in its state of innate incompleteness.

We all know how difficult it is to correct a manuscript: overwriting words quickly makes the text illegible, and methods learned in school make the passage from draft to fair copy one of its fundamental values. Typed text has benefited from successive generations of "Tippex", but its use was necessarily limited, and one generally lacked the courage to retype a whole page. Beyond a certain stage, only essential corrections could be allowed.

Word processing radically reversed the proposition: now, a text

is never finished, so easy and tempting has it become to add a final touch here or there. Moreover, text no longer has borders. It lives in an ocean of texts, with which it maintains a number of relationships - incoming and outgoing hypertext links, indexing in massive resource location tools. What constitutes a work, if it has no borders either in time or space, and how much of it should we try to preserve?

The End of Comprehensiveness

Earlier methods of management of memory were founded on exhaustive inventories, the painstaking, fine cataloguing of information. The dual origins of archiving systems, for the preservation of heritage on the one hand, and policing on the other, are to a great extent responsible for the compulsion to be exhaustive. But the very tension inherent in research tended towards exhaustiveness. All serious researchers owed it to themselves to investigate their subject punctiliously.

The explosion of easily accessible information reduces the dream of exhaustiveness to nothing. The essential problem becomes, somewhat obviously, how to apprehend these masses of information. New tools and concepts will have to be developed to enable us to work on these great masses, and, according to the approach required, to grasp them using fuzzy logic, rather than controlled logic on the level of the documentary atom. This is undoubtedly not new: inflation in quantities of paper already precluded an approach on the level of the unit, but this had not yet been radically appreciated. Current tools for indexing the Web open the way for a quantum revolution in the management of sources.

Our societies have witnessed the end of the paradigm of the written archive, a paradigm that had developed over hundreds of years. Throughout the twentieth century new media have wisely and modestly joined this prestigious tradition. This paradigm has already been transformed, and the devices in place are unable to deal with the brutal advance of information technologies, and the quantitative inflation which they cause. This goes beyond those institutions specializing in the management of memory: a whole new regime of information will have to be constructed, and quickly, completely transforming old memory and archiving systems. If this shift does not take place, our societies will suffer irremediable damage in their collective social memory.

SECOND SESSION

STRATEGIES, REGULATIONS AND ORGANISATIONAL MODELS

EUROPEAN POLICIES AND THE PRESERVATION OF DIGITAL CULTURAL HERITAGE

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INTRODUCTION

Mr Chairperson, distinguished speakers, Ladies and Gentleman

I would firstly like to say that I am pleased to be here today and to have this opportunity to tell you a little about what the European Commission is doing.

During the next few minutes I will try to focus on some issues that I believe are of direct relevance to the challenges facing those working with digital cultural resources. This means that I will jump around a bit from one subject to another. Firstly, I will rapidly touch on some of our key policies, strategies and programmes. Secondly, I will look at a particular action that involves digitisation, and very recently an extension to long-term digital preservation. Thirdly, I will mention the work already undertaken in our research programmes, and I will finish by looking at our research plans and the trends behind the latest projects we are funding.

Let me start by trying to set the scene. The work we do in the "cultural division" of the Directorate General on the Information Society involves funding European research on new information and communication technologies for cultural and scientific content. As such we complement funding in individual Member States. On the one hand, this gives us something of an overview of what is going on in Europe, and on the other hand it forces us to prioritise and focus only on doing things that add value to what everyone is already doing.

In any case our starting point is with Europe's cultural institutions and industries. Cultural institutions (mostly public funded) cover public libraries, museums, digital libraries, archaeological sites, national libraries, science museums, data archives, galleries, public records offices, research libraries, and so on. Whereas the cultural industries (mostly private funded) cover film and video archives, image collections, music, broadcasting, media and design centres, publishing, etc.. This represents about 150,000 cultural institutions, sites,

etc., in Europe, employing perhaps as many as 2 million people, looking after perhaps as many as 10 billion cultural objects, and welcoming somewhere around 6 billion visits annually. In addition there are in Europe over 1.5 million small cultural enterprises and multimedia content production companies, which employ another 5 million people (sometimes called the "creative industries").

Fortunately, starting from the perspective of the Information Society, I am only really interested in the digital part of the world of cultural and scientific heritage. Although we have many projects that involve very specific physical objects, sites, or documents, our focus is on the digital part of the equation. However, even that digital "bit" is in itself a minefield of challenges and problems, and clearly we cannot divorce ourselves from what is happening, or has happened, in the world around us.

On the one hand, we cannot ignore the effects of the present confidence crisis that has been created by corporate scandals such as ENRON, nor the "irrational exuberance" we saw in the late 1990s where "dot.com" business plans were formed in wilful ignorance of actual demand for new services. Where a set of myths appeared, such as the fact that the Internet traffic was doubling every 100 days or that "content was king". You will remember that we were told that data networks were congested, that we lived now in "Internet time", that you could make lots of money from people wanting more bandwidth, and that the next application would be the "killer". What we actually saw were extremely credulous, innumerate people who overlooked glaring implausibilities and inconsistencies, and who followed the herd. In fact, Internet traffic "only" doubles every year. Content revenues and Internet spending are still far below revenues from voice traffic (80% of revenues still come from voice despite the fact that phone traffic represents less than 10% of traffic carried on the Internet). Networks are not congested, even if transaction latency could be improved (the average utilisation on a major long-haul backbone was only 10% in April 2001). In this context, it was interesting to read that the North American Network Operators Group listed the 4 top reasons for network performance problems as "engineers, power failures, cable cuts, and hardware failures". And finally Internet has only seen two real "killer" applications, email and Web browsing, and is doing fine without a third - even if some are now predicting that the "search/find/obtain" metaphor is going to be the next "killer" application.

But on the other hand, we cannot ignore the 600 million Internet

users worldwide, or the fact that new user figures are still growing at a healthy 10% annually, nor that the leading Internet companies are still today posting very strong revenue growth. No one can ignore the fact that eBay (one Web site) posts more classified ads today than all the US newspapers combined. Or that Amazon.com is no. 1 in US consumer satisfaction tables (for all brands and products). Or that consumers spend 13% of their media budget on Internet as compared to only 8% on newspapers and magazines, and it's the only part still increasing. Someone recently pointed out that in a market where active Amazon.com customers only represented about 0.5% of the 600 million Internet users, there is still plenty of scope for being confident about future growth and wealth generation in the "digital" world.

I will admit to not being able to fully digest the real meaning of all the data and figures we see everyday in the trade and professional journals, but what is clear even to me is that network infrastructure and connectivity is not where it should be. Clearly future revenue and profit opportunities will be best at the edge of the networks. And today what is at this edge is a kind of global library with more than 4 billion public pages, and hundreds of billions (550 billion) of "deep" documents. And within this global library, cultural content is increasingly present. This is of course in addition to an estimated 500 million access devices already connected to Internet - a figure that some predict will become 5-20 billion devices operated by more than 2 billion people by 2010.

What this all means is that we are (in the "digital cultural" field) forced to be highly selective and focus our intervention on longer-term research topics that involve high quality digital cultural resources and have an eminently European added value. In order to be selective we need to identify and work with cultural organisation and resources that are, in some way, a specific manifestation of the evolution of European society.

However, let me try to focus down even more and look at a precise and pressing need (as an example of how we might focus and prioritise). In May 2002 there was a meeting in London on preserving Europe's public broadcast archives. It was organised by a grouping of our research projects (under the title PRESTO), and some very astonishing figures were mentioned. If my memory serves me correctly, these archives hold more than 50% of the world's audiovisual heritage (UNESCO says that Europe holds 25% of the world's 200 million hours of audiovisual heritage, but PRESTO claims that

Europe actually holds an excess of 125 million hours). This represents something like 25 million hours of film, 50 million hours of video and another 50 million hours of audio recordings (e.g. just the Swedish national broadcast archive holds 6 million hours of material). However, nearly 70% of the holdings are on old formats that can no longer be read on commercially available equipment. In addition, about 25% of the total archive is in such a state that the original will be damaged or even destroyed during cleaning and digitisation. Finally, Europe's archives loose every year several 10,000s hours of the oldest parts of their collections. PRESTO estimated that the total cost to preserve, by simple format transfer, the world's audiovisual archives would be around €100 billion.

So what does this example tell us? Firstly, they have a pressing need to act immediately since valuable assets are being lost each year. Secondly, in many extreme cases their first action must be the right one, since the original is often irreparably damaged and they are left only with the new digital original. Thirdly, they must constantly address the interrelated problems of appraisal, selection and cost. In addition, broadcasters are still trying to understand how to use the new technologies to deliver, or re-deliver, their historical content to the viewer. They will need to manage their assets better using the latest content management applications and the new tools for such things as indexing, tagging, data mining, etc.. They will also need a strategy for the long-term preservation of their digital archives, that must be intimately linked with the way they provide new services. And they must learn how to exploit the potential of the entire archive and not just focusing on a small fraction of its content. Finally, in the years to come European broadcasters will also have to digest a change in public-service mandate and a revised public-funding regime, and no doubt come to grips with new models of public-private partnerships.

Today we are in a situation where as we focus our problems and challenges appear to get bigger. Nevertheless I hope that through this last example you can see something of the logic that drives our research funding, and I would hope also that many of you are able to sympathise with the challenges facing the world's broadcast archives! In the future we will need to focus even more on specific objectives that have a compelling and easy to understand European added value, and build on the substantial investments already taking place in each Member State. In addition, we need to concentrate on producing measurable and lasting commercial and institutional benefits, and

in establishing world-class centres of excellence in Europe.

But perhaps I am rushing forward, and I should start looking at what the European Commission has done over the past 4-5 years concerning technological issues supporting cultural heritage. So let's turn back the clock to the year 1998 and start with the research programmes.

CULTURAL HERITAGE IN THE PAST IST PROGRAMME (1998-2002)

In the past, cultural heritage issues had a focus in one specific part of the programme of Information Society Technologies - namely in an area entitled multimedia content and tools.

The specific research focus over the period 1998-2002 was on providing new ways to "access scientific and cultural content through the networking of Europe's libraries, museums and archives". Our work thus focused on:

- Improving access to heritage by expanding the contribution of libraries, museums and archives.

- New ways to access heterogeneous, distributed and networked collections.

- The provision of powerful new functionalities for accessing and managing large-scale digital repositories.

- And new technologies for the preservation of electronic materials and surrogates of fragile physical objects.

This meant that we focused our funding on advanced digital libraries, intelligent heritage, community memory, digital preservation, and numerous networking and cooperation projects. We issued 7 different actions over that period, and just to give you some idea of the size of the effort:

- We received and evaluated more than 400 proposals with a total requested funding of about €540 million, and using more than 150 different independent European experts.

- We launched more than 100 projects for a total budget commitment in excess of €90 million.

- The projects selected and funded involved more than 600 participant organisations from 35 different countries, and this translated into more than 1,500 man-years of research effort dedicated to Europe's cultural and scientific heritage.

RESULTS SO FAR

For digital libraries we funded about 30 large projects, many of which looking at resource discovery, metadata and interoperability issues. We are confident that we will see both new tools and new services for navigating through collections of different types of content. We have also a few research projects looking at different ways of publishing scientific and technical content over the Web, including work on Open Archives.

I will not bore you with long descriptions of projects, but I will just mention three in this area that received funding in the past. The first was the COLLATE Project[1], which looked at collaborative annotation, indexing and retrieval of historical archive material. Here the challenge was to develop a Web-based knowledge and working environment for film historians, and to see how such a system was used and how it might help them in their work. Naturally, it had to cover repository design, asset and rights protection and management, automatic document processing, collaboratories supporting virtual teams, context-aware retrieval, user interfaces, etc.. The project hosted an international workshop on "Innovations in Digital Asset Management" in Darmstadt in Germany in October 2003[2].

The second is CHLT[3], which is looking to integrate computational linguistic tools and techniques within digital library environments. This project, which includes Imperial College and the University of Cambridge in the UK, has a kind of brother project funded by the NSF, and they have a collective objective to reduce the barriers to accessing and reading texts in classical Greek, early modern Latin and old Norse.

The third is METAe[4], which developed software modules to automate metadata capture by introducing layout and document analysis in digitisation software used to create and maintain digital collections of printed material. They have also developed an omni-

[1] www.collate.de
[2] See www.collate.de/workshop.html
[3] www.chlt.org
[4] www.meta-e.aib.uni-linz.ac.at

font OCR engine, specialising in Fraktur and old European typefaces of the 19th century.

In the field of digital preservation we are funding some projects on digital restoration of old film, on video archival technologies, on new digitisation techniques for old manuscripts, and on new business models for exploiting digitised assets. Here I would just mention the project PRESTO[5], which brought together Europe's major broadcast archives, such as INA, BBC, and RAI, to develop affordable and efficient approaches and improved workflow for preservation of audiovisual material.

For intelligent heritage we funded some very practical projects on image capture and management as well as some rather more advanced projects looking at virtual and augmented reality, in particular in the field of digital archaeology. Projects ranged from Tourbot[6], which was an interactive robot providing Internet access to museums, through Archeoguide[7], which developed augmented reality, 3D-visualisation, and mobile computing for archaeological site visits, to Vakhum[8], which built animated computer models and visualisation tools for viewing the kinematics of human movement.

Concerning the issue of community memory - which is a new activity for us - we launched a few projects looking at new and experimental ways to deliver memory-related services, as well as new models for allowing the citizen to become more involved in the way they can create, manage and have access to the future digital memory of society. As an example, CHIMER[9] brings together museum specialists, teachers and children in the Czech Republic, Lithuania, the Netherlands and Spain to create new forms of repositories of children's views of local cultural heritage using digital maps, GPS and mobile technologies.

In the past we were particularly active in establishing a solid collection of supporting projects covering networks of excellence, training, standards development, awareness building, and benchmarking and evaluation forums. Topics covered by the larger networks include museums, public libraries, digital library researchers, historical Finally, we also launched a successful campaign of 25 small projects designed to help the transfer of new technologies into smaller

[5] www.presto.joanneum.ac.at/index.asp
[6] www.ics.forth.gr/tourbot/
[7] www.archeoguide.intranet.gr/project.htm
[8] www.ulb.ac.be/project/vakhum
[9] www.chimer.org

cultural institutions. Topics range from the use of GIS for historic gardens, through the role of VR for presenting museum objects and collections, to the creation of 3D models of open-air museums. To get a clear idea of this specific type of action consult the TRIS Project Web site[10].

Before moving on, I would like to introduce two tables of information. Table I[11] covers major resolutions made by the European Council of Culture Ministers. As you can see, it covers a broad set of issues starting with cinema heritage, through preservation to archives and museums. The importance of such resolutions cannot be underestimated. They look at what should happen next and give visibility at the highest level to the challenges facing cultural institutions and actors in today's world. Table II[12] provides a list of useful documents and Web sites concerning cultural heritage.

> Message 1: The European Union has an active programme in the cultural domain, that extends from support for traditional cultural activities to research in digital culture. All these activities require cross-Europe co-operation, although each activity or programme has its own specific objectives. Europe's Culture Ministers are increasingly aware of the challenges specific to digital culture, and are increasingly supporting activities in that domain. But are our institutions prepared to change to meet the (inevitable) increasing demands for their "digital" services?

eEUROPE

Let us move forward to March 2000. As I mentioned a few minutes ago, the European Union recognised the need to address the emerging challenges of the new knowledge economy. At the Lisbon European Council of the same year it was decided that we should do everything we can to make Europe the most competitive and dynamic knowledge-based economy in the world. The target was sustainable economic growth with more and better jobs and greater social cohesion.

[10] www.trisweb.org
[11] See *Appendix*, p.313.
[12] See *Appendix*, p.315.

The European Commission's approach was to develop two complementary activities. The first was a political initiative called eEurope, seen as a very practical initiative that was expected to produce immediate results. The second was to reinforce Europe's longer-term research and development potential through the programmes on technologies that support the Information Society.

Let us first look at the eEurope 2002 initiative, which had three major objectives:

- Firstly, to try to bring every citizen, school, business and administration online and into the digital age - and to do so quickly.

- Secondly, to create a digitally literate Europe and an entrepreneurial culture ready to finance and develop new ideas.

- Thirdly, to ensure an inclusive information society, building trust and strengthening social cohesion.

Beyond these 3 major objectives, more than 60 different practical actions were identified, and I would like here to look at just one of those actions.

CREATING COOPERATION FOR DIGITISATION

Within the eEurope 2002 objectives, there was a specific action for Member States and the Commission to jointly create a co-ordination mechanism for digitisation programmes across Member States.

The first step for us was to form a Member States experts group to look at the problem and the nature of the actions needed. We were very fortunate that the Swedish Presidency of the Council provided both moral and practical support and hosted our landmark meeting in Lund. From that meeting emerged something we call the Lund Principles. They define the importance of the issues and the Lund Action Plan tells us what we should be doing at any given time.

Firstly we looked at the way we could add value to Europe's digitisation activities, bearing in mind that our actions must be sustainable over time. We established the importance of the issue by recognising that:

> Europe's cultural and scientific knowledge resources are a unique public asset forming the collective and evolving memory of our diverse societies and providing a solid basis for the development of our digital content industries.

The first issue highlighted by the experts was the need to ensure sustainable access to our heritage. We all know that Europe has unique and significant wealth in its cultural and scientific heritage. And that the digitisation of these resources is a vital activity in that it can provide both improved access for the citizen and at the same time help preserve Europe's collective cultural heritage (both our past and our future heritage). The second important point was the support provided for cultural diversity, education and content industries. Digitised cultural assets are crucial in sustaining and promoting cultural diversity, and at the same time they are also a key resource for education and for the tourism and media industries. The third issue was to recognise that digitised resources are of a great variety and richness. Member States have already invested significantly in programmes and projects for digitising cultural and scientific content. Such digitisation activities cover a diversity of domains and content types, such as museum artefacts, public records, library collections, archaeological sites, audiovisual archives, maps, historical documents and manuscripts, and we must build on what has already been achieved.

However, our experts also identified a number of key problems that limit the potential of these resources, whether culturally, socially or economically.

The first barrier was the fragmentation of approach. Though widespread, digitisation activities to date are highly fragmented, depending on the policy instruments and mechanisms in the different Member States. Moreover, the absence of a coherent European view of what cultural content has been digitised or of how this content was selected for digitisation produces an inevitable duplication of effort and investment.

The second barrier was obsolescence. Digitisation is a costly exercise requiring high investments usually from public funds. There are significant risks to these investments due to the adoption of inappropriate technologies and standards. This can result in creating resources which are quickly obsolete or which require the investment to be repeated a few years later.

The third barrier was the lack of simple, common modes of access for the citizen. Access by the citizen to the different resources, at national and at EU level, is compromised by the lack of common approaches and technical standards, as well as by the lack of support for multilingual access.

The fourth barrier was intellectual property rights. The various stakeholders in the world of digitised content (e.g. original owners, intermediaries, and end-users) have different legitimate interests. These needs must be recognised and balanced. Solutions for managing rights need to be understood and applied by the cultural sector if the economic value of their efforts is to be sustainable over time.

The fifth barrier was the lack of synergies between cultural and new technology programmes, and the sixth barrier was about making the best of institutional investment and commitment. We all know that digitisation requires a commitment from individual memory organisations to long-term, expensive and technically demanding actions, and our research programmes can help develop new cost-effective solutions and assist in the way our institutions adopt new skills and practices.

So, let us return to our digitisation issues and to some of the key actions we are developing in the European context.

National Profiles

In 2001 we issued a questionnaire to EU Member States in order to identify national policies. The results were surprising. For the 10 Member States that replied within the deadline, we found more than 40 different policies and programmes. One very valuable result was the real feeling that the questionnaire had highlighted the need for stronger co-ordination within many Member States (and I might add that there are now coordination networks in almost all Member States). We decided to build a common baseline for national profiles and to try to ensure that they were maintained, publicly accessible and easily understandable. Improving the awareness of what is going on in other countries (and within countries where there are regional administrations) at both policy and project levels is one type of action that can contribute to providing better access to digitised resources and to improving the effectiveness of digitisation initiatives. Whilst national policy profiles still pose problems in some countries, we are now seeing that progress reporting, handbooks, and identified best practices can in themselves provide a complete source of infor-

mation on national policies and programmes. What we must keep in mind is that information on national policies, programmes and projects should be well described and easy to find. Citizens should be able to understand what is being done and why, and activities should be described in a simple and non-technical way. In addition, it is also important to recognise that simpler language, and a multilingual presentation, will be essential if we are to foster greater worldwide interdisciplinary cooperation.

In Table III[13], I have provided my own personal summaries of what I see happening in the Member States. I have used a recent progress report on digitisation, and coupled this with status reports presented at out last Member States representatives meeting.

BENCHMARKING

It is now recognised that a benchmarking model can become a strategic tool. It helps increase the overall quality of digitisation projects, it supports the exchange of good practice, is valuable for project monitoring and review, and it can be used in the selection of projects by funding authorities. Online questionnaires have been completed by more than a hundred European projects, and we must now see how to best promote the use of benchmarking. One way forward is to help institutions find benchmarking partners, so that they can share results and create best practices.

TECHNICAL STANDARDS (INTEROPERABILITY, INVENTORIES AND RESOURCE DISCOVERY)

The first step is to improve the quality and usability of our digital content. We must promote unified access for citizens as well as an increased awareness of long-term preservation issues. One way forward is to agree on interoperability standards and guidelines for digital preservation and content longevity. We also need coherent models and good practices for rights and asset management, together with the development of the associated e-culture business models. We need to continue to support interoperability and resource discovery by launching more work on metadata, registries and schemas. Yet there is already a considerable body of knowledge available - so we need to focus on the adoption of existing standards with all the

[13] See *Appendix*, p.317.

related training, awareness building, and technology transfer actions that are needed.

At least 10 EU Member States are known to have national cultural portals, culture-nets, or listing of projects, but coverage is neither systematic nor comprehensive. Inventories and resource discovery functions are backbone features of these portals or aggregator sites. These inventories must be easy to maintain, tools must be easy to use, fragmentation of coverage needs to be addressed, and new user services built. Standards for XML-based metadata and collection level descriptions are both keys to ensuring interoperability in a cross-domain environment.

After a meeting in Paris (January 2003) a data model was agreed along with metadata for systems collecting data on digitisation (covering institution, project, digital collections, and service/product). The next step will be to collect data to test the validity of the model. The importance of multilingualism was again stressed, as was the relationship with the accessibility and usability of cultural content.

On the issues of interoperability and service provision, a new programme of work was proposed during 2003 covering interoperability, standards, IPR, and the concept of an observatory. The use of a XML scheme, DC.Culture, is being developed, and could lead to a test to federate inventory information from several Member States. Making interoperable the inventories in the different Member States could eventually lead to a European inventory of digitisation projects and, why not, it could even be the basis for an EU-wide observatory on digitisation.

Turning to Good Practice

Everyone wants to adopt practices that are recognised throughout the world as good examples. We all should support issues such as consistency of practice and process, the proper management of assets and rights, and the re-definitions of the skills required by our cultural institutions. Current topics of interest include metadata, multilingual support, and imaging and digital preservation technologies. In a meeting in Alicante under the Spanish Presidency more than 40 digitisation projects were presented as good (or best) practice. However, we must go beyond just the tagging of good practice examples. How many examples have been documented in such a way as to highlight and explain the good (and bad) lessons learned? How many examples can be really adopted by the large body of small cultural in-

stitutions and organisations?

Guidelines do exist, but they are often highly specialized and fragmented, and represent the experience gained by specific institutions on specific types of source material (text documents, film, audio, photographs, etc.). The task is to provide practical good practice information for cultural organizations embarking on digitisation. These good practice projects identified in Alicante have been analysed and documented so as to highlight the specific good practices and the guidelines they illustrate, and a handbook will be published for a meeting in late 2003 in Parma, Italy. The draft report is already available on the MINERVA Web site. It is intended as a "living" handbook to be complimented by a dynamic and growing list of good practices. The idea is that new examples can be submitted and the new lessons learnt can be described and contextualised.

The Major Issue of Quality

Beyond the issue of technical standards we need to create a shared view of European content, and we need to develop a solid framework for a EU-wide infrastructure for accessing digitised cultural and scientific heritage. We need to identify added value conditions for European content (e.g. selection criteria) and establish technical standards for conformance to interoperability requirements. Certainly one of the key issues is to provide a practical and tangible focus for quality. Institutions and actors providing well maintained, authentic, reliable and trustworthy information should be seen to be doing so and should be able to differentiate themselves from others on the basis of those qualities. Are cultural actors prepared to develop, adopt and control their own framework for quality on the Web? We know that specialists' communities are developing the quality criteria for health care information and educational resources on the Web. What will it take for cultural actors to do the same?

The W3C-WAI accessibility guidelines are mandated by the European Commission for public administrations and are increasingly being recognized and implemented in Member States. However, quality goes far beyond the issue of accessibility (e.g. functionality, usability, fit-for-purpose, credibility, etc.), and Europe's cultural institutions must rapidly adopt and implement a common framework for the recognition of quality cultural content on the Web (and one that is relevant to citizens and not just professional users). We started with an endorsement of a Brussels Quality Framework, where accep-

tance of its recommendations and its implementation was seen as a vital first step. We now have a working group developing a Quality Handbook. A draft is being commented on and we hope it is accepted before the end of this year. An adoption and implementation strategy is needed, as are some immediate practical examples for testing (there is a possible link here to good practices examples). It is envisaged to present the handbook in a condensed form to the European Council of Culture Ministers, to ensure its widest possible adoption.

CONCERNING THE SPECIFIC ISSUE OF DIGITAL PRESERVATION

We must work to counter the risks of creating a "digital dark age", by developing advanced industry-friendly research agendas for the preservation of content. Long-term digital preservation is a major problem, yet many of those people who control national policy developments appear unaware of the issue. Have the cultural institutions, the problem owners, been sufficiently vocal about this issue? What can be done to bring this problem to the fore as a major policy issue?

The Spanish and Danish Presidencies of the European Council were strongly committed to this topic, as is the present Italian Presidency.

In addition to the challenge of digital preservation, the long-term sustainability of a European content framework also depends upon the following issues: multilingualism and cultural diversity, relevance, accessibility, and the effective exploitation and delivery of digital cultural content. EU-funded research projects to be launched in near future will go some way to addressing specific problems in long-term preservation, however a clear set of practical tasks needs to be identified, covering all the major challenges. It is also increasingly evident that we need to see a commitment from industry, both big and small, to developing solutions and providing preservation services. We already fund the work of ERPANET[14], which has contributed in generating a clear short-term action plan for presentation and validation during this international conference.

[14] www.erpanet.org

NATIONAL REPRESENTATIVES GROUP

Finally, we need to ensure an effective forum for ongoing co-ordination across all Member States. We have now created a National Representatives Group, made up of officially nominated experts from each Member State. Its mission is to act as guardians of the Lund Principles and to monitor progress of the Action Plan. This group meets every 6 months under the chairmanship of the current Presidency, for example the next meeting is planned in Parma for 19-21 November 2003 under the Italian Presidency (this is where the quality challenge will be openly debated). The group shares national experiences and has created a common platform for cooperation and coordination of national activities across the European Union. It provides a stable, continuing focus for consensus building between Member States, for promoting good practice, and for encouraging initiatives to support the visibility of quality cultural sites. A final element is the recent creation of MINERVA[15], a network of excellence funded by our research programme. The network already had an initial participation of seven Ministries or related national bodies, however all 15 EU Member States have now joined it. MINERVA is a collaborative framework for executing the Lund Action Plan and organising its working groups.

At the European level, these activities have been lent added support from recent European Council Resolutions on *Culture in the knowledge society* and the *Role of culture in the development of the European Union* (see Table I). More recently the Spanish Presidency (1st semester 2002) took on the challenge to create a framework for long-term digital preservation. A Council Resolution was prepared and has been accepted by the EU Ministers of Culture. The Resolution entitled *Preserving Tomorrow's Memory - preserving digital content for future generations* was published in the Official Journal in July 2002. The establishment of a EU-wide action plan on long-term digital preservation may be one way forward. Here again we are already funding several research projects looking at digitisation and preservation of historic film, old text, and other cultural materials. And, as I already indicated, we are also funding ERPANET, a networking project aiming to increase awareness on the issue and provide source documents on the various digital preservation activities on-going around the world.

[15] www.minervaeurope.org

In the European context it is important that our actions reply to a clearly perceived need at the European level. It is for this reason that unanimously agreed resolutions and statements from Europe's Ministers of Culture are so important. In Tables I and II, I have tried to summarise the essential resolutions, decisions and documents from Culture Ministers, along with useful Web documents and sites.

Before I move on, two specific additional issues are worth mentioning concerning digitisation.

ENLARGEMENT TO NEW ACCESSION STATES (NAS)

As I have already mentioned, during 2004 the European Union will expand to include 10 new Member States (the so-called "new accession States"). And it is important that initiatives such as the Lund Principles extend their coverage to these new participants (and there is nothing to exclude the association of other countries in such an open framework). In fact, a meeting was held with these countries in Rome in early 2003, and additional funding for new participant Member States in the MINERVA network is presently being negotiated. An opportunity to showcase activities in the new accession States will be provided during the Irish Presidency (1st semester 2004) of the European Council.

RELEVANCE FOR SMALLER INSTITUTIONS

Possibly one of the biggest challenges facing us all is to ensure that our products and services (e.g. progress report and handbooks) are relevant to smaller cultural actors. The MINERVA network has created a users group attracting representatives from industry, universities, regional and local administrations, and small cultural institutions using the successful tool of the "cooperation agreement". The first users group meeting will be held under the Italian Presidency in Rome at the workshop "Digitisation: What to do and how to do it" in October 2003. The focus must be on the demonstrable benefits of participation. One practical step is to prepare e-learning (open distance learning) modules for local institutions. Topics to be covered include: digitisation processes and management of digital resources, legal aspects (IPR, copyright, data protection), quality criteria for cultural web sites, and digital collection and project management, service orientation and management.

> Message 2: On digitisation progress has been substantial and sustained. Member States are better co-ordinated internally, and are actively co-operating to create practical results useful for all types of cultural institutions. Priority issues are increasingly quality indicators for cultural Web sites and the ever-present challenge of long-term digital preservation.

PRESERVING TOMORROW'S MEMORY

Let me develop some of our thoughts on the increasingly important topic of digital preservation. Late in 2001 we discussed with the incoming Spanish Presidency the possibility to continue the work started with the past Presidencies. The issue of long-term digital preservation, whilst mentioned in the Lund Action Plan, was not really fully developed and as such does not figure as a major objective of the MINERVA network. The Spanish Presidency felt that this was a topic that would merit further work, and possibly justify a Resolution of the Council. It was a courageous decision, since it is a difficult and complex subject, not immediately accessible to political statement and decision. It is not an intuitively simple problem, and there are no short-term easy answers. It is technically complex and challenges the fundamental role of our cultural institutions. Solutions are not available today and it is already clear that there is a lot to be done in the coming years, if we are to find acceptable and, above all, affordable answers to this problem.

I do not have to explain to you the importance of having clear policies concerning long-term digital preservation. In fact a majority of cultural institutions believe that irreplaceable information will be lost if digital preservation issues are not resolved in the near future. However, it is vital to recognise that a comprehensive digital preservation policy could be very expensive and will inevitably result in a substantial mutation in the focus and core functionalities of our cultural and scientific institutions.

And so, I think, it became more and more evident that not only was there a need for a Council Resolution on long-term digital preservation, but that now was the right time for such a Resolution. In preparing for the Resolution we tried to capture and summarise the essential challenges.

POSSIBLE ACTIONS AND RECOMMENDATIONS?

The preservation of digital heritage must become a major policy objective and even an institutional raison d'être. Many cultural institutions already assume responsibility for preserving digital material and most expect to do so in the near future. However few have explicit policies that govern acquisition, conversion, storage, refreshing, and/or migration of digital content. New organisational policies and procedures will be needed that maintain accessibility and authenticity over time whilst respecting cultural diversity and pluralism.

Solutions will not be purely technological, and research agendas must recognise that social, legal and ethical issues will be important in finding practical, acceptable, and affordable solutions for digital preservation. Important questions will need to be answered, such as what should be preserved for the future? Who will archive preserved information and what skills will they need? What preservation metadata will be needed and who will create the metadata? And who will pay for all this?

Solutions will need to be supported by organisational will, economic means and legal right, and must ensure the preservation of and permanent access to digitally produced materials. Consideration should be given to innovate ways to manage Europe's digital collections, such as through national information infrastructures or a system of certified digital archives.

Recognition of digital preservation as a major institutional and societal problem can only be achieved through large-scale, sustainable and significant initiatives that incite and stimulate public support. Large-scale initiatives are essential, since they will force the cultural institutions to be explicit about their priority setting and selection criteria. In addition, it will bring to the fore other societal issues such as privacy and data protection, and it will oblige the institutions to take seriously the development of revenue generating activities to pay for collection maintenance.

ISSUES OF COSTS AND SCALE

Today there are no reliable and comprehensive data on costs, nor any proven techniques for estimating those costs. What is certain is that digital preservation could be very costly, and the survival of existing cultural institutions will depend upon the development of new cost, business and financial models and new ways to share those

costs between the public purse and business interests. Today digital preservation is seen as a costly "extra" task. Recognising that society cannot collect everything, selectivity will have to be based on a collective understanding on quality metrics and collection appraisal. Automation will also be needed in order to reduce costs, however the way forward must be through the integration of digital preservation functions into the creation process. This is in part a technical issue and in part an issue of awareness about how to create properly, so that it can be preserved effectively and efficiently.

Building Awareness and Advocacy

It is vital to raise awareness among governments, public institutions and other information producers and holders on the need to safeguard the digital memory as much as possible in its authentic form. It will be important to convince the public, since it is not immediately evident that the citizen cares about preserving digital information.

Stakeholders will need strategic guidance, with a particular focus on building awareness with data creators. And there is also a need to move away from guidelines and towards specifications which help the smaller institutions deal with the problem.

In addition it is now recognised that there is a major skills deficit in the institutions. The "skills gap" needs to be assessed and quantified, with a view to what new skills will be needed in the future. One option is to create a skills map and develop "fellowship" training and exchange programmes that would transfer knowledge between institutions and could be scaled up to a formal infrastructure.

One Way Forward is Networking

A large-scale multidisciplinary and multicultural collaborative model will be needed that both strengthens existing networks of archives, libraries, museums and other documentation services and brings together developers and users of digital information management and processing tools.

In addition, an information infrastructure should be evaluated, that would be collectively responsible for the long-term accessibility of the social, economic, cultural and intellectual heritage instantiated in digital form. This could be a network of certified repositories or archives, meeting standards and criteria of an independently adminis-

tered certification program. Such a network should not only provide archival materials for their own content but should also work on behalf of others who do not care (providing failsafe mechanisms). It is not clear how such an infrastructure could be created, what would be the technical and institutional attributes of digital repositories, and how to set standards for institutions as repositories that operate across different existing collecting agencies. It goes without saying that there is much scope for a shared infrastructure to develop economies of scale, however as a final point there is still no convincing benefit model of such an infrastructure (and one that would take onboard all the regional implications and agendas in Europe).

TECHNICAL AND RESEARCH CHALLENGES

I will not bore you all with a long list of technical objectives and research issues, however we need to work on requirements covering terms of use, data structures, provenance, legal validity, authenticity, etc.. We need to validate social and economic models of archives and digital libraries as ways to ensure the future accessibility of information with enduring value.

We need new tools and technical infrastructures. The tools must automate preservation for data creators and warn us when obsolesces occurs. We need new standards and we need to ensure that they are used. And we will need testbeds, prototypes and trials that demonstrate the technical and economic feasibility of operating on a mass scale.

Late in this presentation I will mention some of the things we have done, and what we still have to do.

> Message 3: Long-term digital preservation is a major challenge. Member States and the European Commission are investing in the issue, but there is still much to do. We need to understand both the cost of digital preservation (and work to reduce that cost), and the institutional implications (which could be substantial). We need to build awareness and advocacy both at the level of policy building, as well as with the institutions and with the citizens. We need to bring Europe's key actors together, and we need to invest in technology research and development to find solutions, if only for specific media types, e.g. audiovisual heritage.

PREPARING FOR THE FUTURE - THE DIGICULT REPORT

In parallel with the work under eEurope and within the past research programmes, we also launched a major study entitled *Technological Landscapes for Tomorrow's Cultural Economy* (short title *The DigiCult Report*, published January 2002)[16]. We tried to discuss options and provide recommendations about the way Europe's museums, libraries and archives should approach technology-driven mutation.

In the report, more than 180 European cultural operators concluded that:

- It would be mistake to reduce Europe's culture to the concept of a cultural product and the one-dimensional notion of a free market based only upon supply and demand.

- Education is the most promising future market for cultural heritage.

- Europe's museums, libraries and archives will need to enter into new relationships with both private businesses and new user groups.

- Larger cultural institutions are reasonably well equipped to deal with new technologies, however smaller institutions lack resources, adequate skills, and a clear view of the options available.

- Long-term digital preservation and born-digital objects are key drivers for technological research and innovation.

- And finally, Europe lacks a methodological and coordinated approach to digitisation.

The report identified challenges and recommendations for the different types of actors in the culture value chain - firstly the museums, libraries and archives, then the regional and national governments, and finally the European Commission.

For cultural institutions the challenges are to do with:

- Integrating digital asset management and preservation skills into the core competences.

- Building partnerships to market to new user groups, e.g. build new types of interactive services, license digital resources for re-use, provide courseware material, aggregate visitors for tourism services.

[16] See www.digicult.info/pages/publications.php

- Making more visible the ability of institutions to guarantee authenticity, provide knowledge-based interpretation and contextualisation, and use new technologies to develop niche markets for their resources.

- Providing transparent digitisation policies that are based on user needs and the quality of the source material.

For regional and national governments the challenges are to:

- Move from individual digitisation projects to a clear set of digitisation policies and programmes, and co-ordinate across regions.

- Find ways to involve small and medium size institutions, and to ensure that know-how is properly disseminated.

- Focus on the educational market.

- Guarantee long-term availability of "born digital" assets, through an extended legal deposit or network of trusted organisations, and ensure that long-term digital presentation is an integral part of their information policy.

Finally, for the European Commission the challenges are to:

- Continue to support long-term research and development (R&D) in a way that also allows smaller institutions to participate.

- Focus on the dissemination of good practices, open standards, and the potential of the educational market.

Beyond a series of recommendations, what emerged were some views about where Europe could (or should) be in 2006. Let me summarise some of these views:

- Europe should have a clear view on the benefits, value and market potential of cultural heritage, and a much more pragmatic view about return on investment.

- Institutions should realise that a mass of users does not make a mass market, and they should concentrate on niche markets and

building long-term relationships with their communities of users.

- Overall employment in the cultural sector will increase slightly, although it may drop in the traditional institution management sector and it will increase in areas demanding skills with new technologies.

- Cost of market entry will remain high, although new digital services can produce revenues; however, 85-90% of the funding will still be public, and more imagination is needed in fundraising.

- People want personalised, highly interactive "experiences", they want to be part of "communities of interest", and they want to be able to control content and create their own packages.

- Governments realise that culture and education cost money, that investments must be based on clear policy objectives (and in particular for theme-driven digitisation and collection building), and that some form of regulation will be needed to enable educational use and for allocating responsibilities for long-term digital preservation.

- Traditional institutions will remain relatively inflexible, however new types of partnerships are inevitable with different types of cultural institutions and new types of cultural intermediaries, probably driven by standards developments and adoption.

- A new generation of easy to use tools for data capture, co-operative authoring and automated workflow will appear, narrow-band and mobile delivery will be routine, and domestic broadband access will start to be widespread.

The report concluded with three clear messages, the first concerning organisational change, the second on the emergence of commercial services, and the third on the use of new technologies.

Summarising for the period 2003-2006, renewing skills and improving human capital are the top priorities for cultural institutions. Trail and error digitisation must be replaced by clear policies and strategies, driven by demand for high quality learning materials. Users expect to be entertained, and institutions must compete for the attention of visitors by providing highly interactive and augmented experiences. Cultural institutions must focus on their content-based curatorial knowledge and expertise, and co-operate with commercial

actors to reduce the risk and distribute the cost of introducing new services. Commercial services can be introduced to generate realistic revenues and cover operating costs, and there will be a strong interest for personalised access to quality cultural resources. Open and sector specific standards will be widely used, however semantic interoperability and multilingualism will still be challenges. New interactive technologies and dynamic digital objects will allow users to manipulate, alter and create their own experiences. The problem of long-term preservation of those complex digital objects will still not be solved.

When the report was finished, we did not want it simply to become a historic document, collecting dust on the shelves of our illustrious libraries. For this reason we now fund the Digital Cultural Forum[17], which brings together about 50 European experts and provides technology watch, newsletters, and a discussion forum on research and technological development for the cultural heritage sector. Integrity and authenticity, digital asset management systems, and semantic Web have all been treated in thematic publications. Recently, the *2003 Technology Watch Report* covered customer relationship management, digital asset management systems, smart labels and tags, virtual reality and display technology, human interfaces, and games technologies. The *2004 Technology Watch Report* will focus on the XML family of technologies, application service models, collaborative and virtual communities, mobile access to cultural institutional information resources, and cultural agents and avatars.

A partner study is at present being conducted. The approach is more or less the same, in that it tries to capture the opinions and wisdom of cultural actors, but the topic is the role of cultural and memory organisations in social and economic inclusiveness. The final report is expected at the end of this year.

THE 6TH FRAMEWORK PROGRAMME (2002-2006)

Let me now turn to the present and to Europe's new research programme[18]. In the European Commission's document entitled *Towards a European Research Area* the EU Research Commissioner (Busquin) proposes to "...look at how…to better organise research

[17] www.digicult.info

[18] See www.cordis.lu for more information on past and present programmes.

in Europe…". The idea is to create a European research area, and although this is not a new idea the conditions required to achieving this now seem to be in place. What should this European research area look like? Well, it certainly has to embrace the following aspects:

- Networking of existing centres of excellence in Europe and the creation of virtual centres of world-class competence.

- A common approach to the needs and means of financing large research facilities in Europe.

- More coherent implementation of national and European research activities.

- Greater mobility of researchers and the introduction of a European dimension to scientific careers.

The Sixth Framework programme is one of the most important ways to implement the "European Research Area", and a new approach is introduced both in terms of content and instruments.

Firstly there is a major focus on the task of "Integrating Research", which represents the bulk of the effort: integrating research efforts and activities on a European scale. The aim is to develop our knowledge and understanding on a limited number of priority thematic areas, as well as in areas supporting specific EU policies. A new instrument called the Integrated Project is designed to mobilise a critical mass of research and development effort that is expected to result in new products, processes or services.

A second major focus is on "Structuring the European Research Area" - exerting a more structuring effect on the research activities conducted in Europe through stronger links with national, regional and other European initiatives and programmes. Here a new network of excellence has been designed to strengthen Europe's scientific and technical excellence by integrating existing or emerging national research capacities.

In the new Framework Programme, the Information Society forms the largest priority thematic area. One of the key objectives of the programme is to find solutions for major societal and economic challenges, and this includes work on health, security, environment, learning, e-government, etc., and also "preservation of

cultural heritage". Today this is the only easily identifiable place for cultural heritage and our target is as follows:

"For cultural heritage the effort will concentrate on intelligent systems for dynamic access to and preservation of tangible and intangible cultural and scientific resources".

The below table tries to summarise the differences between the new and past research programmes in terms of focus, structure, approach, rules, etc..

5th Framework Programme (1998-2002)	6th Framework Programme (2002-2006)
Budget: €14.96 billion (4% of EU total budget - 1999 figures), with €3.6 billion for Information Society Technologies.	Budget: €17.5 billion (3.9% of EU total budget - 2001 figures), with €3.7 billion for Information Society Technologies.
Focus: impact on social and economic challenges, problem-solving approach, networks of disciplines, focus through thematic clustering ("key actions").	Focus: implement a "European Research Area" policy, improve impact of research by focus and integration of effort, stronger links to national, regional and other European initiatives.
Structure: 4 vertical thematic programmes, and 3 horizontal programmes.	Structure: focus research through 7 large thematic priorities, structuring the research area (innovation, human resources, infrastructure), strengthening foundations (coordination with national programmes, innovation policy).
Approach: "classical" multi-partner research projects and thematic networks, clustering and networking of different projects within a "key action".	Approach: larger, long-term "integrated projects" and long-term, multidisciplinary "networks of excellence", both with a high level of management autonomy.
Participation: associated candidate countries under special conditions.	Participation: associated countries under the same conditions as Member States.
Rules: financing based upon eligible costs, ex-ante control,	Rules: grant to overall budget or grant for integration, on-going or ex-

partnerships and work programme more or less fixed.	post controls, partnerships and work programme flexible, joint financial responsibility of partners.
Evaluation principles: selection using external independent expert advice, peer review of progress towards objectives, criteria based upon both scientific and management quality.	

What can be seen is an increasingly emphasis on improving the impact of the funding available by greater focus and integration of effort, stronger links to national, regional and other European initiatives, and giving the research teams more autonomy to evolve to meet the research objective.

INFORMATION SOCIETY TECHNOLOGIES - WORK PROGRAMME 2003-2004

The overall focus of IST is on the future generation of technologies, in which computers and networks will be integrated into (or even hidden within) the everyday environment, rendering accessible a multitude of services and applications through easy-to-use human interfaces. A major effort has been made to concentrate on a limited number of research objectives in the core technologies and their applications.

For cultural heritage the plan envisaged only one single call (already completed) on the topic of "technology-enhanced learning and access to culture", although another call is envisaged in the second part of the programme cycle. The research focus today is on providing a global view of Europe's educational resources and our cultural and scientific collections, through advanced services that generate new forms of cultural and learning experiences.

Concerning "access to culture", the key objective is to promote accessibility, visibility and recognition of the commercial value of Europe's cultural and scientific resources. Specific research objectives are:

- Firstly, to create European platforms for digitisation and preservation of cultural and scientific resources, through the development of advanced tools, systems and services. These should address: automation of digitisation processes and workflow, advanced and specialised digital restoration and preservation of film and video material, and organising, archiving and exploiting repositories of digital memory.

- Secondly, to develop environments for intelligent heritage and tourism, for re-creating and visualising cultural and scientific objects and sites, supporting next generation location-based services based upon open platform specifications, models and ontologies for networked tourism systems, with a focus on enhancing user experience in cultural tourism.

- Lastly, to develop advanced digital libraries (DL) services, providing sustainable access to large-scale and high-bandwidth infrastructures, linking distributed and highly interactive repositories of European culture, history and science. Work will integrate DL infrastructures, architectures, metadata, interoperability, and navigation into advanced prototypes, for use by online knowledge communities in virtual laboratories.

> Message 4: Digital culture is present in the research programme, and the focus remains on technology-enhanced access to cultural and scientific resources, and their long-term preservation. What changes concerns the ambition of the research topics, the expectations concerning tangible, practical results, and the research instruments available. In digital culture, one target is to have, within the next 10 years, a stable distributed repository of Europe's cultural content, as well as assured protection from loss. The other target is to reduce the cost of digitisation by 50% over the next 5 years.

RESULTS OF THE FIRST CALL

Information Society Technologies priority issued its first call for new projects in late December 2002. In May we received nearly 1,400 proposals requesting around €7.5 billion, when only about €1 billion was available. The "technology-enhanced learning and access to cultural heritage" objective received the 2nd largest number of proposals, with 210 proposals asking for a total funding of more than €950 million, when only €65 million had been initially earmarked. Concerning culture we received 91 proposals, requesting nearly €400 million, and we are currently negotiating 8 projects for a funding of about €40 million. Remembering that we fund on a cost-share basis, this represents a total investment of about €65 mil-

lion, or the equivalent of about 600 man-years of research effort.

The below table summarises the evolution over past and present research activities in terms of focus, structure, approach, participation, etc..

Research on Cultural Heritage (1998-2002)	Research on Cultural Heritage (2002-2006)
Location: activity in key action "Multimedia Content and Tools", additional activity in "City of Tomorrow and Cultural Heritage", physically located in Luxembourg.	Location: activity in strategic objective "Technology-enhanced Learning and Access to Culture", physically located in Luxembourg.
Focus: networking of Europe's libraries, museums and archives.	Focus: dynamic access to and preservation of tangible and intangible cultural and scientific resources.
Budget: ~€90 million in funding, representing >1,500 man-years of research effort, distributed over 7 different Calls.	Budget: ~€41 million in funding, representing >600 man-years of research effort, in 1st Call.
Approach: >100 projects, including >60 research projects, about 25 thematic networks and technical co-ordination measures, and 25 small-scale technology trials projects.	Approach: 8 projects under negotiation, including 2 large "integrated projects" and 2 large "networks of excellence". Projects should integrate all the necessary measures to meet ambitious objectives, and be reference projects within Europe. Strong focus on measurable success indicators.
Structuring: through clustering of projects, using thematic networks and additional technical co-ordination projects, and ad-hoc project workshops. Projects having a well structured plan for the entire work, and reviewed annually using external experts. Focus on paper-based progress	Structuring: trend to large "initiative-driven" research projects and networks, use of international conference series, stronger links to projects and programmes funded in Member States. Projects working to annual plans, to be revised after external review. Greater focus on Web presence,

and deliverable reporting.	and on contributing to understanding in the domain through annual "state-of-Europe" reports.
Participation: >600 participant organisations from 35 countries (40% institutions, 35% academic/research, 25% industry).	Participation: ~250 participant organisations (32% institutions, 48% academic/research, 20% industry).

WHAT CAN WE CONCLUDE?

We are only now negotiating these new projects so conclusions are perhaps a little premature. However, we can already say that coverage is good for digital library services, "intelligent heritage", and the preservation of audiovisual heritage. But issues relating to automation of digitisation workflow are not covered, and the topic of long-term digital preservation was only marginally addressed.

WHAT ARE THE TRENDS?

The below table summarises basic trends, both in terms of application topic (digital libraries, "intelligent heritage", and audiovisual restoration) and in terms of expected results and institutional participation and co-operation.

Trends in Digital Culture Research
In digital libraries metadata issues remain a core research topic. The trend is towards decentralised metadata management and storage, and in particular of heterogeneous metadata and ontologies. Metadata is starting to have structure, some cover management functions, others cover access rights, others the content itself, and finally others preservation. Work continues on indexing, annotation, knowledge extraction and semantic interoperability issues. In the move to digital library services, the focus is increasingly on understanding how to manage a number of technological "plug-and-play" components ("bricks" in the jargon of one project) that can be used to efficiently build digital libraries and new services. This involves working on service discovery, user authentication, etc., and (for example) the integration of on-going work on decentralised public key infrastructures and trust models. It remains challenging to integrate different types of media assets coming from collections distributed across museums, libraries, ar-

chives, music collections, etc.. There is an increased focus also on usage, covering user interfaces and visualisation, search and browsing functions, personalised query, tailoring to different user profiles, and finally considerably more attention is also being paid to evaluation. There is equally the challenge to see how new collections of content can automatically "plug-and-play" into an existing digital library infrastructure and generate new services.

Concerning the domain of "intelligent heritage", research remains dispersed over a vast range of topics, depending upon the type of content and physical locations, etc.. There is an increasing focus on structuring research on data capture and field recording (in particular of difficult types of sites and artefacts), data organisation, virtual reconstruction and visualisation, etc., possibly with a view to standards developments. Work on site visits continues, but now relying on the expected appearance of new mobile technologies, e.g. 3G, wi-fi, etc.. The challenges are now focusing on how to exploit fully new mobility and location functionalities (e.g. linking mobile with GPS and maps), how to provide attractive features for visitors, and how to use the back-shop technologies to better profile visitors and optimise visits. Another challenge is how to deliver the same valuable cultural content across different delivery devices and infrastructures, i.e. Web, TV, hand-held, etc.. New systems will also allow an entire new set of additional possibilities, such as site security control, object identification and tracking, etc..

For film and audiovisual restoration and preservation, there has been a major consolidation to obtain a single industry-strength solution - using a factory metaphor. The focus is increasingly on the needs of the many smaller audiovisual and film archives and the delivery of cost-effective services. This requires a totally integrated approach, covering new contact-less playback devices (to read old formats without damaging them), metadata and preservation information, delivery formats, etc.. Public access and user requirements have become a major issue. Assessment appears throughout the process, for conditioning, restoration, storage and delivery.

In terms of results and products, there is a clear trend towards tangible results in terms of demonstrators, toolkits, testbeds and service trials. There is an increasing focus on test suites and metrics, Europe-wide research road maps, and open source software components. Dissemination through recognised international conferences is now common. Over the past 10 years there has been a shift from "back-shop" management of inventories of objects and

texts, through scientific-oriented professional access, towards open public services for accessing multi-media formats such as music or film.
In terms of institutional co-operation the focus remains on policy development, best practices and guidelines, and on the economics and business models for services. Member States are increasingly investing in digitisation and collection building, and there is a trend towards creating clear long-term co-operation agreements. Recent moves are towards coverage of all Member States in an enlarged European Union.
In terms of institutional participation, the trend to ministerial (or publicly funded agencies, etc.) participation is reinforced and extends now also to the new accession states. Prestigious institutions remain present, while smaller specialist institutions now tend to group together to participate in projects exploiting specific features of their collections. There is an increasing interest in providing a platform for the participation of local institutions. The definition of culture itself has become broader over the past 10 years - moving from the traditional library, museum or archive to public administration, schools, historical sites, TV, film or music collections, etc.. Archaeology remains an attractive field for tests and trails.

In fact the trends can be more systematically analysed for specific domains, and as a function of the maturity of the research effort (at least at the European level). In order to see more clearly these trends, let us look first at one specific research area.

VIRTUAL ARCHAEOLOGY

We have finished some projects in this broad field, however most are still active (see Table IV). And we are also negotiating two additional research projects and a major network of excellence.

What we can see is that there is still much to do to move from a collection or cluster of individual projects in virtual archaeology to seeing a clear organisational and conceptual framework for a new interdisciplinary community. It is clear that much work is needed to reduce both the cost of field recording and data capture and the overall cost of archival and ownership of digital assets. We have set a "cost-focus" to reduce by 50% within 5 years the cost of digitisation and modelling of cultural objects, monuments, sites, etc.. Another

aspect of this is to ensure the rapid transfer of research results to those industries that provide services and support to cultural institutions.

Technical challenges include moving into more extreme environments, e.g. underwater, or dealing with large, complex shaped objects or monuments. Other challenges include modelling textures and reflective surfaces with increasing levels of realism. Yet another challenge involves the increasing use of multi-sensory data, e.g. touch with haptic devices, and collaborative real-time exploration options.

Technologies are being increasingly focused on enhancing visitor experiences, although much still has to be done to convince institutions to invest in going beyond the simplistic visitor centre model. New mobile technologies, such as 3G handsets and wi-fi, will allow in the near future highly interactive and personalised experiences where the visitor arrives with his own access technology and embedded functionalities.

In this domain there is a real need to exchange experiences and best practices, and IPR, ownership and security of digital assets remain critical topics.

Research Trends in Virtual Archaeology (2003-2006)
Objectives: move from a grouping of technology-driven research projects and theme-specific actions and networks, to developing a clear organisational and disciplinary framework covering the interface between digital technologies, on-site cultural heritage, and user experiences.
Focus: shift from technology development and trails with cultural objects and sites, towards the effective and sustainable application of new technologies (often in the field of archaeology).
Approach: still in the phase of individual projects, but moving to using a network of excellence to integrate an increasingly wide range of actors and on-going projects into an interdisciplinary community.
Justification: initially driven by bringing together European research teams and fostering academic-institutional partnerships. The initial focus appeared to be on the cost and quality of capturing objects and information. Now a clear "cost-focus", such as reducing by 50% within 5 years the cost of digitisation and modelling of cultural objects, monuments, sites, etc., or reducing the cost of creating new services and personalised site visit systems - thus, stronger focus on automation

and on understanding the full cost of ownership and underlying business models.
European added-value: moving from an interest to foster partnerships across Europe to contributing directly to economic, social and cultural development by devising strategies that bring together long-term preservation, tourism and sustainable investment.
Field recording and data capture: long-standing interest in 3D capture, but increased focus on texture, reflective characteristics, "in-situ" capture of large or difficult to access items or spaces. New topics include automatic photogrammetry and mapping of difficult sites by robots (e.g. underwater), reconstruction of 3D models by data fusion from sensors, integration of optical and acoustical data into 3D reconstructions.
Data organisation, provenance and standards: the issue of 3D objects as exhibitions remains strong, however there is increasing interest in creating interesting exhibitions using interactive storytelling systems based upon user interests and choices going beyond "passive personalisation". New interest in personalised portals for culture "routes" cutting across several museums or sites. Some initial work done on new ways to structure and present knowledge based upon knowledge maps. Increased focus on defining standards for automatic and manual metadata capture of images and 3D models, and mapping to CIDOC-CRM.
Reconstruction and visualisation: moving from the rapid modelling metaphor to convenient modelling for archaeologists, using open systems running on low-cost hardware suitable for use in visitor centres. New augmented reality systems with visual recognition of location, identification of reference features, real-time tracking, real-time overlaying of 3D models (as opposed to only 2D models) onto real scenes. Building and visualising 3D models with high levels of realism and intricate shapes and textures, allowing visitors to touch and manipulate replicas and see real-time photo-realistic images of the real object (including light-field). Linking 3D objects with collaborative real-time exploration options and moving to shared immersive experiences using high-bandwidth infrastructures. Move towards linking 3D objects with haptic devices to provide

multi-sensory experiences, e.g. see and touch virtual art and sculpture.
Education and communications: the idea of replacing the institution with a virtual surrogate has never been strongly supported, however there is a constant interest in enhancing the experience provided by a museum or site, e.g. hybrid (mixed real and virtual) exhibits and augmented reality for site visits. A substantial shift away from customisation of technologies for presentations and site visits, to the use of new standard technology platforms, where the visitor arrives with his own handset and functions (e.g. 3G handsets with cameras, ear phones, wireless connectivity, etc.). The focus is now on databases and gateways for customised and personalised information over a wide range of user terminals for site visits. Work on achieving interoperability over different information sources for presentation at a given site, e.g. common data formats, etc.. Bring together and inter-operate past research projects in the field of visitors systems. Increased focus on measurable objectives in terms of number of visitors using the systems, and number of objects and locations covered.
Sustainability: in the past there was little focus on the economics or sustainability of the actions, now there are clear economic objectives in terms of reducing the "cost of ownership" of new technologies and new services. Now examining new forms of e-tourism (with the cultural "routes" model) and integrated e-business functions (e.g. creation of digital souvenirs). Now aiming to create prototype generic business models for the cultural domain.
Technical challenges: moving from one-off trails and experiments to setting up testbeds to demonstrate the practical implementation of new "hot" technologies.
Institutional challenges: still in the phase of convincing institutions about the benefits of new technologies (thus increased focus on reducing costs). However this implies going beyond the simplistic economics of individual visitor centres.

Human factors: a noticeable shift from the professional user towards the public user or visitor. Constant interest in allowing the visitor to see, touch and manipulate digital objects. Increased focus on visitor experiences, user trials and links to potential economic impact. Increased interest to testing visitors' reactions to augmented reality.
Non-technical issues: increased focus on market watch and technology transfer issues, through a needs analysis and an inventory of successful technologies. IPR, ownership and security of digital assets remain critical topics. Constant need for the exchange of best practices, and to provide tangible examples of what new technologies can provide in terms of innovative functionalities.
Information and dissemination: moving from one-off meetings and workshops toward the systematic use of major conference events such as VAST(Comitato per la Valutazione delle Scelte Scientifiche e Tecnologiche) and CAA (Computer Assisted Assessment). Introduction of a refereed international journal as an element in creating a community. Greater desire to inform industry about research results.

In other domains we can see a much more substantial consolidation of the research community around a single major challenge and mobilising project.

Let us now look in more detail at one specific research area.

AUDIOVISUAL PRESERVATION

The below table describes the evolution of research trends over two different periods: what we funded during the period 1998-2002, and what we have now started to fund in the period 2003-2006.

What we see now is a clear quantification of the size and urgency of the problem. We also see a major consolidation of European actors around an "industry strength" system for complete and affordable digital preservation for small and medium size audiovisual archives. The concept is a scalable, automated and fully operational "factory" which integrates capture, metadata extraction, restoration, storage, rights clearance, transactions and end-user delivery.

Institutions clearly understand the relationship between access

and preservation, however they will have to abandon the perfectionist view of individual assets and overcome their scepticism concerning long-term mass-storage systems.

Solutions must cover different stakeholder policies and practices implicit in different archival environments, and flexibility concerning storage and manpower costs will be essential. Sustainable legal and commercial models remain critical to the success of this initiative.

Research Trends in Audiovisual Heritage (1998-2002)	Research Trends in Audiovisual Heritage (2003-2006)
Objectives: understand the scope of the problem, and establish a cost/benefit model. Reduce cost of preservation for specific high-risk materials.	Objectives: develop an integrate technical solution and an "industry strength" system for complete digital preservation of all kinds of audiovisual collections.
Focus: developing technologies and processes. Prove the technology works and demonstrate cost reduction.	Focus: build-up preservation factories providing affordable, standardised services accessible to small to medium sized collections.
Approach: through a collection of classical research projects. Incremental approach to prototype systems development.	Approach: through a large-scale "integrated project". Direct attack on scalability and operating efficiency.
Justification: perhaps 50% of existing archives are ageing and need to be preserved before they deteriorate beyond recovery. Preservation is like a tidal wave, it gets potentially more destructive each year.	Justification: all audio, video and film recordings are endangered within the next 20 years. If only 10% of Europe's audiovisual archives are preserved this will cost ~€2.5 billion, and a preservation factory could reduce these cost by 50%.
European added-value: focus on collecting complimentary expertise together. There is a need to provide reliable technical knowledge to conservation bodies about digitisation and preservation issues.	European added-value: audiovisual archives are a typical 20th European cultural asset. Lay foundations for long-term strategic pan-European collaborative effort. Replies explicitly to European Convention for the Protection of Audiovisual Heritage.

Access and Preservation: broadcast archives can fund preservation because of the high business-related value, but do not provide public access. Historical collections provide limited public access, and can not generate revenues to pay for preservation.	Access and Preservation: seen as being inter-related, access generates revenues to finance collection maintenance. Reducing the cost of preservation allows more material to be preserved and provides access to more assets - a virtuous circle is formed.
Automation: semi-automated systems demonstrated to be able to achieve 50% cost saving on preservation. Automation of specific functions such as metadata extraction or summarisation. Replace current manual restoration processes.	Automation: concept of an integrated, highly automated, and workflow optimised preservation factory.
Affordability: the focus was on cost reduction at labour-intensive "bottle-necks". Efficiency of video programme restoration processes.	Affordability: system will be designed to be simple and affordable, including archiving and browsing quality media files, all databases, and metadata extraction tools. Automation of manual processing and documentation will reduce cost of ownership.
Technical challenges: developing different partial solutions for different media. Little focus on hardware and software integration, but a strong focus on semi-automatic metadata extraction and acquisition needed for building Web access. Audio and visual restoration tend to be developed separately. Stronger focus on physical conservation than on physical migration to new digital formats.	Technical challenges: equipment for digitising old formats, metadata extraction, restoration algorithms, storage, rights clearance and management, network bandwidth, secure transactions, end-user delivery. Existing solutions are not of "industry strength" - not robust, scaleable, or affordable - and not integrated into an end-to-end solution.

Institutional challenges: good institutional participation, but little focus on internal organisational issues. Trend to understanding processes, obligations, and internal practices. Strong focus on improving the quality of the individual preservation act.	Institutional challenges: need to abandon the perfectionist "item" view and move to a factory model where scale, throughput and affordability are key. Overcoming scepticism about safe storage of unique copies on robotic mass-storage systems for long-time periods (>20 years).
Human factors: collecting user requirements. Optimisation concerning cataloguing and rights handling. Multi-lingual access (thesaurus and retrieval). Collaborative working environments where users evaluate sources and add valuable information.	Human factors: need for user-friendly tools for workflow (identification, inspection of physical status, filling technical data, preparing transfer, etc.).
Non-technical issues: identify business, user and legal requirements. Move towards a rights management system for distributed archives based upon contracts, including rights annotation tools and a specialised rights analysis engine.	Non-technical issues: need to tailor solutions to different economic and social models, different storage and software costs, various human resource costs, and existing stakeholder policies and practices. Need for sustainable commercial and legal models.

Message 5: What we see is that the nature of a research project has evolved quite considerably. Projects now run over longer time periods (moving from 24-30 months to 48 months), they involve more participants (moving from 7-8 to about 15), and they involve increased funding (moving from €2-3 million to €8-11 million). Whilst research objectives have become more long-term, expected outcomes have become more tangible in terms of tools, products and services. The networks are becoming ways to structure Europe's research communities around the major long-term institutional

drivers (mainly access and preservation). Participation has evolved, with the appearance of representatives of the Ministries of Culture. This hopefully will both guarantee greater co-ordination with national funding, and at the same time ensure easier exploitation of results through national cultural institutions.

TECHNOLOGY-ENHANCED LEARNING

As a side issue, the trends in the technology-enhanced learning area concern new models of human centred learning based upon GRID-enabled collection of technologies, resources and content, to create learner-oriented services (as a complement to the Web-services concept) and open learning environments for the individual learner. The focus is bringing together interdisciplinary teams linking the educational, cognitive and social sciences with emerging technologies.

CONCLUSION

Message 6: Let me try to conclude here by saying that technologies are now appearing that will provide anytime and from anywhere citizens and professionals with access to information. Provided the information is available in a digital form, there are now an almost infinite number of ways of delivering it to an individual. Cultural actors are already challenged to manage an increasing variety of different content formats and contextual frameworks - but they will also have to be able to (and will be expected to) provide a diversity of new services in the near future. In Europe there are world-class collections of cultural and scientific content, and it is normal that we will continue to offer, at the European level, a place to tackle some of the major challenges facing our cultural communities.

I think we can all agree that cultural actors are crucial to delivering integrated and meaningful access across distributed cultural digital collections. However, they are challenged to manage the increasing variety of digital assets and to develop solutions for discovery, longevity, and interoperability. They will need to overcome diverse

> descriptive practices, and to increasingly address the needs of multiple audiences and applications. Users now believe everything is available on the Web and are increasingly intolerant about delays, poor service, and unreliable information. There is a clear demand for new services to be created out of cultural resources - but it is also clear that these opportunities can no longer be developed in isolation. New types of partnerships and alliances will certainly be needed - with the private sector, with other content holders, and across different types of memory organisations.
>
> At the European level, our intervention is increasingly subject to the ability of cultural actors to define properly their problems in a way that compels support. They must guarantee efficient implementation, and provide substantial measurable returns on the investment made. In Europe we are challenging our cultural communities to create a compelling European vision of themselves - and one that is easy to understand by the European citizen. Are our cultural institutions moving rapidly enough to establish leadership on key problem issues? And are they sufficiently vocal and militant about their vision for the future and the values they wish to protect in tomorrow's society?

On the issue of digital preservation the important commitment of the different Presidencies must be noted. Starting with the Spanish Presidency, who was courageous in proposing and supporting a European Council Resolution. Through the Danish and Greek Presidencies, who continued the good work in bringing together experts to exchange experiences. And now to the Italian Presidency, which intends to identify a clear set of practical short-term actions and "fast winners". The EU has already made a strong commitment with the continued funding of projects targeting audiovisual preservation, awareness building, and networking. Now the challenge is to pull all this together - to create a compelling message and to identify the key priorities and practical actions for the near future.

RISKS AND EMERGENCIES: SIX CASE STUDIES

Luciano Scala
Director of the Istituto Centrale
per il Catalogo Unico delle Biblioteche Italiane
e per le Informazioni Bibliografiche (ICCU)

A year ago, when our Directorate General for Book Heritage and Cultural Institutes decided to dedicate to the issue of digital memory preservation the most relevant initiative that would have characterized its contribution to the Italian Presidency of the European Union, I had a long and interesting conversation with a senior official of the Directorate General for Information Society on the opportunity to find the appropriate tools for communicating, to the widest possible audience, the existence of a problem that can no longer be relegated to cultural institutions, as it concerns the whole civic and political society.

Our conversation was principally around the idea that, in recent years, a naïve and certainly exaggerated assumption has been created with regard to the unlimited powers of modern electronic and telematic technologies in solving problems of communication and preservation of knowledge.

This assumption is often accompanied by a lack of awareness of the fact that we can no longer postpone the definition of methodologies and practices for governing the processes of digital production, so as to minimize the risk of memory loss.

From that conversation came the idea that there are two main factors contributing to the widespread emergency on the possibility of ensuring the memory of today's cultural elaboration. First, the superficial and optimistic way of relying on the "self-regulating" powers of industrial processes governing digital production. Secondly, the meagreness of funds for managing such processes (especially in the case of cultural institutions).

I apologize for this long preamble, but the above considerations are at the basis of the survey conducted by ICCU on risks and emergencies in the domain of digital memory - a research I have the pleasure to present here today, at this important international conference.

Prof Alessandra Ruggiero conducted the survey. My personal contribution was quite limited, especially if compared with the

support provided by Prof Mariella Guercio, of the University of Urbino, and by Dr Vittoria Tola and other colleagues from ICCU who collaborated in preparing the survey, which you can find annexed in the Conference's documentation[1].

The survey had the ambition of illustrating a greater number of examples, even though we had decided right from the start to document only governmental cases, that is to say experiences for which official documentation is available. Yet, when the report's editors tried to go into more detail, by means of interviews and conversations, they found it often hard, if not impossible, to gather enough information for creating a comprehensive record of the problem; and not only when working on situations in our country, but also on situations of European and international relevance.

We believe that this first report only shows the outline of the tip of the iceberg. Other significant experiences of total or relevant loss of digital memory remain unknown. And not simply because nobody found it useful to report them, but also, and above all, because in many cases the awareness of the problem turned out to be completely lacking, a factor that comes even before the difficulties in providing an adequate description of the problem itself.

The survey we're presenting you today is, in our institute's intentions, the first of a series of studies in the field. It provides a rather wide-ranging picture, which goes beyond the European horizon with the example of two relevant US experiences. It covers just over 30 years, from 1960 to 1991; and, through the examined cases, it makes it possible to identify multiple factors which will prove to be essential for a future partial or total recovery of digital memory.

I'm here thinking in particular about those recoveries made possible by the discovery, certainly lucky if not by pure chance, of old and obsolete equipment, similar or identical to that used for building the databases, together with the discovery of documentation about databases creation and related procedures.

In addition, there is a paradox in that the emergency was in more than one case sorted out thanks to an "oral memory" recovery: the protagonists of the processes in question were traced, and they still remembered the details of the creation of files and archives to be recovered.

In a society in which more than 90% of information is born-

[1] The survey, in press 2005, is available on ICCU's Web site (in Italian and English), at the URL: http://www.iccu.sbn.it/PDF/emergenze.pdf

digital - with no equivalent being created in a traditional medium (paper or other kinds of medium), as was instead the case in an intermediate phase - it becomes difficult to admit that the production processes at the basis of information creation and existence should basically count on occasional and random factors, such as oral memory and industrial archaeology, to ensure the transmission of present memory to future generations.

The case of the Combat Air Activities File is particularly significant.

I'll hereby quote the survey: "The Combat Air Activity File (CACTCA) contains data from combat air missions in Southeast Asia (…) that flew between October 1965 and December 1970. (…) Each record includes mission name and date; type, number, and identification of aircraft; results of the mission, including loss and damage data about aircraft and crew; and free-text comments. Records also contain data about bombing runs in Vietnam, including the ordnance used and the geographic coordinates where the ordnance was dropped. (…) As much as 30% of the ordnance dropped did not explode. More than three decades later, farmers ploughing fields and children playing in bamboo thickets accidentally caused the ordnance to explode, which has killed or maimed more than 10,000 people. An internationally funded program to identify potential unexploded ordnance is using targets, map coordinates, and types of ordnance for US bombing runs from two Vietnam air combat databases that cover the years 1965-1975, which the National Archives accessioned in 1967-77. (…) The initial effort was unsuccessful because the geographic coordinates were flawed. The reason for these anomalies is that data initially were created and used in a report generator system called the National Information Processing System (otherwise known as NIPS). (…) When the records were transferred to the National Archives, the staff on the Machine Readable Archives Division began a process of "deNIPSing", (…) moving them out of NIPS by reformatting them to a flat-file non proprietary format. (…) For 25 years it was believed that the "deNIPSed" files were trustworthy reformatted records. However, the data anomalies found in Combat Air Activities File raised a question. It now appears that at the time the "deNIPSing" occurred, the documentation accompanying the data file either was incomplete or perhaps missing, because the geographic coordinates, which were encoded in binary (…) in order to conserve space, were incorrectly treated as 7-bit ASCII in each

data field. Consequently, all the geographic coordinates were wrong. Once this problem was identified, a process begun to correctly convert these data fields".

This is, as clearly explained in the report, a case of data anomalies produced by information migration; anomalies discovered only because the National Archives and Records Administration (NARA) had kept the original NIPS and migrated them on more modern media to keep them alive or, anyway, readable.

The Italian case we were able to document directly concerns our Ministry for Cultural Heritage and Activities. It is the case of the Neapolis database, born from a project of the Consortium Neapolis for enhancing the environmental and artistic resources of the Vesuvian area.

The experience lasted two years, from 1987 to 1989. The project was financed by the 1986 Financial Act, also known as the Cultural Reserves Act (*Giacimenti culturali*), and cost 39 billion Italian Lire, that is to say more than 18 million Euros. It enabled the creation of an interdisciplinary working group, composed of 110 experts.

Neapolis, according to many, was: "(…) the first project, in the cultural heritage sector, in which an integrated centre for documentation was created, and also one that was extremely innovative from the technological point of view, in that it was based on a relational database which gathered "catalographic" information (information and images), maps and excavation diaries. (...) [In 1989], the computer in which all data and applications were stored, located in the Data Processing Centre in Boscoreale, was shut down due to a lack of financial and human resources. (…) In 1999, when the *Soprintendenza Archeologica* (Office for Archaeology) of Pompeii decided to look into the possibility of recovering information gathered by the Neapolis Project, they had to take into account the reactivating of the system. Even if this was possible, it would have required an unreasonable financial input. For this reason a project to recover data was initiated, (…) approved by AIPA, which involved some of the people who had contributed to the development of the original Neapolis Project. The recovery was possible thanks to the economic resources of the *Soprintendenza* and was completed in 2000. The *Soprintendenza* is currently involved in maintenance, update and enlargement of the existing database. (…) The recovery project dealt mainly with the database, the most important and valuable outcome of the Neapolis Project. (…) A

fundamental condition for the recovery (…) was the availability, within the company in charge of the recovery, of a mainframe system with features very similar to those of the now disused one in Boscoreale, complete with tape drive. (…) The positive outcome of the recovery (…) was made possible by (…) the identification and availability of people who had collaborated with the original project, preserving its 'oral memory' ".

The last case examined in the dossier is the Web site of the City of Antwerp, the first Belgian city to have a Web site.

The 1.0 Web site version was issued on June 11, 1995; by the middle of December of that same year the 2.0 version was produced. Both versions have an historical value, as they contained "(…) general information about the City (Council, agencies, events, agenda, news, private Web sites of citizens, etc.). (…) Several functions were available to the users: search, links to other Web sites, downloadable software for Web developers, chat café, games corner, newsgroup, etc.. (…) Antwerp was the first Belgian city which had a Web site, called Digitale Metropool Antwerpen (DMA). (…) The Web sites were preserved on backup tapes by the IT-staff of the city administration and transferred to the Antwerp City Archives in the fall of 2001. (…) The IT staff managed to recreate the old backup configuration and to restore the content of the obsolete tapes on CD-ROM. As there was no written documentation, the main reason that made the recovery possible was the help of people who remembered non-written procedures such as passwords and old programming languages, and of people who were familiar with the old configuration. Besides, the recovery of versions 1.5, 2 and 4 was successful because there were still original data on tapes, whereas that of version 3 was unsuccessful, because the source data were not available anymore".

Of the six cases our dossier presents, the three ones I briefly described you emblematically represent both the complexity of the preservation dimension and, at the same time, its dramatic simplicity.

First of all, they prove that in order to transmit to future generations the digital memory of our present and - in more than one case - of our past, we must face a troubling variety of technical and organizational issues and activities, which can barely be reduced to a single unity and which absolutely cannot be managed via pure technological solutions.

In particular, in the first case the recovery of Combat Air Ac-

tivities File data was made possible - though after a long time and irrecoverable losses - by preservation procedures and locations that were related to the existence of a safe and trustworthy repository (the Washington National Archives); and by correct, that is to say intact, preservation of the bit flow - thanks to an archival staff which was aware from the beginning of the risks of performing migration without paying enough attention to the data's original source and structure.

The second example, the recovery of the Neapolis Project, shows how serious feasibility problems may emerge when preservation issues aren't taken into consideration with sufficient caution, and when there is a lack of continuity in active management of projects. Problems that, even when successfully overcome, will, at the end of the day, limit the chances of recovery. A success that, in this case, was anyway due only to the existence of equipment that survived obsolescence, and to the memory of professionals who had participated in designing the system ten years before.

The preservation of the City of Antwerp's Web sites reveals other factors of complexity: the lack of adequate migration procedures and, especially, of adequate management of the project's documentation. Also in this case, the digital memory was saved by the albeit fragile oral memory of those that created it.

We are preparing ourselves to live in a world made of documents, we are convinced that we now have the greatest information heritage in the history of humankind: yet the risk is that, without even being aware of it, we'll have to settle for a mediocre degree in the trustworthiness of documents, resembling medieval jurisprudence in its uncertainty and precariousness.

Let's just consider the recent news: the announcement of the recovery of a palimpsest containing Archimedes' work. The text, underlying a 12th century prayer book, is the only and most ancient Greek manuscript of the great mathematician still existing. Prof Fabio Acerbi, considered a major expert in Greek maths, said in an interview: "Despite today's electronic gizmos, the photos ordered a hundred years ago by Prof J.H. Heiberg (renowned Dutch philologist, who went to Constantinople in 1906 to shoot photos of the manuscript) prove now to be crucial for reading the last pages of the palimpsest".

The sample presented in this occasion is surely limited, yet of great impact. It would be worthwhile to have a wider-ranging picture of experiences of recovery or loss of digital heritage, which

are at this point significant both in quantity and in quality. And not just for the consideration of professional communities, erroneously convinced that such heritage will be there for the next decades, without requiring particular efforts nor costs; but also because these case studies provide important technical and methodological suggestions for defining and promoting guide lines and policies for digital preservation at international and national level, as well as inside single institutions.

A first consideration that we can already make, is that the preservation function has known - up to this point - different phases, and requires specific and varied approaches, including full support for:

a. Creating trusted digital repositories for long term preservation.
b. Creating software and hardware repositories for phases of transition, in order to face short term emergencies.
c. Defining standards, both for producing persistent formats and identifying procedure workflows and handbooks, so as to transmit to future generations - with greater guarantees than in the cases I just described - a reliable and solidly documented memory of information technology projects, which will enable us all (governments, companies, citizens, cultural institutions, research centres) to transform our way of working, taking decisions, and of producing and communicating cultural objects.

DIGITAL MEMORY PRESERVATION: POLICIES AND REGULATIONS IN EUROPE

Maria Guercio
University of Urbino
Co-Director of the ERPANET Project

PREFACE

Since 1999, I've trodden the boards of international conferences on digital memory, very often playing the role - with conviction and frequently in the form of a monologue - of the one who draws attention to the risks and critical aspects of the inevitable changeover we shall face as preservers or users of the new documentary heritage, as we discover the undeniable and crucial advantages of interoperability, immediate access and widespread communication.

Risks and critical aspects that have a lot to do with preservation feasibility and with costs which - as proved by our report on emergencies - are everything but consistent with the belief that creating electronic contents is an easy thing to do.

In these years, with very few exceptions, 15-20 minutes - the time I normally have for my interventions - had to be enough for me to inform, warn, explain, address the various interlocutors on issues we all know to be very complex and concern long term preservation (until "the end of the Res Publica", as promised or menaced by the researches of the San Diego Supercomputer Center). A part from the quality of my performances, similar occasions have all proved to be precious, but could not yield significant and lasting results and merely raised a first, superficial awareness of the problem. The efforts, in terms of information, training, organization and research, required for solving the knotty problems of digital memory preservation are of totally different scope and nature.

This conference is surely one of the first occasions - not just at national level, and together with some sessions of last year's international conference in Dobbiaco[1] - to face the matter with a political and cultural wide-ranging approach, and with realistic ambitions. We

[1] International Conference on Choices and Strategies for the Preservation of Collective Memory, Dobbiaco, June 25-29, 2002.

must thank for this the Italian Ministry for Cultural Heritage and Activities, and in particular our librarian colleagues - the Directorate General for Book Heritage and the Istituto Centrale per il Catalogo Unico delle Biblioteche Italiane e le Informazioni Bibliografiche (ICCU). In the last two years, they have focused their efforts in building a solid edifice, which shall bear the weight of the initiatives we will have to take in the future, together with the other Italian and European bodies and with the technical, political and, I wish to say, as it must not be taken for granted, ideal support of Community bodies. The issue of preservation eventually starts finding its legitimate place within projects funded at the European level, albeit in forms which still aren't very well structured and seem to be quite random. I'm thinking in particular of the ERPANET Project, which I co-direct, and of the Network of Excellence for Digital Libraries, an initiative which has recently been funded: it takes forward the researches conducted by DELOS, and explicitly carries on a specific and demanding preservation activity, with the objective of creating a research network for institutions to effectively cooperate at the European and international level.

Thanks to ERPANET and DELOS, but also to MINERVA - the network of cultural institutions that gathers efforts and ensures the potential continuity and coherence of European initiatives - and to other experiences in the sector I shall not mention for the sake of brevity, we can now count on initiatives that promise to strengthen the foundations of the European edifice. An edifice open to international cooperation for researching, informing and training individuals, and producing the adequate tools to face the technological challenge and safeguard the new forms of cultural heritage.

A solid and shared research infrastructure is unquestionably the starting point for intervening at the organizational and regulational level - a level that in certain situations is as necessary as research itself and which we should immediately begin to face, at least at the European level, with similar energy and awareness. Or I should say with greater energy, since the obstacles and slowness which restrict and impede the taking of common decisions within national and, even more, European institutions, imply long term processes and yield unsure and sometimes ambiguous results, as we have experienced in various occasions, such as, for example, in the case of regulations on access and privacy and of regulations on copyright

and protection of the rights of authors, to the suffering of preservation curators.

My intervention thus focuses on these regulations, legislative interventions and dispositions, studied at their various operational levels. And, above all, it focuses on the efforts that ICCU, the University of Urbino and ERPANET have made in the last months to identify and provide a state-of-the-art of rules in European countries (not only in EU Member States), and in some international communities (I'm referring in particular to Australia, Canada and United States), who in some cases have acknowledged earlier than us the risks of digital preservation.

The survey revealed itself to be a real marathon job. It started late and not in the best time of the year, as the deadline was in full summer. Plus, the institutions we sent our long questionnaires to - with false promises, I have to admit, on how long it would have taken to answer them - are constantly subjected to inquiries by national institutes and international and research institutions, inquiries which are so frequent and complex to be somehow harassing. Those institutions hence had more than a reason for not participating. Yet, luckily for us - and maybe it wasn't by pure chance - many did join our inquiry. The collected data are extremely rich. 47 questionnaires were returned - with significant quality of sample - from relevant national institutes of all Community countries and from many other national situations. The result was hence far better than expected. But I have to admit that the keen support of the European Commission was very important. Mr Maurizio Lunghi, on behalf of the Commission, took the difficult role of pressing institutions for an answer, thus contributing to the success of data collection. And I also believe I can rightly say that using the existing networks (MINERVA and ERPANET) for contacts was another element of our success, since all our institutional interlocutors trust the information that circulates in these two networks. That is a non-trivial indication we should take into account, at the general level, for future developments of this initiative - especially at the political level.

Naturally the questionnaire, prepared in a very short time, should have first been tested. It should have been better evaluated, as certain terms are ambiguous (they can be misunderstood, when applied to different organizational and legal contexts and to different technical sectors), some parts should have been simplified and others deepened. As always in these cases, if we were to do it now

we would have prepared a different questionnaire, though not completely different. Our results are in fact everything but insignificant: we believe they will help, if not in defining a systematic framework of provisions and regulations for digital preservation in Europe, at least in understanding the great number of common critical problems and the still limited range of solutions currently emerging in the different countries.

But was it really necessary to promote a survey on the state of the art of this sector's regulation?

Survey Reasons and its Critical Aspects

There are many reasons that pushed us doing such a hard work. You will judge for yourselves - the organizers have already given you the report's draft version - whether the released results are useful, and consistent with the goals we had established.

As the report underlines, digital memory preservation has long been - for too long - an open issue for professional and academic communities, which for at least a decade, with continuity and perseverance, have been trying to find answers, but without the help of a clear and established framework. This situation, rather than offering advantages, is actually close to causing damage, due to the lack of operational tools, reference points, and tried and shared best practices. The issue's high level of complexity and the lack of guidelines tend to make qualified public opinion weary of the subject, and cause unnecessary aggravation to preservation professionals.

It is therefore necessary to take, as soon as possible, a new turn in the programmes and efforts of the individuals and organizations that deal with preservation at the national, European and international level.

Most of all, besides developing research initiatives and training individuals to become advocates of the issues, it is essential to make available to the interested parties materials and proposals for collaborative work, which may provide a reference point for relevant action at all possible, appropriate and necessary levels.

To me, as co-director of the ERPANET Project for the University of Urbino, and to the Director of ICCU, national, regional, local regulations, guidelines and plans, internal codes, procedure and workflow manuals appeared relevant products to focus on at this time. As described above, we are currently at a time when just

increasing awareness is no longer enough. It is necessary to promote actual change within conservation institutions, possibly in accordance with a coherent logic within European Union countries and, even more important, national contexts.

At the beginning of the study described in this report - a survey of legislation, regulations and policies for digital heritage preservation in European countries - it would have certainly been useful, yet more complex, before actually proceeding with the data collection, to further carry on a phase of preliminary investigation. This has already been done in some specific sectors, and would have been even more appropriate in the case of such a wide-ranging context. This preliminary work might have included a more in-depth systematic analysis of the conceptual, organizational and juridical issues posed by the different cultural heritage sectors, for example developing a framework that may promote and communicate shared understanding of key concepts, issues and possible solutions.

As it often happens in research, there was not enough time to prolong the preliminary work, especially because the chance of presenting the study results at a European conference specifically dedicated to the preservation of digital heritage was not to be missed. It was even more important to participate because of the support given by European Union bodies (DG INFO-E5, "Preservation and Enhancement of Cultural Heritage") to the creation of a European working group able to focus, with continuity and effectiveness, on the issue of digital preservation. Although within the current constraints, the group would also design an operational plan (priorities, timeframe and initiatives) for developing a substantial European intervention in this field.

The importance of national/regional/local regulations and internal policies for digital memory preservation is universally acknowledged to be an important issue that is going to be present in any research initiative, since otherwise it would not be possible to take a coherent approach toward a complex issue, in an environment where initiatives (even European ones) *tend to focus on specific projects rather than create durable services* (though there are some new, important exceptions). This issue is even more relevant if we acknowledge the necessity - an actual operational requirement - to provide, as soon as possible, precise and detailed information to the creators of digital materials.

The results of our work can hardly be summarised in my brief

intervention. I hence invite you to consult the report, which already summarizes and elaborates our research. Before issuing the final publication, we will also ask the institutions who actively participated to verify the contents and evaluate our considerations, at least for those aspects directly concerning them. In some cases, we have in fact found it appropriate to accompany quantitative analysis with a specific in-depth analysis, so as to let the peculiarities of single situations emerge, enhance innovative solutions and create the preconditions for a logic of re-use, which in these sectors always implies context-oriented interventions. We have thus made available a network of information, knowledge and suggestions provided for by the survey, albeit in non-systematic forms.

In this occasion, I shall only make some brief remarks on aspects worth specific consideration, still within the limits I just mentioned, distinguishing the two sections of the survey: the one dedicated to national and/or local legislation, and the other to the internal policies of single preservation institutions.

One of the most critical aspects, which we had previously taken into account and which concerns both sectors, is related to difficulties in sharing a common language, on one side, and making available an organic overview of ongoing initiatives on the other. These initiatives are instead dispersed not only among different countries, but even inside each sector at the national level. In brief, what emerges is a picture of provisions, regulations, and plans as a multiply broken line, its continuity being undermined and its different segments being hard to integrate.

Report Content: National and Local Regulations

In this context, providing a coherent overview of national and local regulations, both current and in development, on digital memory preservation, is unquestionably the starting point of an ambitious and demanding process. A process that tackles different sectors and activities, especially in regard to the general issue of government responsibility and accountability on one hand, and to legal requirements for specific sectors of cultural heritage preservation activities on the other. For these two aspects, I will mention some specific areas of initiative the survey highlighted:

- Creation and management of documentary materials (mostly archival) produced through e-government functions.

- Management and preservation of electronic publications, for which some European countries have established a legal deposit requirement, while other governments only offer, and encourage, the possibility of deposit on a voluntary basis. The procedure that requires depositing *only one copy* creates new scenarios and new risks in regard to issues of authenticity, integrity, and access to the deposited materials. Encryption techniques and access restriction mechanisms might make impossible necessary migration activities: regulations that forbid the use of such mechanisms for the deposited copies are an essential condition for digital heritage long-term preservation.

- Review and update of cultural heritage preservation regulations, especially in regard to policies governing selection, acquisition, and rules for access, use and duplication.

- When promulgating regulations, use of technical expertise of professionals that may be entrusted with the creation, management and permanent preservation of cultural heritage[2].

- Creation of a balance between intellectual property/copyright protection needs and permanent archival preservation needs: no European Union country has consistent regulations in this sector, which has recently been regulated by the European Union in a way that has only partially taken into account user needs and the complexity of the activities necessary for digital heritage preservation. It has been repeatedly pointed out that the digital environment is going to considerably alter the balance that has been in place for centuries among the activities of acquisition, loan and reproduction of materials. In this area, legislations and regulations - which aim to re-build legal balance, through the re-definition of reference points for records and information - are very necessary, although they require great effort.

Within countries, there is a fragmented legislation and regulatory activity and, at the European level, not enough effort is made

[2]Recent electronic records management regulations in Italy prescribe, for example, that public administrations put in charge of their records management services (both traditional and electronic), for the entire life cycle of the records, professionals who received an adequate technical-archival preparation at the university level (dpr 445/2000 on public administration records).

towards reconciling the contradictions in the regulatory activity of European Union governing bodies. From all this, the current situation arises, where regulations have too many different levels and contents, and where too may interventions create confusion, working against the need for a strong coordination activity in this area. Some potential regulatory solutions are emerging in specific sectors, such as the *legal deposit of on-line and off-line electronic publications* and the regulations of *ERMS systems* (Electronic Records Management Systems), which in some countries are extremely detailed, especially in regard to the need for acknowledging and maintaining the over time validity of electronic records and of the so-called "surrogate records" created through digitising programmes. Divergent solutions emerge when it comes to tackling acquisition and management of new dynamic materials, still in the experimental phase. Web-archiving is nowadays a new research front as exciting as, in my opinion, disheartening, at least in regard to the technological, organizational and legal framework and tools currently available to us[3]. The increasing amount of Web documents is going to create new areas of concern and action for legislators. Regulations promulgated in this area often disrupt the activity of professionals who work towards enabling and increasing long-term access to digital online materials, as Andrew Charlesworth pointed out in his presentation at the workshop organized by ERPANET in Kerkira.

Report Content: Internal Policies and Plans of Digital Heritage Preservation Institutions

The other area of in-depth analysis of our report, that of internal policies and plans of digital heritage preservation institutions, shows other critical aspects. First of all, the need to regulate a system of digital repositories management rules and procedural models is not usually perceived as a priority. But our survey showed that some countries already have regulations in place that require, at the national or local level, to approve internal policies for the management of digital repositories.

This happens especially for sectors already under strong control, such as public documentary heritage. Just to mention cases

[3]On this issue see, on the ERPANET Web site (www.erpanet.org), the papers presented at the workshop "Preserving the Web" (Kerkira, May 23-25, 2003).

studied in the report, Sweden and Italy in particular have, at least in the archival field, approved specific regulations over the past few years. At the legislative level, actual guide lines have been set and have to be respected while performing records management procedures, considered compulsory in digital environment. Those guidelines show an increasing attention to standards and principles for long-term preservation.

Yet the problems in this field do not strictly concern only the regulation level. The policy tool is still new and has to be very flexible in order to accommodate the needs of each sector and the characteristics of the material. European traditional practices do not usually have internal written procedures that are formal and official, and they tend not to acknowledge technical responsibilities in this area. There are some exceptions in the English-speaking world, which often, though, does not have specific regulations, but only a general framework. This study, which describes the experiences of the most relevant conservation and research institutions, shows that currently there are only a few specific regulations, especially in regard to records creators (public administrations and companies in relation to their digital repositories, publishers and documentation centres in relation to electronic publications, etc.).

Conclusions: What is to be Done?

Ultimately, the study shows a situation that is still open. Initiatives aren't well connected, whereas the needs are now at a level of emergency, as the majority of institutions has strongly pointed out.

All survey participants wished for a transition, in the near future, from the current occasional and temporary projects to continuing, stable and reliable services. This transition cannot be taken for granted, because it requires adequate financial resources and professional expertise, and, most of all, it depends on the official recognition that there is a pressing need for systematic action.

This situation is still very uncertain, also because of the basic disinterest of the hardware and software market and vendors: though we have seen some weak sign of change, there don't seem to be relevant benefits for the users yet. Thus, the effort to support cooperation and partnership initiatives between document creators and institutional repositories is indispensable.

National regulations and, even more, internal policies, may become essential in prompting creators to take an active role. Every-

body identifies this requirement as the first condition for the results, which have been achieved so far through hard work, to become even more relevant in relation to the quality and quantity of materials preserved at a reasonable cost, and in relation to the feasibility of digital heritage management activities.

As Stewart Granger and the earlier quoted NSF-DELOS report rightly pointed out, solutions have to be sought through a higher level of activity in digital communities. These communities should be able to effect significant cultural change and to stimulate the market, through the development of flexible preservation strategies and of regulations attentive to user needs and their representatives (heritage custodians), as well as through the promotion and adoption of standards and open systems. This promotion and adoption activity, though, will have to overcome the obstacles posed by the proliferation of metadata and standards, which, on the one hand, is necessary, but, on the other hand, may actually hinder the process that these tools were born to support.

In a development process that is everything but linear, increasing potentials go together with new contradictions that only a future reference framework will be able to eliminate. The success of some initiatives taken over the past few years, thanks to the mindful and farsighted support activity of the European Union for the Information Society, shows once and again that cooperation is indispensable and requires the adoption of shared regulation. Among the initiatives, are the NEDLIB project, the MoReQ (Model Requirements for Electronic Records Management) study, the MINERVA and ERPANET Projects, which are both assuming increasingly relevant role in creating or supporting research and practice communities. These are only a few examples of initiatives that almost invariably choose to develop or adopt technical guidelines and standardization activities. It is naturally also important to develop a coherent, if not common, reference framework, which many States and sectors need to rely upon.

The final study report describes some hypotheses of future work, which are currently being developed. For example, the relevant role of new governing bodies and regulatory tools that many governments have created in order to support information society activities in the form of e-government services, clearly emerges, though frequently unaware of the connection with the preservation issue.

It is a world that moves cautiously, slowly, too slowly compared

to the existing risks and to the loss of materials that occurs every day without us even noticing it; *and yet it moves*. Along with these transformations, it grows the awareness of the new needs and requirements that have to be identified and supported in order to guarantee the success of current efforts. In particular, the survey has allowed us to identify consensus among technical operators in regard to the need for framework development and for an adequate institutional effort - both at the European Union and at the national level - that may ensure the positive outcome of the indispensable cooperation activity, within shared operational strategy and with the help of human resources more and more professionally trained and politically aware.

The availability of adequate human resources and of their continuing education, though, is another issue, as important as the other ones discussed here. It will therefore have to be the object of further investigation and consideration, although we can already say that any advanced training project needs the support of a consistent regulatory structure, shared with both single institutions and broader contexts.

FRENCH POLICY ON ELECTRONIC ARCHIVING

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Department for Technological Innovation and Normalisation,
Directorate of the Archives de France

French definition of an archive, according to the bill of January 3rd 1979, isn't related to a particular medium for records. It hence includes both the Merovingian papyri and electronic records. This explains why our National Archives have, since the 1980s, defined and applied a method for electronic archiving.

In the recent years, with the development of e-government, the Directorate of the Archives de France took another step forward, implementing a more comprehensive policy for electronic archives. This policy is defined by the objectives, the tools and the practical actions that I shall briefly present hereby.

OBJECTIVES

Three objectives have been set:

a. fostering awareness amongst records creators and decision-makers;
b. disseminating "best practices";
c. ensuring continual attentiveness to technological and legal aspects.

A paradox of contemporary society is that it gives heritage, of all forms, increasing importance, while using more and more volatile, and hence prone to amnesia, technologies. It is thus fundamental to convince decision-makers that the development of electronic administration has to proceed together with the assuming of responsibility for electronic archiving.

Yet, raising awareness on this issue will not be enough, if archivists won't succeed in developing a method for facing the challenge of electronic records preservation on the long term, and promote its adoption. Technological attentiveness is, in that sense, an essential element of any electronic archiving policy. And it is also necessary

to face legal issues related to the conditions of use and the preservation of electronic records on the long-term.

TOOLS

The Archives de France were recently re-organized, and in that occasion the Directorate created a Department for Technological Innovation and Normalisation (Département de l'Innovation Technologique et de la Normalisation, DITN). One of its missions is to face the issue of electronic archiving.

As the name suggests, one of the DITN main missions is to lay down regulations on the use of information and communication technologies within the public archival services of France. By "regulations" I mean both "provisions", which have to be ratified by relevant bodies such as ISO and AFNOR, and, more in general, all kinds of recommendations, best practice guide lines and general indications. These regulations cover archival description functions and preservation functions for all kinds of medium, electronic media obviously included.

Normalisation is by definition a work of cooperation. Cooperation at the French level, between heritage institutions sharing common interests, but also at the European and international level. If there is an issue whose scope goes well beyond the local level and for which international research is as essential as profitable, that is unquestionably the electronic archiving issue.

Cooperation also implies an inter-disciplinary approach. For example, within DITN there aren't only archivists, but also computer experts. In the same spirit, the Directorate of the Archives de France created a Committee on Electronic Records which brings together archivists and IT, communication and legal experts.

ACTIONS

With the aim of raising awareness and supporting training within this domain, in 2002 the Directorate published the handbook *Les archives électroniques; Manuel pratique*, for both archivists and electronic records creators. Other specialized publications on electronic records will follow. For example, we are about to complete a publication on the archiving of records produced by bureautique means, which will be issued at the beginning of 2004. A manual on Web-archiving should follow.

Various actions for training archivists have also been taken, both in the form of first level courses (held at the National Heritage Institute and in various universities) and of permanent training programmes (internships organized by the Directorate of the Archives).

Our normalisation efforts result in constant participation to the activities of relevant committees, both at the French level (AFNOR CN 11) and at the international level (ISO TC 46). Our main contribution to the work of these committees concerns the definition of metadata models.

Concerning methods, we have been studying the technical aspects of long-term preservation methods (for example: how are Web sites to be archived?), as well as the archival procedures and the legal aspects which are related to information and communication technologies (e.g. legal value of electronic records, authenticity in digital environment, protection of personal information, etc.).

As a result of the attention dedicated to technological and legal matters, the Directorate has achieved a consultancy role for both public archival services and management services used by electronic records creators.

This role has particularly grown in the recent years, with the development of electronic administration in France, particularly in the form of teleprocedures. We may mention, for example, the work done for the dematerialization of the Land Registry in Alsace-Moseley, or for sharing records between local communities and State services.

By participating in all these practical projects on electronic archiving, we try to promote "best practices" and answer to a strong demand for guidance in this domain.

The outcomes of these actions are being discussed - and at this stage any evaluation couldn't be but partial and temporary. Awareness of the importance of electronic archives has surely been raised. Local services are now regularly carrying out electronic archiving procedures. But this isn't enough, if we consider the increasing amount of electronic records that are worth preserving.

As a matter of fact, a change in scale is necessary, if don't want to loose the digital memory of our era. And, in order to provoke this "big-bang" in the archival universe, the national level is essential yet not sufficient. This is why I welcome European and international initiatives such as this conference, hoping that they will support the archive community in facing up with the challenge of the digital information era.

ARCHIVAL SCIENCE & ARCHIVAL ENGINEERING: BUILDING A NEW FUTURE FOR THE PAST

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Program Management Office,
National Archives and Records Administration (NARA)

While we are still at the dawn of the digital era, before too many cultural assets are lost, and before the technology has raced utterly beyond our ability to catch up, we need to construct concepts, methods and operational systems which can preserve and provide access to digital information. In this, we need to be aware of the burden of our own past, of the possibility that the theory, methodology and practice which the archival profession has constructed in the past may hinder progress in the digital era. Not that we should jettison our professional heritage, but we need to be judicious in carrying it forward. On the pragmatic side, without concentrated efforts to build sustainable solutions for digital preservation, the present will have no future.

The essential goal in preserving records is to enable reconstruction of past events, activities, decisions, and states of affairs from recorded information accumulated in the course of action. The role of archives and the archival profession is not to reconstruct the past. That is the proper work of historians, auditors, analysts, genealogists and others, who use records to extend their knowledge or to create new knowledge. The role of archivists and of archives is to deliver the building materials which others use to reconstruct the past. The systems that archivists must build for electronic records should not be mausoleums to house those records, but transportation systems to deliver them, in authentic form, to the future.

At the National Archives and Records Administration (NARA) in the U.S., we describe our efforts to respond to the challenges posed by electronic records as a project to build the archives of the future. This Electronic Records Archives (ERA) will not be a physical building, but a virtual repository in cyberspace. NARA's vision is that the Electronic Records Archives "will authentically preserve and provide ac-

cess to any kind of electronic record, free from dependency on any specific hardware or software". ERA will be a set of capabilities which NARA, other government agencies, and the public can access from anywhere on the Internet for management of government records and to send, find, and retrieve electronic records from the National Archives, Presidential Libraries, and Federal Records Centers. It will be a system in terms of its coherence and comprehensiveness to support the management of records, but the location of the information technology infrastructure which enables this system will be, literally, immaterial to its users.

Through extensive market research, collaboration with computer scientists in research projects, and dialogue with information technology companies, large and small, we have established that, even though most of the basic technologies which are needed to build such a system are available as commercial products, building a comprehensive system capable not only of preserving and providing sustained access to any type of electronic records, but also of supporting the process of managing records, and interacting with innumerable other systems, of various types, in federal agencies, in researcher's schools, libraries, offices, and homes, and - not the least - in the future, is clearly beyond the state of the art. Numerous experts have characterized building the Electronic Records Archives as unprecedented, complex, and risky, but also exciting because it promises to move the state of the art of information technology forward in a new direction, which some analysts believe will be recognized as essential not only for cultural heritage institutions, but also for conducting business in the digital arena. This undertaking is also expensive. The U.S. Government has provided $36,000,000 in 2004 to enable NARA to contract with two companies to produce competing architectural designs for the system. This effort is expected to last one year. After that, NARA will select the best architecture and proceed with development and deployment of the system. The development will be incremental, with initial operational capability expected only in 2007; moreover, NARA expect to expand this initial system four times, with delivery of the complete system in 2011. For these reasons, this initiative is being very carefully watched, not only by NARA's management, but also by the White House, the U.S. Congress, other government agencies, and the infor-

mation technology industry.

A significant factor in the complexity of the system we want to build derives from NARA's decision to acquire a system which supports NARA's entire, end-to-end process of managing records across their life cycle. Recognizing that the basic process of managing records is the same for all records, and in fact requires an integrated approach which encompasses all of the records of any records creator and also all of the records preserved in the archives, the scope of the system extends to the life cycle management of all types of records. There is one basic difference between the way the system supports the management of electronic records and how it addresses other types of records. The system will support the management of all records using data and information about those records, their creators, and the activities in which they were created, but in addition the system will actually process electronic records.

NARA has developed requirements for the system by forming a series of Integrated Product Teams, which bring together representatives of all the different types of stakeholders whom the system must serve. The ERA teams included specialists in all of the archival and records management functions assigned to the system. They included electronic records specialists, and also experts in textual, audio/visual and cartographic records from NARA offices around the country. Three teams progressively identified and refined the requirements, starting with a high level concept of how the system will operate, described in narrative terms from the perspectives of the different classes of users of the system, and ending with the articulation of more than 750 specific statements of functional and system requirements. Throughout this process, a fourth team, consisting of senior managers and chaired by the Deputy Archivist of the United States, reviewed the work of the other teams, resolving policy and other management issues which arose, and validating that the list of requirements does in fact express what NARA needs and wants to do to.

For this purpose, the requirements were translated into 47 "use cases". The "use case" is an object-oriented method for describing a process executed by a system. Each use case describes the actors involved - both humans and other systems - the assumptions and preconditions of the case, the steps taken in carrying out a process, in-

cluding alternate scenarios as appropriate, the results of the activity, the conditions which exist after the process, and any issues identified in analyzing the case. Engineers and other technical staff drafted the use cases from the requirements, ensuring that they reflected all identified functional requirements, and highlighting situations where stepping through a process revealed gaps in the requirements. The use cases covered all the records management processes within the scope of the system, including scheduling and appraisal, physical transfer of electronic records to NARA's custody, accessioning into legal custody, description, search, retrieval, redaction of sensitive records, and disposal of temporary records, as well as generic system functions, such as registering to use the system, monitoring the system, and changing the user interface. The final versions of the use cases were used to revise the ERA requirements.

In order to ensure that the Requirements Document was clear and comprehensible, we released two successive versions of the document for comment to all of NARA, and also outside of the agency to the information technology industry and the general public. We are now using the latest comments to refine further the Requirements Document, with a target of requesting proposals for design and development of the system in December.

What have we learned about the process of developing an archival system?

Building such a system is challenging from a purely technological perspective, but the difficulty is greatly compounded by the disparity between the way archives operate, and the ways archivists think and work and the ways that computer systems are designed and developed. The problems are compounded further in the case of a national archive, or any other archival institution, which is responsible for preserving records from a variety of records creators, because with a variety of sources come differences in both the technical and the archival properties of the records.

One of the difficulties is that requirements must be expressed in atomic, non-redundant terms. Archivists deal with complex cases which have significant internal nuances, vary considerably from one case to the next, and have a lot of exceptions or special cases. As a result, we often express what is required for managing records in terms

that are broad, and even vague, in order to cover as much ground as possible, and ensure that important subtleties are not excluded. One example of problems entailed by imprecise use of language surfaced only after several iterations. In the course of expressing requirements, archivists had described a variety of things we do with records; such as, appraise records, describe records, preserve records, and so on. The Integrated Product Teams went to considerable lengths to decompose these processes to yield clear descriptions. Technologists formulated the requirements statements from what the specialists had told them, and the teams reviewed them. In the second version of the Requirements Document, however, it became evident that the technologists had not been sufficiently well informed to distinguish processes that apply to individual records from ones that operate on files or series. They interpreted the descriptions of processes as operating, in almost all cases, at the level of individual records. The records specialists clearly understood such differences, but neither group perceived this basic disparity in understanding.

Another difficulty stems from the fact that requirements should be expressed in terms of what the institution and the users need, and not in terms of how the system will satisfy the requirements. That may sound simple, but in practice it can be difficult. Many people come to the process with preferences for specific solutions. Prejudice or preference in favour of specific solutions must be excluded from the articulation of requirements. For any complex system, it is impossible to know a priori if any particular solution - even if it is in fact the optimal way of satisfying some number of requirements - will be optimal given the total combination of requirements the system must satisfy.

Keeping solutions out of requirements may encounter difficulty in distinguishing between the two. An area where there is confusion between requirements and solutions is in discussions about techniques for digital preservation. Much of the recent discussion debates the relative merits of migration and emulation. Both of these methods are solutions. The evaluation of techniques for digital preservation cannot be based on technological criteria. It must use criteria derived from the purpose for which cultural materials are preserved. In the realm of archives, the criteria must ensure the preservation of information not primarily as digital objects, but first and foremost as records.

Has the archival discipline clearly articulated the requirements for preserving electronic records in a manner that reflects a consensus of the profession - not to mention the stakeholders - and can unambiguously and comprehensively guide the design and development of systems which will satisfy those requirements? What should archivists communicate to systems developers concerning requirements that relate to the preservation of archival aggregates, such as series and archival fonds? There is a lack of unanimity and uniformity in the archival literature on these topics.

The requirements for ERA, for example, include the capability of materializing different files classification systems. This is needed because NARA must be able to accession electronic records organized under traditional filing systems. But, is a files classification system a requirement for managing records? When records are affixed to paper, the possibilities for organizing them are constrained: the most effective means of linking related records is by placing them in close proximity, and reinforcing this by the physical boundaries of file folders and file drawers or shelves. The physical necessity is the root of filing systems, even though they are elaborated and communicated as conceptual arrangements. But, are such filing systems really required to manage records?

In the context of e-commerce, or e-government, the possibilities for arranging information on Web sites are myriad. Related documents do not need to be in proximity to one another. Not just documents, but specific elements of their content can be related to other documents through hyperlinks. On the surface, then, the "arrangement" of records on a Web site can be very ad hoc. Below the surface, the structure may be regular and rigorous. To support the regular course of electronic transactions, the on-screen presentation of documents, such as order forms, invoices, and status reports, must be linked to underlying online transaction systems. This is the way information is organized to conduct business. To suggest that it should be arranged according to a traditional filing system for purposes of record keeping would introduce a layer of opacity between the user and the relationships that the records originally had to the processes in which they were created and used. The ideal is that records be organized in a way which optimally support the ongoing business of the records creator,

not that the order imposed on the records embody solutions which worked well on paper. Just as digital technology is creating new types of records that could not exist without the technology, it opens up unlimited options for organizing records in support of the activities of the records creator. The requirement for archives is to preserve the way the records creator organized the information it used in its affairs.

These examples show that, in order to translate archival knowledge into viable solutions, we need to construct, or to reconstruct, a dynamic intellectual edifice, one which has pathways for systematically collecting and organizing empirical information about new types of electronic records and new ways that technology is applied in the conduct of business; one which has conceptual spaces suitable for analyzing such information, not only for its impact within the domain of the management of records, but also for what it reveals concerning changes in business processes and in the relationships between these processes and records; and one which is capable of integrating the results of such analysis into the solid foundations of archival science and the effective application of archival methods in automated systems.

THIRD SESSION

TECHNOLOGIES, STANDARDS AND METHODS: THE STATE OF THE ART IN EUROPE

INTRODUCTON TO THE THIRD SESSION

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Member of the Guidance Committee
of the Italian Digital Library

Having to draw the state of the art of digitisation in Europe, in regard to the Italian situation I believe we can rightly say that in our country, and specifically in the cultural heritage sector, the phase of uncritical enthusiasm for digitisation, which we may call the "age of wild digitisation", is eventually over and we are now entering the phase of awareness and maturity.

We all know that digitisation is a complex and vulnerable process, and that such vulnerability is directly proportional to the speed at which technological mutations follow one another – hence, the crucial issue of digital obsolescence arises. Digital memory preservation has long been an open issue for professional and academic communities, which for at least a decade have been trying to find answers, without the help of a clear and established framework.

The main problem is that digital materials depend on the software that makes them accessible and readable. In other words, digital materials do not exist beyond the act of retrieval: we can access and read them only by means of the software which created them. But the types of hardware and software available on the market change very rapidly, not according to a preservation logic but to the industry's interests. Since vendors would not guarantee that their earlier products will still be available after new ones are released, digital materials become obsolescent extremely soon. On the other hand, it is now clear that the organizational efforts and the costs of maintaining digital materials throughout time are much higher than those of traditional preservation procedures.

All this suggests that digitisation cannot be simply considered a spontaneous action of single libraries, but has to be governed by a dedicated and possibly national body, ensuring that all different aspects of the matter are taken into account.

When starting a non-extempore digitisation activity, one must be aware that the process needs to be continuously verified, because contents must be kept alive. Again, this means that digitisation cannot be just a choice option of single libraries, but has to be

planned and coordinated. We should, for example, always have a clear plan of which contents are to be digitised and, on this basis, choose the appropriate formats, storage systems, etc.. In short, we should develop a solid framework for digitisation projects and, furthermore, produce a comprehensive national policy.

Aware of this, the Directorate General for Book Heritage and Cultural Institutes decided to promote the national project of the Italian Digital Library (Biblioteca Digitale Italiana, BDI). The BDI is an organic digitisation project, aimed at ensuring the preservation of and the widest possible access to collections, through the cooperation of libraries. As a first step, we commissioned a feasibility study in order to identify technologies, standards and organizational criteria for developing an organic project. The study was presented at the 3rd National Conference on Libraries, held in Padua in 2001. That conference highlighted the state-of-the-art, in and outside Europe, of the use of digital technologies in the librarian sector. On that occasion, it was also remarked that Italy is a little backward in this field, and the risks of proceeding in a non-organic way and follow different policies, albeit within the national public framework, were illustrated.

The feasibility study also showed how awareness of the challenges related to the building up of an Italian Digital Library is now widespread, and how necessary it is to connect this new Italian initiative to the many and rich initiatives developed by other countries, especially at the European level. The study in fact insists on the importance of a "comprehensive" approach, which focuses on enhancing our cultural heritage and adding value to the project through a strong connection with similar actions ongoing in other countries.

As a preliminary conclusion, after this brief overview of the state-of-the-art of digitisation in Italy, I wish to say that achieving an understanding of the dizzy speed changes of new technologies, providing adequate training for professionals, identifying the real needs of cultural heritage and adapting technologies to such needs, and sharing our different experiences, shall all prove to be successful strategies to benefit from the epoch-making change of the advent of digital techniques.

The issues at the centre of this session ("Technologies, Standards and Methods: the State of the Art in Europe") would have required a whole conference to be fully discussed, and maybe a few hundreds presentations by qualified and authoritative experts.

Yet, as I would like to remind you before we start, the objectives of this meeting aren't strictly technical. The organizers have chosen to focus, on this occasion, on a limited number of "open issues" and on the specific challenges of some specific sectors.

The "open issues" we shall discuss at this round table are basically three.

The first is COPYRIGHT PROTECTION IN TELEMATIC NETWORKS. The issue of copyright is one of great interest when we look at the developments of telecommunication and telematic networks for cultural heritage. The word "copyright" can have various meanings:

- Identification of the competent authority or of the owner of the information (single individual, government or private body, museum, archive, etc.).

- Protection of the confidential nature of a piece of information, so that you can access it only if allowed.

- Respect of the rights of authors, in the sense of asking permission for using a work and/or paying what owed.

For all these three aspects, a wide range of solutions has been produced - yet none of the specific solutions has been fully consolidated, due to a lack of international agreements.

Prof Vito Cappellini, from the Department of Electronics and Telecommunication of the University of Florence, will tell us more about it. He is a great expert in the field and has conducted researches on copyright's protection. He will illustrate us the latest technologies for electronic watermarking of images, by which it is possible to identify, in a safe and robust way, the owner (e.g. institution, library, museum, etc.) of a work, whatever the future use of those images might be.

The second issue is that of STANDARDS DEFINITION and, hence, that of METADATA. Metadata are structured data containing information on other data, developed in order to facilitate management and use of those data. We should not undervalue their importance, if we wish for any given set of digital records to be adequate for scientific communication purposes, and to be certified, equipped with tools for researching relevant information, and long-lasting. With the help of metadata, in fact, an information system can per-

form with increasing precision its three major tasks: identifying, using and preserving records.

On this issue, we will have the intervention of Dr Cristina Magliano from ICCU. Dr Magliano has represented Italy in the IFLA Section on Cataloguing since 2002, and she is the coordinator of the National Group on Metadata, a group ICCU created in order to harmonize metadata standards within the digitisation projects carried out by Italian libraries.

Finally, the third issue is that of COOPERATION. In yesterday's session, there was a leitmotiv running through all interventions: the only strategy to successfully face the challenge of digital memory preservation is that of developing both interdisciplinary and international forms of cooperation.

On this aspect, we will hear the intervention of Mr Neal Beagrie, Director of the Joint Information Systems Committee (JISC), an important cooperation programme on preservation and management of digital collections, promoted by the Higher and Further Education Councils of UK. And we will also hear the intervention of Ms Jacqueline Slats, Program Manager of the Digital Preservation Testbed, a Dutch programme promoted by the National Archives and the Ministry of Internal Affairs, which represents an example of best practice. The Dutch government wishes to perform 65% of its transactions with citizens in digital form by 2006 (the objective of 25% set in 2002 was easily achieved). According to the Digital Preservation Testbed, the most important problem in preserving digital memory is that of technological obsolescence. Thus, they are investigating three possible approaches for long term preservation: migration, XML and UVC emulation.

The three sectors we will examine are CINEMA, SOUND ARCHIVES and AUDIOVISUAL ARCHIVES. The issues and problems of these sectors will be illustrated by Prof Giovan C. Profita, Director General for Cinema of the Italian Ministry for Cultural Heritage and Activities, followed by Dr Dietrich Schüller, a great expert of preservation and restoration of audiovisual archives and current Director of the Phonogrammarchiv of the Austrian Academy of Sciences. Finally, for audiovisual archives we will have the pleasure of listening to Ms Barbara Scaramucci, Director of the Audiovideoteche Rai. The Rai Teche Directorate created the first system in Europe for multimedia cataloguing of audiovisual materials, which then became a model for the European Broadcasting Union (EBU). The Multimedia Catalogue of Rai Teche, licensed in 1997,

has taken the place of Rai's former system of textual documentation, which was based on the Stairs model. And I am really pleased to remind you that Rai Teche has been listed in UNESCO's "memory of Italy" register.

COPYRIGHT PROTECTION IN TELEMATIC ACCESS

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INTRODUCTION

That of Information Technology (IT) is becoming an issue of increasing importance in the area of cultural heritage.

Some highly significant IT aspects are represented by:

a. digitisation;
b. digital memory;
c. telematic access to content.

For what regards *digitisation*, relevant topics to be considered are:

a. digital representation *accuracy* (e.g. the number of pixels of digital pages and images);
b. *quality* of digitisation systems, with particular reference to colour control and calibration for digital images;
c. *virtual restoration*.

In the following, some undergoing activities related to the above topics (*digitisation* and *virtual restoration*) are presented.

In a *digitisation* system, developed by CENTRICA[1] in cooperation with the Department of Electronics and Telecommunications of the University of Florence and with TOPPAN, some very advanced lighting systems and colour management technologies (for colour control and calibration) were employed. The digital resolution, using direct digital acquisition was up to 12,000 x 10,000 pixels. Special *zooming systems* (XLimage®) were employed to access in real time parts of the high resolution digital images and navigate in the content (see *Graphic Appendix*, from fig.1a to fig.1c, pp. 339-40).

[1] http://www.centrica.it

In *virtual restoration*, restoration techniques are defined and implemented for all the image (by using suitable median filters), for *cracks* (through *crack followers*) and for lacunas (by means of segmentation and filling procedures)[2]; (see *Graphic Appendix*, from fig.2 to fig.9, pp. 340-45).

For what regards *digital memory*, topics of high interest are:

a. safe data archiving;
b. digital integrated archives;
c. efficient access to content (*morphology access*);
d. copyright protection.

This last aspect is becoming of crucial importance for telematic access to the content of digital memories and is the object of the following section.

Copyright Protection in Telematic Access

Data (and in particular images) stored in the digital memories can be distributed to remote multimedia systems (users) through communication networks (fixed and mobile systems). Communication networks are mainly represented by LANs (Local Area Networks) and MANs (Metropolitan Area Networks), interconnected through cables, optical fibres and satellite links. The content of digital memory can also be distributed quite efficiently through mobile communication networks (e.g. GPRS and UMTS systems).

To perform *copyright protection* in this distribution of data and images, suitable techniques are to be defined and used. A technical solution for *copyright protection* is currently represented by *digital marking* (*watermarking*)[3].

A *digital watermark* is an identification code carrying information about the copyright owner, the creator of the work, the authorised

[2] M. Bonacchi, V. Cappellini, M. Corsini, A. De Rosa, A. Piva, M. Barni, *ArtShop: an Artworks Image Processing Tool*, Proceedings of the Eight International Conference on Virtual System and Multimedia (VSMM) 2002, Gyeongju, Korea, September 2002; and A.M. Bonacchi, V. Cappellini, M. Corsini, A. De Rosa, M. Barni, *ArtShop: a Tool for Art Image Processing*, Proceedings of the 14th International Conference on Digital Signal Processing (DSP) 2002, vol. 1, pp. 103–106, July 2002.

[3] M. Barni, F. Bartolini, V. Cappellini, A. Piva, *A DCT-Domain System for Robust Image Watermarking*, Signal Processing, Special Issue in "Copyright Protection and Access Control for Multimedia Services", 66 (3), pp. 357-372, 1998.

consumer and so on, which is permanently embedded into the digital data. To be really effective, a watermark should be: statistically and perceptually *invisible* (so that data quality is not degraded and attackers are prevented from finding it and deleting it), readily *extractable* (the data owner or a control authority should easily extract it), *robust* (it must be difficult to be removed by an attacker, trying to counterfeit copyright by means of signal processing techniques, distortions or forgery attacks with multiple watermarked copies of the document), *unambiguous* (its retrieval should unambiguously identify the data owner), *innumerable* (it should be possible to generate a great number of distinguishable watermarks).

In practice it is important that in a digital image (or page) the *watermark* is *not seen* and is attached to the image in a *solid way*. The watermarked content can be obtained practically with the same quality of the original one (the watermark does not alter the image and is not visible). If the distributed content is captured by an attacker, producing a *pirate product*, this product can be examined by the watermarking decoder: the decoder response will clarify if the watermark is present or not![4] (See *Graphic Appendix*, from fig.10 to fig.13, pp. 346-49).

A Virtual Gallery with Copyright Protection

A special *digital memory* project was designed and implemented in cooperation between Europe and Japan: the Virtual Tuscany & Gifu Art Gallery.

The Tuscany & Gifu Art Gallery, available on Internet with free access, contains digital pictures related to ceramics, paintings, sculptures and so on, realised by artists of the Tuscany Region (Italy) and the Gifu Region (Japan).

All the digitisation work was done by the Communication and Images Laboratory (LCI) of the Department of Electronics and Telecommunications of the University of Florence. The digital images were *watermarked* by LCI *patented digital mark*. The Japan Section of the Gallery is managed by the ManART in Toki-Shi (see *Graphic Appendix*, fig.14 and 15, p. 350).

[4] A. Piva, M. Barni, F. Bartolini, *Managing Copyright in Open Networks*, IEEE Internet Computing, vol. 6 Issue 3, pp. 18-26 , May/June 2002.

FUTURE TRENDS

As shown in the above scenario, efficient digitisation techniques, restoration tools and digital storage systems are now available.

A very important point is represented by the copyright protection of high quality data and images, stored in digital form and distributed through communication networks (internet in particular).

While for 2D data and images efficient digital watermarking techniques are already available, further research work is needed to define efficient and robust digital marking techniques. These techniques are needed for objects, such as statues, archaeology items and monuments, especially when their *virtual content* is distributed through communication networks. Some preliminary solutions are currently emerging[5].

[5] F. Bartolini, M. Barni, R. Caldelli, V. Cappellini, M. Corsini, A. Piva, *Some Issues on 3D Watermarking*, Proceedings of EVA 2003 Florence, Electronic Imaging & the Visual Arts, Firenze, Italy, pp. 195–199, March 2003.

METADATA: NATIONAL AND INTERNATIONAL DEBATE

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In Italy, initiatives for digitisation have been developed in the framework of valuable but not very wide-ranging projects. It was only with the creation of the Guidance Committee for the Italian Digital Library (Biblioteca Digitale Italiana, BDI), a committee which the Directorate General for Book Heritage strongly wanted, that a coordinated programme with a clear cultural objective in the field of digitisation was started-up in our country.

Before getting to the issue of how we should describe resources and make the connected functions operational, let me make an important consideration. The crucial issue is not how to catalogue resources, but which resources are to be catalogued. Just as when building up and managing traditional collections, in a digital library project materials have to be selected - a selection that will depend on the type of institution involved, on users' demand and on that institution's material and practical resources. Description and management options arise from this first choice, as well as the characteristics and sizes of the delivered services.

In choosing which cultural and scientific contents we wished to digitise, we tried to bear in mind the various suggestions coming from other countries: the idea of having a "comprehensive perspective" aimed at completing collections, of giving priority to users' needs and to service delivery, and the call for cooperation.

This new concept of services and of relations with the library's partners implies a new policy for digitisation projects, in terms of both choices and investments. A policy that will have to be based on forms of interaction and integration between systems, albeit safeguarding the peculiarities of the different environments.

In Italy, the National Library Service (Servizio Bibliotecario Nazionale, SBN) represents an important model of service infrastructure: it is a distributed system designed for the needs of a federation of cooperating libraries. Just to mention a few figures: we're talking of

53 poles, of 1,949 libraries cataloguing in mutual cooperation, and of about 7 million bibliographic records of modern publications.

In the coming years, one of the major strategies will be that of developing access for records on any possible medium, in order to disseminate and, at the same time, preserve the cultural inheritance of the different countries. Thus, the crucial role of libraries in the "digital era" will be that of developing new technologies for retrieving information, no matter where it was created.

The need for a more precise definition of electronic resources in order to simplify users access, has intensified the development of metadata schema - where metadata are generally defined as "data describing data".

Moreover, the preservation issue - that is the problem of digital media permanence and of ensuring that the carried information remains alive - has become crucial in all domains.

With the mushrooming of electronic texts, images, sounds and objects, accessible via Intranet or Internet or kept in digital repositories, the amount of accessible multimedia information has relevantly increased.

"The treatment of electronic resources includes various functions. Besides describing them for identification, retrieval and access purposes, it is necessary to evaluate and select them not only on the basis of their content, but also of conditions of use. Collections and property rights must be managed, together with the related transactions; in addition, the preservation of digital contents and media must be ensured. All these operations require structured data. In order to carry out such a wide range of operational tasks, specific information is needed - an information which is often hard to retrieve. The goal can only be achieved through integration efforts, not only between different actors, but between different services, technologies and administrative systems which have all, up to now, being seen as separate domains when treating traditional materials, and where the business process was anyway less complex to manage, being long-established". These are some of the considerations of the *Feasibility study for the BDI* commissioned by the Directorate General for Book Heritage in 2000.

INTERNATIONAL STUDIES

As a consequence to this change in notion of publication and bibliographic object, the IFLA (International Federation of Libraries

Associations and Institutions) reviewed both the ISBD(ER) standard for electronic publications and the ISBD(S) standard for serial publications, which was later changed into the ISBD(CR) "continuing resources" standard, so as to include on line resources and related information on their availability.

But it is especially with the IFLA FRBR study[1] that the focus shifts to the object and its content, defining the characteristics by which that content is commonly identified - especially for users retrieval purposes.

The entity/relation model provides a correct understanding of the described object, in its literal and factual aspect, and makes it possible to use recordings which were created in different contexts. The resulting description, with its multiple relations, configures the record as a central core with a set of connected entities, arranged in an array that can be crossed from any starting point.

The new role of libraries in developing new technologies, and the fact that new functions such as access to electronic records and networks appeared on the scene, made it then necessary to develop new technical standards.

Metadata Schema: Studies and Implementations at International Level

In the middle 1990s, when it became necessary to organize the increasing amount of information that was being created, some general metadata schema were developed: the Dublin Core (DC), the Government Information Locator Service [now Global Information Locator] (GILS), and the Digital Object Identifier (DOI). Together with some schema for specific domains, such as the Text Encoding Initiative (TEI), the Encoded Archival Description (EAD), the MD set of the Consortium for the Interchange of Museum Information (CIMI), the Visual Resources Association (VRA) for describing visual documents, the Content Standard for Digital Geospatial Metadata (CSDGM) and the Online Information Exchange (ONIX) editors' standard, just to mention a few. These schema are based on a common syntax, which the machine can read as HTML (Hypertext Markup Language), SGML (Standard Generalized Markup Language, ISO standard since 1988), or XML (eXtensible Markup Language). Metadata can automatically

[1] *Functional Requirements for Bibliographic Records: Final Report*, IFLA UBCIM (1998).

search for the electronic resources corresponding to a given description, through precise tags and related values.

The first and more wide-spread metadata standard is the Dublin Core Metadata Element Set (DCMES), developed by a task force of users. I would here like to remind you that the DCMES establishes a semantic vocabulary for describing the information on the "core" characteristics of a Web object, so as to categorize the object and hence simplify searches conducted by users. Since the beginning, though, the DC community understood that the new tool worked well for both digital objects and objects on traditional media.

Recently, the extension and development of some types of metadata has made their application possible not only for electronic or digital resources, but for describing all kinds of resources: museum, library and archive objects, etc.. In some specific situations, the resource in question may be a whole collection of objects, or just a part of them: among the typologies of elements, we find images, sounds, services, events, collections, texts, etc.. The single metadata can describe the model of a process or an event, and persons and roles. The community also developed a library profile, and introduced the concept of a set of elements coming from various metadata schema used in other domains - bibliographic formats and formats used by creators, etc., included - with a statement on the field of application (libraries, in this case). The aim is to simplify the making of descriptions and the exchanging of formats coming from different systems, and also to acquire bibliographic formats from non-librarian communities, by converting them through the DC scheme.

In the domain of digital preservation, many studies and initiatives discussed the fundamental tasks when using metadata to support the long term preservation of resources. In particular, between 2001 and 2002, an international experts group was created within the OCLC (Office of Research) and RLG Community, representing a wide range of institutions and initiatives. Metadata for preservation purposes were studied and defined, and the state-of-the-art of their use was examined. Two studies were then issued: *Preservation Metadata for Digital Objects: a Review of the State of the Art* (January 2001), and *Preservation Metadata and the OAIS Information Model: a Metadata Framework to Support the Preservation of Digital Objects* (June 2002). The latter developed both a conceptual model and an information system.

The OAIS Open Archive Information System model provides a conceptual framework of reference. Originally developed by the Spatial Research Community while producing standards for preserving relevant data on space observations, the model proved to be adequate for the mentioned purpose also for other types of communities, since it can be applied to any kind of digital or analogue archive. The focus is on the issue of responsibility for long term preservation of digital information: it is a distributed archival model centred on information creators and consumers, records managers, and also on the archive itself and for its interactions. Later, we will see how this model was adopted at the national level for recording digital objects.

Since 1999, within the IFLA Cataloguing Section a Working Group on the Use of Metadata Schema was created, coordinated by Prof Lynne C. Howarth, Dean of the Faculty of Information Studies of the University of Toronto[2]. The group prepared a first draft of guide lines, which were presented in Berlin, in August 2003, during the IFLA Conference. One of the objectives set by the group is to define a "core record" for metadata: a set of elements more commonly in use in a number of schema, which can be used by electronic records authors and/or editors, so as to both simplify their queries and produce elements which may be inserted in a catalogue record.

The core takes the Functional Requirements for Bibliographic Records (FRBR) into account. The FRBR is a new scheme developed by IFLA, which clearly identifies and defines which are the entities of interest for end-users. It is a basic conceptual model for bibliographic records, dealing with a wide range of possible situations and contexts. An analysis of the bibliographic entity in its attributes and relations corresponds to the following model-defined functions: find, identify, select and obtain.

On the basis of the 15 elements of the Dublin Core, a list of information to be included in a record according to the FRBR model was produced. The "core standard" is independent from the specific scheme in use, and rather represents a model or structure for electronic records in any kind of format, and for any discipline of the intellect and domain of knowledge.

A so called "master crosswalk" was developed, containing the

[2] http://www.ifla.org/VII/s13/guide/metaguide03.htm

schema mainly in use within the bibliographic control communities[3].

The core record for metadata includes the following elements:
Subject
Date
Conditions of use
Editor
Name given to the resource
Language/Mode of expression
Resource identifier
Type of resource
Author/Creator
Version

In conclusion, I wish to remind you that the 2003-2005 Strategic Plan of the IFLA Cataloguing Section, presented in Berlin at the last annual conference, listed the development of guide lines, especially in the domain of digital resources, among the processes and tasks of cataloguing activities. The adoption of MD in projects for collecting and organizing electronic resources was particularly encouraged, together with the promotion of common approaches for MD exchange. Moreover, the identification of a potential MD market (e.g. developers and users of commercial MD, such as ONIX[4]; portal creators and information industry) and of strategies for the promotion of bibliographic standards among these actors, was discussed as an issue of great relevance.

INITIATIVES IN ITALY

In Italy many institutions have been working to improve search, retrieval and access functions for information related to cultural heritage. Archivists, librarians and museum professionals are all involved in digitisation projects aimed at improving knowledge of and access to collections. The importance of digitising original texts or reproductions, and the technical issues related to this process, are all relevant aspects of a project - yet the application of metadata for digitised collection retrieval adds value to the project itself, and shouldn't be underestimated.

Common initiatives for enhancing contents, harmonizing de-

[3] http://www.fis.utoronto.ca/special/metadata/shortwalk.asp
[4] http://www.editeur.org/onix.html

scription standards and disseminating information on the cultural heritage of the different sectors, already saw the cooperation of archivists and museum and libraries professionals. In particular, important results were produced for what regards photographs and prints – making the best out of the different professional skills available.

In 2000, ICCU created a first group for carrying out, at the national level, a survey of ongoing initiatives for metadata application in digitisation projects; for promoting initiatives for interoperability between different domains (libraries, archives, museums, etc.); and for coordinating all these initiatives within the various projects, by providing guide lines and literature of reference on normalization.

The main objective was to create an observatory with the institutional mission of guiding, supervising and coordinating the projects carried out by the different institutions.

This initiative promoted studies and surveys which saw the active participation of our Central Institutes and of representatives from universities, regions, research institutes, cultural institutes and other State bodies. As a first step, metadata application in digitisation projects was monitored at the national level by means of a questionnaire. In the meanwhile, two sub-groups were created: one for defining common sets of descriptive data for different domains; and another for facing management/administrative issues. In both cases, standards and models of reference at the international level were taken into account.

In order to make this activities visible and spread information on the national projects which had been censused, in April 2001 ICCU promoted a dedicated workshop. That meeting turned out to be a proper operational exercise: not only information on the state-of-the-art of such projects was provided, but the seminar was a successful occasion for defining a "common" method.

Within the reference framework of European projects which saw the participation of Italian partners, some specific issues related to the architectures of the various delivered services, and to the differences between such architectures, were discussed - under both the technological point of view and that of interoperational formats and standards. By exchanging skills and comparing different models and experiences, it was possible to define the approaches for integrating and developing shared strategies. Moreover, the various undergoing projects provided a starting point for

enhancing our project design capacity, which is the main objective of the digital library model - a model of cooperation and of organizational evolution of information.

The subgroup on descriptive metadata had the objective of producing a flexible model for identifying a set of metadata elements which could be extended to different cultural heritage domains, for information exchange and users searches purposes.

The first approach was to assess whether there existed a standard already in use that could be effectively adapted to different needs, or whether it was necessary to develop a new model for ensuring the interoperability of metadata created in different domains.

A number of metadata already developed were taken into account, such as the Mapping Dublin Core/Unimarc – which was implemented by ICCU and proposed for the European Network in Europe Project, to which ICCU participated together with the Austrian Army Museum, the Danish Library Centre, Bibsys (NO), the British Library, the Essex Libraries (UK), the Crossnets Systems, the Helsinki University Library, the Hungarian National Library, the Department of Libraries and Information Sciences of the Oslo College, Joanneum Research (AT), the Libris Department of the Royal Library (SE), and the University of Oslo Library. The project was partly funded by the Libraries Programme of the European Commission.

I also wish to mention the ONE-2 Project, natural follow-up of the previous ONE Project, where ICCU implemented a s/w in c/s architecture, basing search and retrieval procedures on the Z3950 Protocol (SBN online) and using a non qualified Dublin Core metadata for queries.

One of the first difficulties met by the subgroup on descriptive metadata was that of the semantics of the different elements. Thus, on the basis of cross-walks the group tried to establish, for the different domains, an equivalence that would take the problems inherent to the granular and semantic nature of data into account - in order to safeguard their peculiarities, rather than flattening them.

The different crosswalks which had already been produced and published on the Internet were analysed: DC-CDWA-CIMI Mappings (CIMI: Consortium for the Interchange of Museum Information), and others:

www.getty.edu/gri/standard//intrometadata/3_crosswalks/index.htm

http://www.loc.gov/marc/marc2dc.html

http://www2.sub.uni-goettingen.de/metaform/crosswalks.html
http://www.schemas-forum.org/registry/registry.html

And the metadata registries for identifying already developed schema and application profiles:
http://desire.ukoln.ac.uk/registry/
http://www.schemas-forum.org/registry
http://www.ukoln.ac.uk/metadata
http://dublincore.org/groups/registry

We thus identified a mapping model, to compare descriptive data and single out the essential elements for identifying a digital object.

A compared study of metadata-related or profile-related elements and of elements related to specific norms and descriptive standards in use in the historical and artistic, museum, archival and librarian sectors, as well as within official literature (reports and Parliamentary Acts), was carried out for different applications, under both a semantic and syntactic perspective.

We used this analysis, and its connected glossary of terminology in use, to highlight the different semantic meanings of a number of elements. A very illustrative case is that of the "title" element, which in the historical and artistic sector can, at the same time, be referred to the historical or traditional names of an object (for archaeological pieces and works or objects of art), to the asset's denomination according to official sources (architecture), or to data related to the subject according to traditional iconographic definitions. On the contrary, in the archival field it corresponds to the title of the unity as sub-element of the identifier of the documentary description. Whereas in the librarian world it both corresponds to the title itself and to the title's complement - other titles of access such as variant forms, uniform title and key title included.

The subgroup on administrative and structural metadata had set the objective of defining a metadata set relative to:

- modes and policy of access to digital resources;

- organizational and management aspects for digital objects and connected services;

- long term preservation strategies for digital objects.

For this purpose, the key components and processes of electronic records archival, management and preservation activities were studied. On the basis of the OAIS[5] (Open Archival Information System) model, used by the digitisation projects of the Library of Congress and by some important experiences of the librarian and archival world - such as NEDLIB (Networked European Deposit Library)[6] and CEDARS (CURL Exemplar in Digital Archives)[7] in Europe, and PANDORA (Preserving and Accessing Networked Documentary Resources of Australia)[8] in Australia – the group prepared a preliminary draft version for identifying a scheme for administrative metadata.

The functional components of the model are: Ingest, Archival Storage, Data Management, Access, Administration, plus the Preservation Planning component (which was suggested by the NEDLIB Project). OAIS also provides a preservation-oriented model for structuring data. Data are connected to an information package on their representation, so as to make them understandable under both a structural point of view (format details, description of the software of access, etc.), and a semantic one (e.g. language in ASCII text).

Information objects can build up three types of IP Information Packages. These packages are structured as follows:

- SIP (Submission Information Package): used for the phase of data submission/acquisition.

- AIP (Archival Information Package): conceived for long term preservation.

- DIP (Dissemination Information Package): transferred by OAIS to the single user on the basis of an application for access.

Descriptive metadata for retrieving digital objects are usually registered and managed outside the archive of objects, yet connected to them. Administrative management metadata enable

[5] http://www.rlg.org/longterm/oais.html
[6] http://www.kb.nl/coop/nedlib/
[7] http://www.leeds.ac.uk/cedars/
[8] http://pandora.nla.gov.au/

management functions for digital objects - particularly, users access and preservation functions (digital preservation and reformatting functions).

The different digital objects have been organized in a hierarchical structure of layers:

- Digital collection (set).

- Aggregate: a set of digital objects of homogeneous content typology.

- Primary object: a digital object that can be defined as a unity, generally corresponding to a physical unity.

- Intermediate object: a particular form or format of the primary object.

- Terminal object: the single file delivering an elementary unit of digital content.

The relation between the complete set of transmitted files and the bibliographic record is described by the three following tags: <piece>, <completeness>, and a <sequence_number> associated to any image.

We considered the following cases:

a. The bibliographic unity and the physical unity correspond (e.g. a single volume monograph).
b. A physical piece of a set (e.g. a file of a periodical).
c. A component part which does not correspond to a physical unity (e.g. the chapter of a book).

The <stru> section completes the structural metadata with an index of the different sections of the digitised object. Representational information can be associated to these metadata.

On the basis of the work carried out by the group in these years and of experiences learnt within the digitisation projects implemented by the Directorate General for Book Heritage, the BDI Guidance Committee proposed, and it was agreed, that such structure was qualified to be the reference group for promoting and developing metadata standards, considering the experience it accrued

and the actions it implemented.

Hence in 2003 ICCU, which is in charge of the dissemination of bibliographic regulations and standards, created a permanent working group: the MAG Committee[9] became the reference group for activities connected to the promotion, support, management and evolution of the MAG Administrative and Management Metadata Standard, as well as for offering assistance and counselling to the librarian, archival and museum communities for what regards the management of and access to information on digital objects.

The objective of MAG is to produce a XML scheme, based on the METS model used by the Library of Congress, and to prepare a minimum set of management metadata that could be applied in digitisation projects.

The model provides formal indications for the phase of collecting and transferring metadata and digital data in the respective archives (SIP phase of the OAIS model).

A Namespace is associated to each metadata format, setting the terminology with no possible ambiguity, together with a XML Scheme which sets its syntactic structure.

The permanent activities of the MAG Committee can be summarised as follows:

- disseminating the MAG standard;

- maintaining and further developing the produced standards;

- producing handbooks and guide lines;

- assisting implementers;

- carrying out training and promotion activities;

[9] The MAG Committee members are: Gianfranco Crupi (Biblioteca A. Monteverdi - Università degli Studi La Sapienza di Roma); Gloria Cirocchi, Simona Gatta (Biblioteca della Camera dei Deputati); Maurizio Messina (Biblioteca Marciana di Venezia); Giovanni Bergamin (Biblioteca Nazionale Centrale di Firenze); Antonio Scolari (Centro Servizio Bibliotecario della Facoltà di Ingegneria – Università degli Studi di Genova); Francesco Baldi (Discoteca di Stato); Matilde Amaturo, Marco Lattanzi (Istituto Centrale per il Catalogo e la Documentazione); Claudio Leombroni (Rete Bibliotecaria di Romagna - Provincia di Ravenna); Antonella Mulè (Ufficio Centrale Beni Archivistici); Marco Veneziani (CNR Roma) Paul Gabriele Weston (Università degli Studi di Pavia / Biblioteca Apostolica Vaticana); Cristina Magliano, Patrizia Martini (ICCU).

- establishing a connection with other projects and agencies (Dublin Core, European Projects, etc.);

- developing schema and profiles for the application of descriptive metadata in the different sectors of culture.

The MAG Committee is already at work; a Technical Board has been created for evaluating requests and providing assistance, coordinating activities and extending standards. Currently, the scheme is being updated and its handbook prepared. We also intend to prepare recommendations and guide lines for end-users, providing both general and specific indications for describing and managing different typologies of materials, also with respect to the various domains of culture.

All the relevant documentation on the activities of the MAG Committee, together with links and technical references, can be found on ICCU's Web site[10].

MD DEVELOPMENT: TOWARDS AN OPEN STANDARD

The analysis of the conceptual models which the various communities are developing, increasingly supports the idea of creating modular metadata and producing an ontology which goes beyond the different models and harmonizes them. The TEL Project[11], one of the latest European projects for cooperation and access to digital libraries, has among its objectives that of developing common standards for metadata – in order to support an increasingly wide access to materials of any kind -, carrying out a concerted action of participating libraries for multilingual access, and developing open standards and shared practices for a policy of wide and coherent access to all accessioned resources, also for remote users. Italy took part in the project and actively contributed in defining a profile for both digital objects and for describing the collection entity. For what regards the latter, Italy developed a specific MD model, starting from the DC model.

The Tel profile includes the following elements:
Title
Creator

[10] http://www.iccu.sbn.it/standardBD.html
[11] http://www.europeanlibrary.org

Contributor
Editor
Subject
Description
Edition
Date
Type
Format
Identifier
Origin
Language
Relation
Coverage
Rights
Public
Location
Record's identifier
Owner

THE MINERVA PROJECT (MINISTERIAL NETWORK FOR VALORISING ACTIVITIES IN DIGITISATION)

The objective of the MINERVA Project[12], coordinated by our Ministry for Cultural Heritage and Activities, is to encourage the creation of a common European vision in terms of actions and programmes for ensuring access to and dissemination of cultural heritage through networks – an objective which should be achieved by coordinating and harmonizing digitisation activities. Within the project, the WP3 Inventories Working Group ("Discovery of Digitised Content, Multilingualism Issues") has been created. The group is coordinated by the French Ministry for Culture and Communication, and one of its objectives is to create indexes of digitised fonds, in order to identify and collect in a single database all information on digital collections or digitisation projects. The index should cover all types of contents and services within the cultural heritage domain. After analysing the state-of-the-art, the group identified the major entities of a digitisation process: institution, project, digital collection, and agents and their respective roles. Various MD sets were studied, and a common

[12]http://www.minervaeurope.org

profile for each core entity was drawn. In addition, the service/product entity was defined, on the basis of the DC Collection scheme, which enables to access content (usually it is an online database, but it could also be a virtual gallery or a CD-ROM). The "service" definition was taken from the Dublin Core: "A service is a system that provides one or more functions of value to the end-user. Examples include (…) interlibrary loans, a Z39.50 or a Web server" [13].

The group is currently analysing the problems of multilingual access by subject in the different domains of cultural heritage[14].

ONTOLOGIES

Ontologies deal with concepts and relations between concepts, whereas other types of indexing systems would only deal with terms and with their relations. Thus, it is possible to use ontologies for generating a series of classes and of canonical relations between concepts (synonyms, class/subclass, belonging to, part/entire, inverted relation), as well as properties and attributes of concepts.

Starting from these correlation systems, you can then create some operational applications capable of generating associations of concepts belonging to different domains: by marking the data it is possible to generate semantic relations between different vocabularies.

Within various European projects, attempts were made to harmonize the operational applications deriving from different schema.

An example is the ABC model[15], developed by the Harmony Project. The model builds up its set by taking into account different metadata models, developed by different communities (DC, INDECS, CIDOC, IFLA).

The set is made of the following entities: resources, events, inputs and outputs, actions, context, event's relations.

The model starts from an event perspective and represents the relations between the different manifestations of a given creation.

[13] http://dublincore.org/usage/terms/dcmitype

[14] The following institutions participate to the Italian WP3: Segretariato Ministero per i Beni e le Attività Culturali, ICCD, Archivi, Istituto per i Beni Artistici e Culturali della Regione Emilia-Romagna, ICCU, and various experts.

[15] C. Lagoze, J. Hunter and D. Brickley (2000) *An Event-Aware Model for Metadata Interoperability*. www.cs.cornell.edu.lagoze/papers/ev.pdf

This vision enables us to clarify the semantic associations existing between the various properties of the resource's life cycle and the involved agents. An illustrative example was provided by Prof Jane Hunter in her paper on the model. The example studies a resource, a 130 minutes audio file, reproducing a performance (a Concerto for Violin) held at the Lincoln Center on a given day.

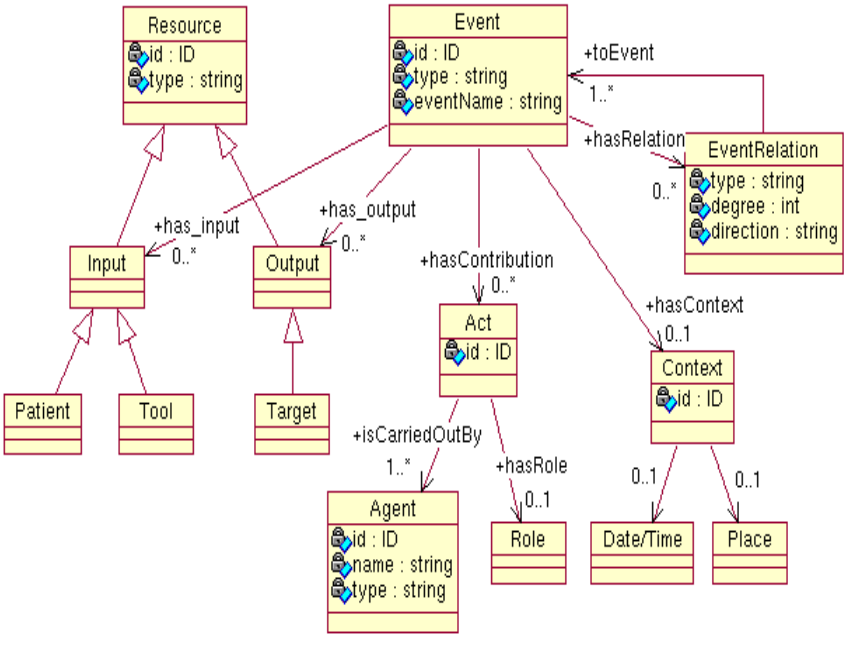

Figure 1: Representation of the "event" ABC metadata model *(from "MetaNet-A Metadata Term Thesaurus to Enable Semantic Interoperability Between Metadata Domains", Jane Hunter, Journal of Digital information, vol. 1, issue 8).*

Figure 2 shows how you can create a common mapping matrix for representing data coming from different domains, starting from the first block representation model and using a mapping language (such as XSLT).

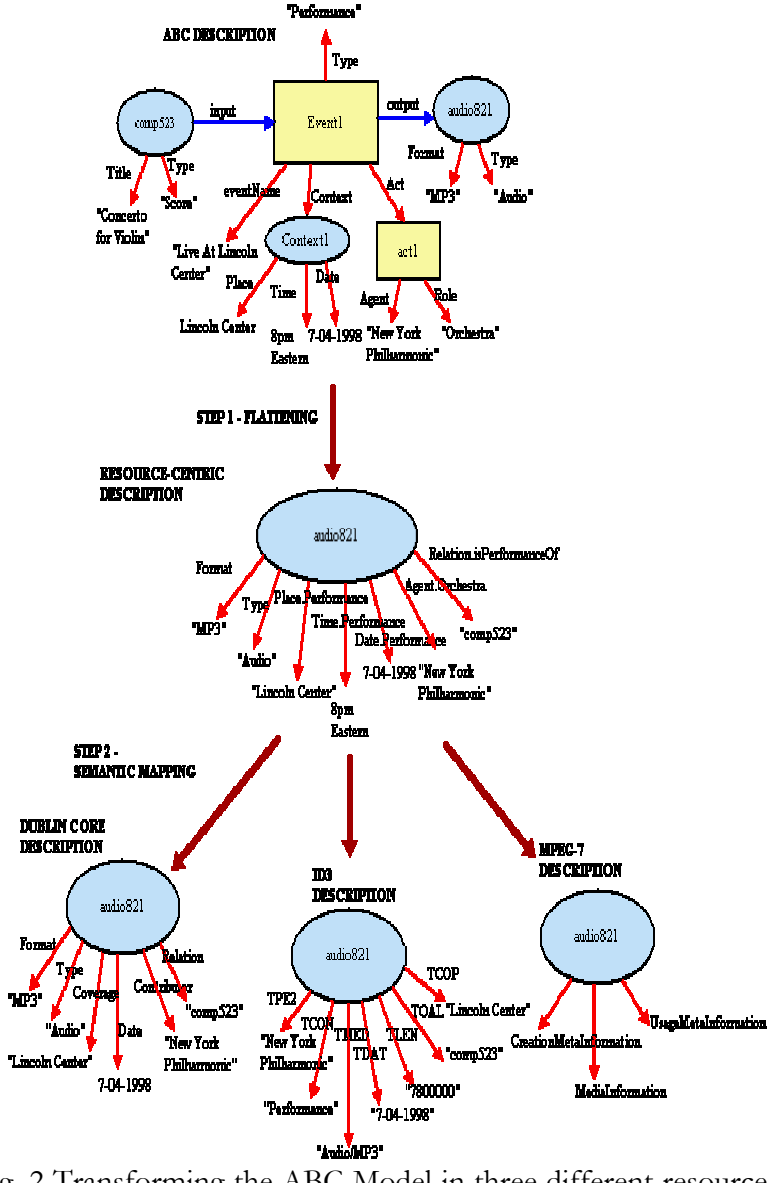

Fig. 2 Transforming the ABC Model in three different resource models *(from "MetaNet-A Metadata Term Thesaurus to Enable Semantic Interoperability Between Metadata Domains", Jane Hunter, Journal of Digital information, vol. 1, issue 8).*

These semantic relations between different vocabularies have some limits, as elements are not exactly equivalent. The next step will be that of building a metathesaurus for supporting hierarchical, associative and equivalence relations between terms derived from different metadata sets.

Another important study, at the international level, is the "Modelling Metalevel Ontology" developed by the Faculty of Information Studies of the University of Toronto[16]. A set of 17 common categories of elements were studied, belonging to 9 different metadata schema which are currently used to organize digital collections of cultural resources. This general scheme is aimed at creating a sort of "lingua franca" for the Web user. The model is based on a crosswalk server, which interprets the user's submissions and sends them to the different metadata schema (CIMI, DC, EAD, ONIX, TEI, etc.). It was developed in the form of a "metalevel scheme" prototype, so as to test its effectiveness while assisting users.

One of the major tasks, also in terms of costs, is to continuously review the various categories of names and their respective definitions. Besides, this seems to be the correct route to follow if we wish to create a service for showing users the way through the different communities of knowledge.

[16] http://www.fis.utoronto.ca/special/metadata/

CINEMA AND PRESERVATION

Giovan C. Profita
Director General for Cinema,
Ministry for Cultural Heritage and Activities (IT)

Today, the art of restoration and preservation of cinematographic heritage is a domain of uncertain borders, visited by everybody and nobody, where no codified rules, nor shared methods within major international centres for restoration, nor educational centres training new professionals in a field undergoing deep changes, exist.

Cinema has its own characteristics, yet it isn't the first serial art needing restoration. There are many kinds of serial artworks: books, prints, engravings, and even bronze statutes where different moulds are created from the same model. Hence, in the coming years we can hope for a more scientific, compelling and shared approach also in the domain of cinematographic restoration.

Dominated as we are by the idea that the future will be better than the past, it was only recently that an interest for the history of cinema grew among an increasingly wide public, who has started discovering the great energy and the artistic and commercial value of the cinematographic heritage of the past. So that today many people, and not only professionals, understand that there's a need to preserve and restore films - but where does this new awareness come from?

We must consider the two essential aspects of a film: its short commercial life and its extremely fast process of chemical and physical degradation. A degradation not only experienced by cinema professionals, but by anyone who ever took a photo or shot an amateur movie. Since the origins of photography, still photos would be taken to preserve a moment and make it last in our memory. Would anyone ever think, while taking a photo, that it will suffer the ravages of time just as we do, that colours will fade away until the photo becomes transfigured and that restoration will be needed? People tend to believe that an image stolen from reality will live an eternal life, though we have all experienced that this is, in fact, nothing but a wrong assumption.

An assumption that has strongly prevailed and even influenced, for many years, the choices and behaviours of professional communities which should have ensured a future to films: ministers, schol-

ars, film archivists. Even in nations with a strong focus on policies for cultural heritage, recognising that the cinema of the past was an asset worth preserving wasn't enough to address the need of actively preserving, copying and restoring films.

The nature of cinema is different from that of other arts: there are three instances coexisting in cinema, and each of them influences in a contradictory and crucial way every restoration activity.

CINEMA AS AN INDUSTRY

Up to the early 1970s, once the distribution of a film in theatres was over, the film lost its business potential. Today, thanks to television, home videos, and other channels of exploitation, the commercial life of a film has become remarkably longer and is potentially infinite. Hence, after decades of total negligence, rights holders have started to preserve and restore films. By rights holders, I here mean anyone who has rights to exploit a cinematographic work - for example, the producers of a film, or a third party they might have made over their rights to at one point. Anyway, whenever an old film is screened in theatres or presented in VHS or DVD as a "restored" version, its commercial value increases remarkably. Thus, since a few years private investors are more and more into restoring movies, planning to get their money back by box-office and Home Video sales.

CINEMA AS AN ART

Whether the business soul would prevail or not over the artistic one is something that has been debated since cinema was born. It took many decades and infinite efforts for films to be recognized as cultural heritage. Under this perspective, restoration must be seen as an essential moment of a work's life. Unfortunately, in these first few decades of history of restoration, it hasn't been so, while it often happened that cinema institutions themselves irreversibly damaged the integrity of a cinematographic work when operating on the film matrixes to restore them.

CINEMA AS A DOCUMENT

In the last thirty years, the notion of heritage has deeply changed: its borders aren't that stable anymore and tend to extend, including

anything that was ever produced. Thirty years ago, you would have found very few film critics ready to admit our Totò movies among the works to be restored, whereas today you would find very few refusing to do so. The canon criteria seems less and less tenable: it is in fact hard to decide which films are to be considered as works of historical value. Cinema has an intrinsic documentary nature: it captures bits of reality, it expresses the climate, taste and flavour of ages and places better than any other form of description could. No other century has witnessed as many events as the 20th century did. Wars, destructions and changes have been described by the cinematographic heritage with richness of details.

That of CINEMATHEQUES is a heterogeneous universe of archives, which we may identify with the one and only existing international association: the FIAF (International Federation of Film Archives), with its more than 120 affiliates representing 65 countries. These cinematheques differ from one another in nature, objectives, structure and funding. FIAF brings together archives spending most of their budget in preservation and restoration activities, institutes almost exclusively dedicated to the dissemination of cinematographic culture, and museums and film libraries.

By dividing the 120, or more, FIAF archives into homogeneous groups, we can identify four major subsets.

Firstly, the big NATIONAL ARCHIVES exclusively dedicated to preservation and restoration. Since preservation and presentation activities are seen as two completely different things, these organizations, which are often oversized and overwhelmed by bureaucratic duties, lack a relationship with theatres' audiences. These archives risk living an exclusively internal dimension of activity. They'd often not deciding to restore a certain film with the aim of screening it, or of presenting it to a certain public, but with the exclusive aim of preserving it. This logic, which may look monstrous under many perspectives, has a very serious implication for the restoration domain: it makes all these organizations impervious to suggestions that could arise from the exchanging of experiences with other archives, and the result is a poorer know-how of these institutes' staff. This is a very serious problem in sector as young as that of restoration, which is living a phase of deep technological and methodological mutation.

The second subset is that of archives (CINEMA LIBRARIES AND FILM MUSEUMS) which carry out both preservation activities of the seventh art (e.g. not just films, but also still photos, posters, books,

magazines) and stable presentation activities: these archives run screenings in at least one theatre, which usually belongs to them. Even when these archives aren't State institutions, as in the case of the Cinémathèque Française, they would still receive consistent public funding. Their collections usually include both national and foreign films.

The third subset is that of the increasing number of LOCAL ARCHIVES, which deal both with presentation activities and with the preservation of regional or local heritage. In recent years, Basque, Catalan, Corsican, Scottish, Welsh, Walloon, Sardinian, Macedonian archives have mushroomed, and many other. They can all be rightly considered as State archives in miniature.

The fourth category is that of NON-FILM MUSEUMS AND COLLECTIONS. When FIAF was created, its charter members knew very well how the objective of a cinematheque should be the overall preservation of the memory of cinema: not only preserving films, but preserving the whole paper and technological media system which precedes, follows and makes the realization of the seventh art possible. Scripts, production reports, photos, ads, sketches, pamphlets, books, costumes, sets, soundstage and filmmaking equipment, are thus all preserved in the departments of many archives. And these fonds are so relevant that they have sometimes achieved the role of proper institutes in their own right.

A special category is that of museums collecting and exposing TECHNOLOGICAL EQUIPMENT. It is the case, for example, of the Museo Nazionale del Cinema of Turin, which has what is probably the greatest pre-cinematographic collection of the world.

In the FIAF Statute (June 17th, 1938) there is an article which has been crucial in the history of the Federation, drawing a border line between the Federation's members and the other actors: "No institution or organisation whatsoever which, under a cover of archive activity, makes use of its collections primarily for commercial purposes shall be admitted to the Federation".

Finally, outside FIAF we find to major categories of moving images archives: TELEVISION ARCHIVES AND RIGHTS HOLDERS' ARCHIVES. The first often hold collections of remarkable sizes; plus, especially since the 1970s and particularly within Europe, television has produced a significant portion of "quality cinema"-just think of the role played in the 1990s by Canal Plus in the development of European quality cinema. Rights holders archives, on the other hand, exist both in Europe and in the USA and, since

the 1990s, have with varying intensity started up independent restoration projects. From Gaumont to Istituto LUCE, from Murnau Stiftung to Sony Columbia, all archives managing exploitation rights have, at this point, created internal departments for restoration.

Recently, new actors have appeared on the restoration scene: DVD EDITORS, who are playing a very useful role by making it possible to access the classics of the history of cinema in their original version. American DVDs are distinguishing themselves in terms of quality (from image quality to that of packaging, from sound quality to bonus tracks, etc.) and are stimulating the demand of contemporary public for quality criteria for the cinema of the past.

I also wish to remind you that television channels and DVD editors, and more in general most of rights holders, do not really carry out preservation activities - that is to say, they wouldn't usually invest money to create, for each film, new 35mm film matrixes so as to preserve it on the long-term, which is on the contrary something cinematheques would do. They would just create a digital master on which they operate. Doing so, there are no guarantees that the restored film will survive throughout time, as the medium which lasts longer and ensures major continuity with the original materials still is 35 mm film.

There is also another element brought on the scene by TV and DVD editors: the need for images to meet television quality standards. Those in charge of television transmissions believe that the audience wouldn't accept to notice the signs of time on a film. Thus, every detail, scratch, spot, decline in image and/or sound quality, must be corrected and substituted with clean, homogeneous, perfect images, removing the effects of time.

There is no legislation for compulsory deposit for producers - this kind of legislation exists only in some countries, and normally has no retroactive value and only obliges producers to deposit a positive copy. Films have now an infinite commercial life, but it so since only a few years - whereas for more than 70 years only a small number of cinematheques took care of the future of cinema. Besides, destruction has always been a normal aspect of the history of art. Each time a film is screened, its death comes closer: each projection affects and modifies its body. The showing of a film, which somehow represents its life, is also the cause of its dissolution. Archive professionals have asked themselves so many times

whether they had to screen a copy, with the risk of damaging it, or keep it closed in a box waiting to have the means for restoring it - aware that it would still be bounded to degradation, no matter how well they could try to preserve it.

Once the distribution of a movie in theatres is over, the movie looses its productive value and disappears as cinematographic film to begin a new television, magnetic or digital life. But a part from legal deposit (which doesn't exist in every country), there is no international legislation obliging producers to deposit their films in an archive. The whole matter is left up to the legislation of single States. The global situation is quite disheartening, based as it on local agreements between a single archive and a single rights holder, rather than on true national policies for safeguarding the cinematographic heritage. If you wish to read the work of a master of literature, you can easily find it in bookstores or libraries, and if you wish to see the painting of a master artist, you can hope for an anthology exposition to be organised or buy a dedicated monograph. But if you wish to see Lubitsch, Ford or Vidor's works, you will go crazy. Even if you're happy with VHS or DVD, you will find only a few. If you're so lucky to come across a good retrospective, you will find out that some works of the artist in question have been lost, that some of the survived works are only available in 16mm film, that their quality is often far from the original splendour, and that some materials are kept by rights holders who will never hand over a copy for a theatre screening. Cinematographic heritage is an inaccessible continent, slowly drifting away from its public.

The International Federation of Film Archives has long since established rules for preservation. By the term "preservation", I here mean the overall set of practices and procedures for ensuring permanent access (with minimum quality loss) to the visual and sound contents of materials. "Active" preservation of materials includes technical analysis and selection, archiving methods in adequate environments, quality control, revision of the physical state of films, duplication, and restoration.

Is the unity of a cinematographic work ensured in the absence of theatre screenings? Have you ever heard someone saying that one could move the Parthenon from Athens' Acropolis to a computer's monitor, without irreversibly breaking the unity of that work of art? So why is the history of cinema today consumed in VHS and DVD form, even in academic contexts? After having

saved films, we now believe that there is another priority which is just as urgent: saving cinema in its integrity of collective experience, aware that this art represents one of the great moments of the history of the 20th century.

Yet, time doesn't only produce a chemical and physical degradation process – during one hundred years, everything in the cinematographic world has changed. Between 1895 and today, filmmaking and screening techniques have changed so much that it would now be impossible to screen the original copy of a film shot at the beginning of the last century. Theatres have been radically transformed since the 1910s, in response to these deep transformations. Screens have changed in sizes and proportions. The cinema theatre, that temple of vision and pleasure that has cradled the dreams of millions of people, has evolved from the Grand Café, where the Lumière brothers organized their first screening, to today's multiplexes - adapting itself to the models of the different ages of cinema.

If we wish to show the cinema of the past in a correct way, we should also do our best to recreate the technical conditions in which films were conceived and appreciated. A film in Cinemascope cannot be fully appreciated on a television screen, just as opera cannot be really enjoyed only by listening to a recorded version. Films were born and conceived to be screened in darkness, in front of an audience, on big white screens where the film's brightness and transparency would shine. Hence, an essential part of the restoration work is bringing films back to theatres, where they can be correctly and fully appreciated.

SOUND ARCHIVES AND PRESERVATION: STANDARDS, GUIDELINES AND BEST PRATICES

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ABSTRACT[*]

In contrast to traditional text documents, sound and audiovisual documents have their specific preservation problems. Audiovisual materials are generally less stable than paper. Moreover, for the retrievability of these machine-readable documents equipment of ever-growing sophistication has to be kept in working condition. By 1990 sound archivists understood that the classical paradigm of preservation - to preserve the object placed in the care of archives - had become obsolete. Only transfer of contents into the digital domain and the subsequent migration from one storage system to the next will ensure the long-term preservation. European radio sound archives took the lead in establishing pilot projects to introduce this new preservation strategy, which also opened totally new dimensions for remote access to hitherto hidden treasures. National sound archives, and more recently research archives, are following that route.

In surveying standards, guidelines and best practices, the paper concludes that materials held by the greater, wealthy archives will be transferred to the digital domain and thus become available for access in the long term. It must be stressed, however, that most attractive parts of the audiovisual heritage worldwide are still outside the reach of national and international digitisation programmes. Many of these documents of linguistic and cultural diversity will be lost over the forthcoming decades due to chemical and physical degradation. This is specifically true for collections in many of the new EU member states. Consequently, considerable infrastructural measures must be taken on national as well as European levels to ensure that these extremely important but hitherto neglected holdings will soon become part of our digital cultural heritage.

[*] A copy of Dr Schüller's Power Point Presentation follows.

PHONOGRAMMARCHIV - AUSTRIAN ACADEMY OF SCIENCES

Sound Archives and Preservation
Standards, Guidelines and Best Practices

Dietrich Schüller

The classical paradigm of curators and archivists:

"eternal" preservation of objects placed in their care

Until the late 1980s: audio archivists were looking for the "eternal" audio carrier

However…

Carriers are prone to deterioration[1]:

- Instantaneous discs fall apart
- Historic magnetic tapes become brittle
- Modern magnetic tapes become sticky
- Life expectancy of metal particle tapes is questionable
- Increasing data density is the natural enemy of data security

[1]See *Graphic Appendix*, fig.1 and 2, p. 337.

Moreover…

Audio – as all machine-readable documents – needs equipment for reproduction

The more advanced the format – the more sophisticated is the dedicated equipment

Modern formats are consumer market driven

Life cycles of systems become ever shorter

Obsolescence of equipment is equally or even more dangerous than carrier degradation

1989/90 audio archivists began to understand:

The "eternal" carriers will never be available

Keeping equipment in playable condition for a number of formats is unmanageable

Classical preservation strategy is hopeless

Change of paradigm: preserve the content, not the carrier

Or: *"from the eternal carrier to the eternal file"*

(Andreas Matzke)

Vision 1990: Digital Mass Storage System (DMSS)

- Juke box containing automatically accessible carriers
- Data integrity is monitored automatically
- Contents copied automatically to new carriers well before data loss occurs (refreshment)
- Contents copied automatically to new systems before old system becomes obsolete

Heavily disputed by conservative archivists – but…

1992 Pilot Project Südwestfunk Baden-Baden

1994 Archivarbeitsgruppe ARD

1995/96 generally accepted by European Audio Archivists

Driving force for radio archives: new dimension of access to holdings

Late 1990s National Sound Archives,
around 2000 Research Sound Archives following

Generally accepted standards:

- wave format – BWF
- 48 kHz/(16) 24 bit – radio archives
- 96 kHz/24 bit – national and research archives
- Carriers: Magstar, DLT, LTO

Intermediary ("manual") solutions:

- R-Dat – threatened by obsolescence of equipment
- CD-R – heavily threatened by carrier instability
- Upcoming: DLT and LTO

Standards – Recommended Practices:

IASA-TC 03: The Safeguarding of the Audio Heritage: Ethics, Principles and Preservation Strategy
Version 2, September 2001
http://www.iasa-web.org/iasa0013.htm

IASA Selection criteria of analogue and digital audio contents for transfer to data formats for preservation purposes, 2003

IASA Guidelines on the production and preservation of digital audio objects (under preparation)

AES (Audio Engineering Society) and EBU (European Broadcasting Union)

various standards on preservation

UNESCO

Safeguarding the Documentary Heritage, 1998,
CD-Rom version 2000
Digital Heritage Charter, 2003
Digital Preservation Guidelines, Draft 2003

Present problems

- Analogue-to-digital transfer
- Preservation research needed – digital **and analogue**
- Low-cost digital archiving
- Spotting small collections of high cultural and scientific value
- Ever increasing gap between available technical solutions and their implementation on a broad scale

Analogue-to-digital transfer:

Estimated 100 million hours (PRESTO) waiting for selection and digitisation

Archivarbeitsgruppe ARD 1995/96: aural control indispensable – hence transfer factor 3

Consequently, transfer would take 100 000s of person years

Development of digital work stations allowing dramatic reduction of transfer time by automated signal control - one operator manages transfer of several analogue carriers simultaneously (RAI, PRESTO → *"factory transfer"*)

Preconditions for factory transfer

- Homogeneous materials produced under professional control, in good condition – radio archives
- High investment into transfer stations

Present transfer standard for radio archives

National sound archives:

Holdings less homogeneous, often produced without professional control, sometimes in bad condition

Factory transfer hardly applicable

Research sound archives:

Holdings typically heterogeneous, often produced without professional control, often in bad condition

Factory research not applicable

Time factor exceeds 3 – A/D transfers may take decades

Proper ranking of digitisation projects imperative – most endangered materials first, more stable can wait

No reliable methods for life prediction of av-carriers available

Preservation research for analogue materials needed!

Low cost digital archiving:

- Quality A/D converters and digital work stations (without automated quality control) affordable
- CD-R/DVD-R unreliable digital target medium – change to DLT, LTO is imperative
- Software for automation still expensive
- "Personal" digital mass storage systems needed

80% of audiovisual materials related to cultural and linguistic diversity are outside proper archival custody:

Private collections and small research/cultural units, unaware of necessary preservation measures – and/or lacking financial and personal resources

Typical: small research collections in Eastern Europe:

Unique sources of the last 50 years are left unattended and will rot away within 10-30 years

Spotting and preserving these collections must be organised on a great scale!

Ever increasing gap between available technical solutions and their implementation on a broad scale

Results of research in danger of becoming outdated before their implementation

Massive investment on a national and European scale needed to upgrade infrastructures of museums, libraries and archives

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http://www.iasa-web.org

TECHE RAI: AUDIOVISUAL MEMORY BETWEEN PAST AND FUTURE

Barbara Scaramucci
Director of Audiovideoteche RAI

A few years ago Rai, whose audiovisual heritage is second only to BBC in size, realized that there was a need to go with the times, and exploit the potentials of digital technologies for its radio and television archives - technologies which have, since the middle 1990s, opened new horizons in this field.

For this purpose, in 1997 Rai had a winning idea. Up to that time, our archiving activities only consisted in migrating materials from obsolete media (e.g. films and magnetic tapes of the earlier analogue generations) and documenting the newscasts with text documents; whereas in 1997 we shifted to multimedia cataloguing (hence in digital format) of all materials broadcast via radio and television. The result is that now we are leaders, at European level, in the field of audiovisual cataloguing systems. This choice enabled RAI, as a public service, to enter the domain of new online media with greater energy, whatever the practical evolution of this sector in our country will be.

The current objective is that of completing the catalogue of Rai's historical audiovisual productions - materials on magnetic tape and on film, and data on rights on materials and on their administrative and storage position included.

Moreover, our catalogue could be easily made available for users outside the company - albeit within certain limits which we will have to define - by preparing a properly "cut" version (i.e. limiting the data that a generic searcher can access) and investing in the building up of a connection network. Since the catalogue is now located on the company's intranet, so that it can be "remotely" consulted by our staff, we could soon make it available also for the educational, scientific, cultural and institutional community - just by transferring it on an extranet.

Mission of the Rai Teche Directorate - Specific Activities

The Rai Teche Directorate is in charge of the documentation of all Rai's audio and video productions. Documentation criteria have

been established after carrying out a complex content and data analysis. Their objective is to have control of information sources, provide comprehensive and objective descriptions (on the basis of both analytical and synthetic criteria), and manage products in their peculiarities. These criteria meet EBU (European Broadcasting Union) recommendations.

In 1978 Rai started creating textual documentation of all its TV newscasts and of some editions of radio news.

In 1998, the Teche Directorate started up a process aimed at the overall documentation of its TV daily broadcasts, together with the documentation of historical materials, starting with the programmes which our channels produced over the years.

In the mean time, we began working on the complex task of putting together the personal data catalogues and a rights archive: we are reconstructing, by cross-checking sources and data, a complete index of all Rai's radio and television broadcasting with the related information on rights, for both acquired products and in-house productions. This well-structured database of rights, which Rai had never created before, covers all the titles of external TV productions (more than 15,000) and a few thousand titles of in-house productions. It represents a new company asset, which adds value to our products while improving their use on new distribution platforms (such as satellites, IP protocols, CD ROMs, DVDs, etc.). In this sense, the rights archive works as an "information counter" for the whole Rai group.

The multimedia catalogue, where documents of all types converge, is the first European advanced cataloguing system for audiovisual materials being completely automated and based on a relational object-oriented database. It was developed with the technological support of both the Research Centre and the ICT Directorate of the company, using software of international level.

For what concerns television, the first phase of documentation consists in extracting some cuts within a given TV programme, and associate a time reference (the time code) to each of them. This makes it possible to identify the needed segment of that programme, by means of a research slider based on video cuts.

Fig. 1: screenshot of the slider with cuts.

Video cuts can be previewed and synchronised with the related text documentation, as well as with low-quality compressed audio, so that it is no longer necessary to go through a complete preview of materials, or anyway this step of the process gets faster. This is one of the reasons why Rai Teche chose this system, which proved to be the most efficient for supporting editors, authors and programme-makers in searching the single pieces of interest. In this sense, our mission as Teche Directorate is also that of optimising the processes of data throughput, in order to provide the best possible system for retrieving materials, also in terms of providing comprehensive and fast answers to queries.

In May 2000, progress in technology enabled us to implement a system for previewing and listening to programmes directly on computers, in a movie format and with low quality video for television and highly compressed audio for radio. It is thus no longer necessary to transfer materials for selecting them: only segments needed for editing purposes are transferred. The system makes it possible to search for and preview materials the morning right after they were broadcast, by means of a "palimpsest" function which reconstructs the exact scansion of anything broadcast by the three TV channels the day before. For what concerns historical materials, the catalogue can be searched by means of free text queries or of various types of advanced searches. In terms of throughput flows, each week 700 hours of historical materials are selected among homogeneous groups of analogue tapes and processed. As

a last step, we will digitise materials which are still only available on film.

For what concerns the radio, we began with the documentation of historical tapes, while the Radio Division started digitising materials. The current objective is nourishing the catalogue with 50.000 hours per year on the average. In March 2001 the documentation of multimedia materials began, capturing on a daily basis the broadcasts' digital signal for all the four channels (Parliamentary Channel included). Materials can be searched for and listened to on the catalogue through a "palimpsest" function, similar to the one already in use for television.

On December 31st 2003, 206,700 hours of TV materials and 348,530 hours of radio materials were available on the catalogue (for previewing and listening).

The multimedia catalogue is progressively transforming production processes based on archival materials, right from their first step - that of searching for materials. One of the reasons why this is possible, is that after working for 20 years with a system where queries were based on key words and where transactions were required only for text documents, we now have a powerful search engine in Web mode, which can operate on all new and old databases. The new portal of the entire multimedia catalogue is called after the name of this system: Octopus.

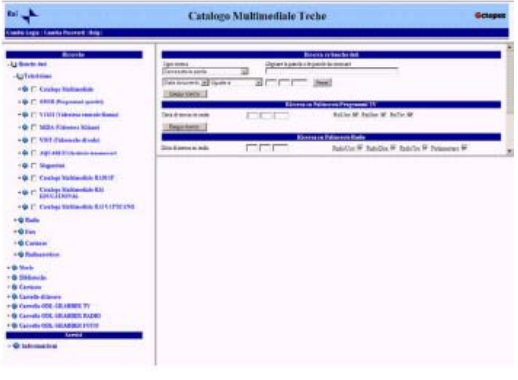


Fig. 2: opening screenshot of the Octopus portal.

Meanwhile, Rai Teche is building up the company's digital photographic library, by progressively documenting and digitising Rai's photographic fonds. This activity is now complete for what con-

cerns all the photographic fonds of by Turin's Production Centre, a white and black selection of the Press Office and the Party Political Broadcast archives, plus the "fonds" of Milan's Production Centre.

In addition, the entire catalogue of retrieved scripts of 1940s, 1950s and 1960s radio broadcasts, the 6000 ads of "ex SIPRA" Advertisement Documentation Centre and the complete collection of "Radiocorriere" (1925-1995), have all been digitised and are now available on the catalogue.

In cooperation with the Human Resources Directorate, the Teche Directorate has also developed a training programme for encouraging Rai's staff in using the catalogue. Up to now, we have held courses for 900 users, mostly coming from professional areas where advanced searching is needed (programme-makers, assistants and editors). 6,800 users are currently registered. Generic end-users can consult the catalogue from Mondays to Fridays in Rome's headquarters (Viale Mazzini), in Turin's Rai Centre and in the Mediateca di Santa Teresa of Milan. Some specific users categories (students, researchers, legal professionals) have a right to be assisted by an expert.

In June 2001 UNESCO decided to list Rai Teche in the "Memory of Italy" Register.

Integration of the Catalogue with Rai's Production Archives

The physical copies of TV and radio materials are kept in the stores of the TV Production Division and the Radio Division.

Rai Teche coordinates the integration of the multimedia catalogue with the archives of the various production centres - particularly for what regards the so called "teca fast", a service designed for the needs of our journalists and based on a client-server architecture (the TV Production Division is in charge of the project). This service basically represents the evolution of the news video library, which is still in analogue format. The advantage is that, from now on, it will be possible to book the materials directly through the multimedia catalogue - and they will be delivered, ready for use, in editing rooms. The system is currently being tested by our national news editors, with remarkable users satisfaction.

Concerning the historical materials in analogue form kept in the

above mentioned stores, we are currently retrieving and transferring materials from deteriorated magnetic media (particularly, 1-inch and 2-inches Beta tapes and BVU cassettes) and we're improving all automatic processes of mechanical nature.

Concerning our audio library, digital technologies for both reference purposes (through the Teche multimedia catalogue) and production purposes are being introduced (the Radio Division being in charge of the latter).

In May 1998 we began transferring our sound documents from analogue tapes to digital media. In addition, we are designing a system which interfaces the multimedia catalogue and works, for production purposes, with digital sound documents of full quality.

Finally, I wish to outline again that Rai Teche can only act as a coordinator of storage activities, as stores are still under the responsibility of the TV Production Directorate and the Radio Directorate.

Fig. 3: Multimedia Catalogue - diagram of processes.

OTHER ACTIVITIES OF THE RAI TECHE DIRECTORATE

The system I've briefly described you under a technical and cataloguing point of view, is already in use in our company - and is designed to last, provided that the required implementations are ensured along the way. On the other hand, when we started carrying out the needed researches and designing the system, we under-

stood that new services based on new media could potentially be created within the system itself - especially in regard to the distribution of online productions (i.e. anything created using the IP protocol) through narrowband and broadband Internet access and, in the future, through UMTS cell phones.

The movie format used in the catalogue is suitable for the Internet and thus used by Rai Net (whose portal is online since March 2001). Through an electronic "grabber" system developed by Rai Teche, video and audio files can be extracted and re-encoded - enabling us to build up Web channels and create Web products.

The catalogue can also provide the so called "metadata", a type of information needed, for example, when carrying out *video on demand* activities.

In addition, the Teche Directorate has created its Web site[1], which provides public access to a selection of materials, together with a number of interactive services. The site received the 2003 Web Award for the "Arts and Culture" Section. On the Web site there are more than 2,000 audio and video clips, containing fragments of the most popular TV and radio programmes, plus 4,500 historical photos and many text documents.

All files have been organised by typology and then indexed, so that they can now be singled out through a free text query running on a sophisticated search engine.

Concerning satellite broadcasts (free TV and pay TV - Rai Sat), the Teche Directorate works as a provider of materials and rights analysis for Rai Sat, with a specific cooperation with the "Premium" pay channel. Rai Teche also works as a "centre of excellence" in searching and selecting archival materials for terrestrial TV channels.

Moreover, a number of Rai's productions were made in cooperation with Rai Teche, especially on the occasion of our 50 years of television anniversary - we can mention, for example, "Cinquanta" with Pippo Baudo, "Giorno dopo giorno" and "ApriRai". We also have a very similar on-going cooperation with Rai's radio channels, Radio 1 in particular - cooperating with programmes such as "Parole mie" and "Ottanta Radio" by Umberto Broccoli.

Finally, we offer a special survey service to Rai's Social Secretariat, analysing the so called "social palimpsest".

[1] www.teche.rai.it

Fig. 4: the role of Teche in respect to the different media.

A very challenging activity of the Teche Directorate is that of providing a customer service. A regulation approved by the Directorate General in 1999 sets the rules for the handing over and viewing of Teca materials for institutional needs of public nature - but not for commercial purposes. Any commercial activity involving archival materials is instead managed by Rai Trade. The Teche Directorate can only satisfy, on the basis of a price list for direct costs reimbursement, requests for references, carrying out of searches and accessioning copies, when these requests come from the following institutions: State institutions, Ministries, local bodies, public bodies, cultural bodies, foundations, non-profit organizations and moral entities, schools and universities. We may also satisfy similar requests coming from magistrates, lawyers and members of other professional orders, provided that our Legal Affairs Directorate gives go-ahead. In general, and a part from exceptional cases authorized by the Directorate General, for being viewed or copied materials must be extracted from programmes which can't be repeatedly used and of which Rai is a full right holder. Plus, the delivered materials are equipped with technological protection systems, ensuring they cannot be used for illicit commercial purposes.

Another project of great cultural significance which we're cur-

rently carrying out is the "Cinema senza tempo" Project, aimed at retrieving the Italian cinematographic heritage kept in the company's archives. The project is managed by the Teche Directorate in cooperation with Rai Cinema and Rai Trade.

Our efforts for the 50th anniversary of Italian television are particularly intense and significant. Rai Teche is responsible for the production of a great number of works based on archival materials, which will be screened throughout Italy during the 2004 official celebrations. And we also organized, with Fratelli Alinari, the travelling photographic exhibition "ImmagineRai", and issued with Rai Eri the book "RicordeRai".

The library prepared an important dossier on the year 1954 and television, and produced CDs and DVDs for the occasion. Rai Teche is a partner of other European broadcasters in the project PrestoSpace for high quality digitisation of audiovisual archives, funded by the European Commission. Rai organized the presentation of the project at the international meeting of Alghero (March 2003). This initiative proves once more Rai Teche's commitment for making these extraordinary audiovisual archives available to both the company and the public community, as we believe that in these archives a great part of the 20th century memory - the first century in history to leave audiovisual records - is to be found.

PRACTICAL EXPERIENCES OF THE DIGITAL PRESERVATION TESTBED

Jacqueline Slats
Program Manager,
Digital Preservation Testbed (NL)

The Digital Preservation Testbed is part of the non-profit organisation ICTU. ICTU is the Dutch organisation for ICT and government. ICTU's goal is to contribute to the structural development of e-government. This will result in improving the work processes of government organisations, their service to the community and interaction with citizens.

Government institutions, such as Ministries, design the policies in the area of e-government, and ICTU translates these policies into projects. In many cases, more than one institution is involved in a single project. They are the principals in the projects and retain control concerning the focus of the project. In the case of the Digital Preservation Testbed, the principals are the Ministry of the Interior and the Dutch National Archives.

The current Dutch Cabinet aims to carry out 65% of its transactions between government and its citizens through digital means by 2006. In 2002 the goal was 25%, and it was easily reached.

Because of this, there is currently a great deal of work going on to develop strategies, methods, techniques and tools to handle the digital produce of the government in a responsible way.

DIGITAL LONGEVITY

Under the umbrella of Digital Longevity, we have several programs. If the objective of Digital Longevity is securing the accessibility of reliable government information, the objective of the Digital Preservation Testbed is securing the *sustained* accessibility of reliable government information.

According to Dutch law and regulations the transfer of archival records take place after 20 years, in "good, ordered and accessible state". Therefore the target group of the Digital Preservation Testbed is not only archival organisations, but also the whole government. Twenty years for digital records is more than a lifetime.

DIGITAL PRESERVATION

The most important problem concerning the preservation of authentic digital records is technological obsolescence. Technological change is increasing exponentially. This brings up many questions, such as what to do with files that were made with old hardware and software, which cannot be used anymore? Unless action is taken now, there is no guarantee that current files can be read in future with future technologies.

The Digital Preservation Testbed is researching three different approaches to long-term digital preservation: migration, XML, and UVC emulation. Not only will the effectiveness of each approach be evaluated, but also their limits, costs and application potential.

MIGRATION

There are many different definitions of migration. Testbed defines migration as the conversion of records from one hardware and/or software environment to another. Migration is currently the most common preservation strategy for digital records, but not always used in a responsible way: when new versions arrive, documents are simply updated into the new versions.

XML

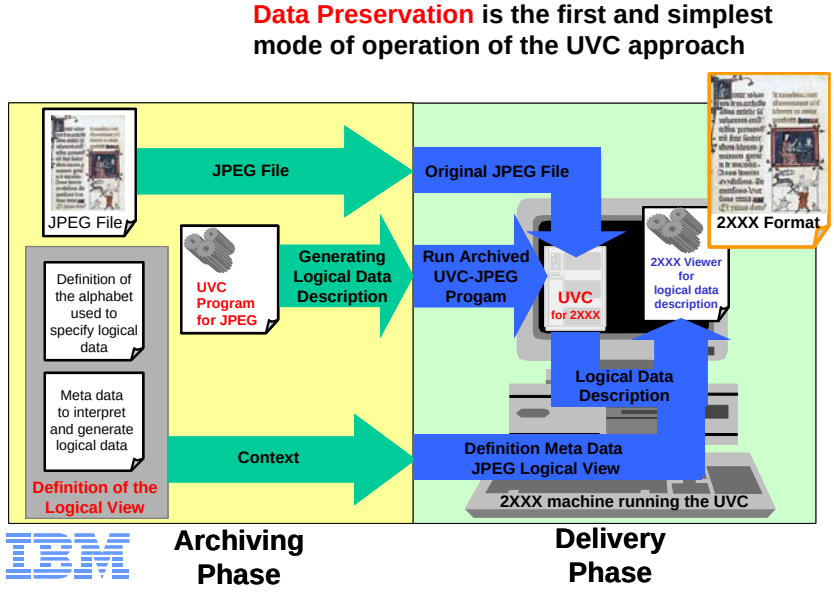
We all know XML as a format or mark-up language. But because of its characteristics and because it is an open standard, it is promising to use XML as a preservation strategy.

UNIVERSAL VIRTUAL COMPUTER

The UVC-based methodology makes a distinction between preserving data and preserving the behaviour of a program. For data, it implements a conversion program able to decode the original form of the data into a logical format that will be much easier to understand in the future. Because the UVC instruction set is simple, it is relatively straightforward to write an UVC emulator for any given computer.

In the context of long-term preservation of digital data, IBM Research considered an approach that relies only partially on emulation. The approach is applicable to digital object types that do not

need to maintain the functionality of the application(s) that were used initially to create or manipulate the objects. IBM refers to this approach as *data preservation*. For data preservation, they propose to save, with the data, a program that can extract the data from the bit stream and return the information to the caller in an easy to understand, technology-independent way, so that it may be exported to a new system.



The example shown here is for the preservation of JPEG files. The UVC JPEG program is written for a Universal Virtual Computer (UVC). In the future, for executing the UVC JPEG program we will need an interpreter (an emulator) of the UVC architecture.

The execution of the UVC JPEG program in the future will return the data with additional information, according to a *logical view* - defined by a *logical view description* or *scheme,* which is also archived.

This data preservation approach enables organisations to retrieve a technology independent description (logical data description) of any JPEG file in the future with the aid of three components: UVC JPEG program, UVC, and the archived logical data definition for JPEG.

These 3 archived components enable any person in 2XXX to regenerate the information in the current environment, using new data formats. Writing a viewer program that invokes the emulator, runs

UVC JPEG program, and processes the returned data as desired.

The next step may be that of translating numerous digital object classes, like images, to the same logical view, eliminating the need for a future client to implement separate viewers for each original format.

When the approach reaches critical mass, probably a small number of logical data descriptions will remain, such as general text, images, sound, video etc.

EXPERIMENTS

Experiments are taking place on text documents, spreadsheets, emails and databases of different size, complexity and nature. These are the record types which are used for more than 90% within the Dutch Government.

The Digital Preservation Testbed is carrying out experiments according to pre-defined problem solving research questions to establish the best preservation approach or combination of approaches. The experiment process started with basic research questions. And each experiment raises new questions.

Not only to control the project, but also to run experiments in a controlled environment, we developed a 12-step experiment process. Here we make also explicit, mostly by desk research of available publications, if a record type is excluded from a certain preservation approach.

These steps are all fully documented in the experiment database of the Testbed. Records are monitored during experiments to establish whether (and how) a specific method is suitable for long-term preservation.

This approach requires a multi-disciplinary team. The Testbed team consists of ICT-expertise, record managers, archivists, national and international experts, etc.. Not mentioned in the diagram, but very valuable is the evaluation feedback group, which consists of archivists from various institutions, e.g. the Dutch National Archives, the Archival Inspection, Tax Services, etc.. The governmental institutions that provide us with copies of records are participating in the team during the experiments.

RESULTS: TEXT DOCUMENTS

Starting with text documents we selected migration and XML as

preservation approaches to experiment with. For the UVC approach we made use of the reports of the Dutch National Library, which served as a point of reference regarding the preservation of electronic publications.

The migration of records from an older version of an application to a newer version of the same application (e.g. Word 97 to Word 2000) is usable for short-term preservation. We did not encounter significant problems converting the records to a higher version. It was remarkable that the results were even better when we skipped one or more versions. However, after multiple conversions the sum of the minor changes can affect the authenticity of the record. So manual checking is required. Furthermore the migration needs to be repeated every few years and is only feasible if the migration is automated.

For the migration of text records to a standard format we experimented with PDF and RTF. PDF is suitable to represent text documents authentically, especially the content and appearance.

We also migrated old records created in one word processor to another (WP4.2 to Word 2002). This approach only met our authenticity requirements after manual intervention.

Finally, the XML approach: XML is able to authentically represent context, content, structure and behaviour of text documents. To represent appearance an additional stylesheet is required.

RESULTS: SPREADSHEETS

For spreadsheets we selected all three approaches to experiment with. It was an extra challenge to experiment with the UVC data preservation approach using spreadsheets, because spreadsheets have more layers (e.g. a data layer and a formulae layer).

Although the concept of the UVC is promising, generating the logical data description appeared to be very difficult. This is not because of the complexity of the UVC, but because of the lack of documentation of the proprietary file formats. From the reports of the Dutch National Library we noticed that they have encountered the same problem.

The migration of records from an older version of an application to a newer version of the same application (e.g. Excel 97 to Excel 2000) is usable for the short-term preservation. The results of these experiments were comparable with those of migrating text documents to a higher version.

Finally, XML is a suitable format to represent spreadsheets authentically, including the different layers.

RESULTS: DATABASES

Experimenting with databases, we were confronted with the question: "What is the archival record?"

a. The whole database system [db, dbms and application].
b. The database itself.
c. A row in the database table.
d. The record consists of fields spread over different tables.
e. Database data accessed or presented in a precise manner in the application form.

Despite the desktop research and a lot of discussions with archival experts, we were not able to answer this question unambiguously. Eventually, from a pragmatic point of view we decided to experiment with the whole database system and the database itself.

The migration of databases from an older version to a newer version of the same database system (e.g. Access 97 to Access 2000) is usable to represent context, content, appearance, structure and behaviour for the short term. The results of these experiments are comparable with those of migrating text documents and spreadsheets to a higher version.

The conversion to XML is suitable to represent the context, content and structure of the database itself. Additionally, in order to preserve the appearance of the application it is necessary to store the technical and functional documentation of the database system, including screen shots.

We were not able to preserve the behaviour of database systems for the longer term using migration or XML. Nor is the UVC data preservation approach able to achieve this.

Hardware emulation could be a potential approach in this respect, but has not been implemented with an archival focus[1].

[1]For the results of the experiments with emails, I invite you to have a look at our email/xml demo: www.digitaleduurzaamheid.nl.
Or send an email for further information to: testbed@nationaalarchief.nl

DEVELOPING TOOLS, SERVICES AND COLLABORATION IN THE UK AND RELEVANCE TO EUROPE

Neil Beagrie
Programme Director
of the Joint Information Science Committee (JISC)
Secretary of the Digital Preservation Coalition (DPC)

ABSTRACT[*]

The UK has a diversified range of cultural institutions with digital preservation initiatives arising from their institutional missions (many of which extend beyond the institution concerned). Across all sectors, memory institutions face significant funding constraints and have static or declining core budgets in real terms. They are required to balance the demands of traditional and electronic materials, and demands in both areas continue to grow rapidly.

The limited funding available to institutions individually, and the scale of challenges involved has prompted partnership and collaboration between institutions and serious discussion of the issue of whether responsibilities can be identified and shared between them. These discussions form the background to current initiatives to develop new tools, services, and collaboration in the UK.

The paper will cover the development of the following UK initiatives:

a. the Digital Preservation Coalition (a consortium of 26 organisations);
b. the Digital Curation Centre (a new joint initiative of the JISC and e-science core programme which will put 5 million euros into research and development over 3 years);
c. the UK Web-archiving consortium and testbed.

It will conclude by assessing the relevance of these developments to other countries in Europe and the role of international collaboration in this field.

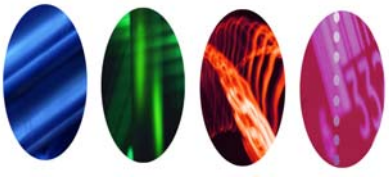
[*] A copy of Mr Beagrie's Power Point Presentation follows.

JISC

Joint Information Systems Committee

Co-operation in Research Programmes and Shared Solutions

Neil Beagrie, Programme Director
JISC UK



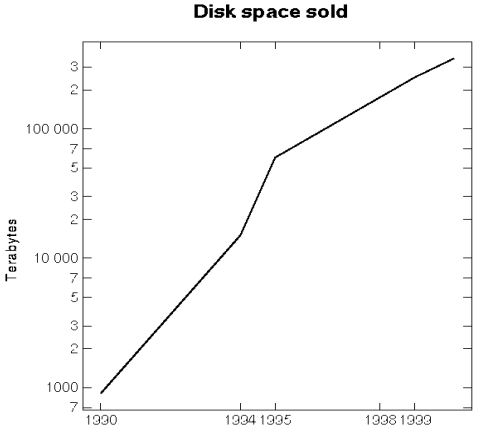
Supporting further and higher education

Overview

- Only 20 minutes, so no jokes:
  - Context – growth of electronic materials
  - Implications and actions needed
  - Digital Curation Centre
  - Digital Preservation Coalition
  - UK Web-archiving Consortium
  - Concluding remarks - relevance to Europe

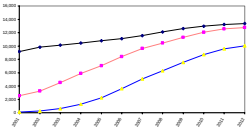
Growth of Electronic Materials 1

Computer Disk Storage
after Michael Lesk

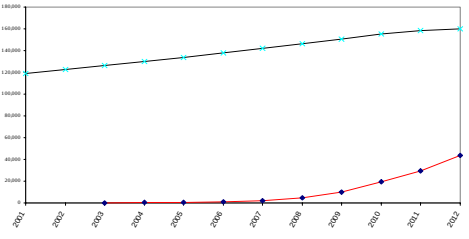


- Exponential growth in digital information 1990-1999
- Trend will continue to accelerate in next decade

Growth of Electronic Materials 2



Journals



Monographs

Publishing Projections 2001-2012

- EPS study for UK legal deposit

Growth of Electronic Materials 3
e-Science and Research Grids

- In next 5 years e-Science will produce more data than has been collected in the whole of human history
- Dynamic databases – such as SwissPROT - are being curated and annotated with complex metadata - current database and Web technologies do not provide good support for such activities
- Analysis demonstrates need for long-term curation in many areas ranging from engineering design and clinical trials to environmental and astronomical data
- Information Growth - not solely an issue of volume: greater diversity and complexity of formats also likely

Implications

- Core Funding for institutions will not grow in line with information growth
- Need for more automation and tools
- Need for new shared services and scaleable infrastructure
- Significant need for R&D investment now to prepare for this
- Greater collaboration/specialisation

Analysis/Actions

- JISC Continuing Access and Digital Preservation Strategy 2002-5

  Key aims of implementation plan are to:

  - complete a series of scoping studies on:
    - e-science, e-journals, web-archiving, e-prints, e-learning
  - development of a Digital Curation Centre for new shared services, and R&D on long-term curation and preservation
- Invest to Save: NSF-Delos WG on archiving and preservation

JISC

Digital Curation Centre

- Joint funding JISC and e-science core programme
- Three year initial funding - 5m euro
- 1/3 funding allocated for new research agenda
- 2/3 funding allocated for development/services
- Potential for future "third-leg" funding (technology transfer)

Proposed Role of Digital Curation Centre

- NOT a data Centre
- Research agenda
- File Format Information
- Tools
- Testbeds and Certification
- Advisory Services
- WHY Curation Centre?

File Formats/Preservation Planning

- Growing complexity and range of file formats.
- Shared resource now seen as an essential building block for long-term curation
- UK influences CEDARS/PRONOM/JISC File Format sources report
- May see international activity in this area e.g. Global Format Registry

Testbeds/Certification

- Testbed research facilities
  - Important for driving research and development, appraising new tools and systems
- Certification - built on minimum criteria for compliance with the OAIS Model
- Translate to UK – e.g. joint code of practice for research

JISC

Digital Preservation Coalition

- Established July 2001
- 26 Members
- Working collaboratively to preserve digital heritage
- Cross-sectoral membership

THE BRITISH LIBRARY

JISC

CLRC

The NATIONAL ARCHIVES of SCOTLAND

ULCC

ALPSP

re:source The Council for Museums Archives and Libraries

RESEARCH LIBRARIES GROUP

curl

The Wellcome Trust

OCLC

Advocacy

- Launch at House of Commons February 2002
- Major PR campaign (generates around 20 press articles pa)
- General and specific stories
- Has changed profile of digital preservation

Some Examples of UK Collaboration

- UK Web archiving consortium
  - 2 year shared testbed of PANDORA next year
  - Shared costs, evaluation, independent collections
  - Six partners – British Library, JISC, National Library of Scotland, National Library of Wales, National Archives, Wellcome Trust
- National Needs Survey
  - Started July with DPC membership
  - 2nd stage dependent on external funding
  - Political process - will look at long-term programme

Conclusions/Relevance to Europe

- Information trends are global. Issues are/will be common to all
- Use shared press and professional PR
- Opportunity for EU action on research and shared infrastructure
- Many world-class dp projects in Europe, but excellence must be sustained
- EU needs to be as serious as US (NDIIPP/NARA) on funding for digital preservation

ROUND TABLE

EU STRATEGIES AND POLICIES FOR LONG TERM PRESERVATION OF THE DIGITAL MEMORY OF CULTURAL HERITAGE: THE FIRENZE AGENDA

INTRODUCTION TO THE FIRENZE AGENDA

Maurizio Lunghi
Experts Workgroup on Preservation of Digital Memory

As an introduction to this round table on EU strategies and policies for long term preservation of digital memory, I would like to quote a very clear rationale prepared by Bernard Smith, of the DG Information Society, which briefly summarises the Firenze Agenda proposal:

"Following the Council Resolution of 25 June 2002 *on preserving tomorrow's memory - preserving digital content for future generations*, and in preparation of the International Conference in Firenze on 16/17 October 2003 under the coordination of the Italian Presidency, an experts workgroup is proposed to check the state-of-art and plan development as needed to implement the resolution principles. The workgroup will be leaded by the Erpanet and Minerva projects, under the chairing of the European Commission.

In particular, the Council Resolution invites European Commission and Member States to report on current situation and to draw up an action plan as appropriate.

The participants list collects both names of experts involved in the preparation of the resolution or nominated by national authorities through the NRG (National Representatives Group), and names of experts involved in key initiatives worldwide.

The workgroup aims to reach 3 main goals:

a. Draw a state-of-art of on-going initiatives and exchange of good practice;
b. Draft a priorities agenda as a starting point to produce a joint action plan among Member States;
c. Define the basis for building a European network and develop national initiatives.

This first activity is hopefully the start-up of a cooperative-process to define priorities and mechanisms to improve coordination and effectiveness of national and sectoral initiatives on digital preservation across Europe".

ERPANET AND ITS ROLE IN ENABLING LONG-TERM ACCESS TO CULTURAL HERITAGE[1]

Seamus Ross
Director of the Electronic Resource Preservation and Access Network (ERPANET)
Director of the Humanities Advanced Technology and Information Institute (HATII)

ABSTRACT

Digital technologies have become central to private and public sector business processes. As a result much of the information needed to ensure accountability of business activity and societal memory exists increasingly only in digital form. Economic growth, and effective and efficient government in the 21st century is linked to the management of digital processes and resources. In the longer-term this linkage will become even more pervasive. As it does the need to ensure the authenticity, integrity, and accessibility of these materials will put greater emphasis on research and improved practices in the areas of curation, preservation, and reuse of digital objects. How companies and public institutions in the European Community address these issues will have a profound impact on Europe's ability to create a vibrant and economically sustainable knowledge-based society. Under the Fifth Framework Programme the European Commission and the Swiss government supported work by ERPANET[2] to conduct research, raise awareness, improve practices, and promote the growth of communities of practice in digital curation and preservation across Europe. This paper describes the research and awareness raising that ERPANET has been doing during in its first phase.

[1] This paper is based on S Ross, 2004. "ERPANET, A European Platform for Enabling Digital Preservation",*Vine: The Journal of Information and Knowledge Management*, 34.2 (issue 135).

[2] www.erpanet.org

INTRODUCTION

The Member States of the European Union agreed in March 2000 that by 2010 Europe should have become "the most competitive and dynamic knowledge-based economy in the world…"[3] The increase in e-commerce, e-government, and eContent initiatives have continued their pervasive penetration of European society. We widely recognise the benefits of using digital communication technologies and digital information. A vision is emerging of Europe as an information rich society whose record is just waiting to be harvested and processed by the technology-enabled researcher of the future or by emerging eContent industries. E-commerce and e-government initiatives continue to raise awareness of the need for reliable and trustworthy information sources and to ensure that the digital products and by-products of business activities will be accessible in the longer term. Delivering this vision depends upon the survival of digital data in accessible, usable, reliable, and authentic form. As a result curation and preservation of digital information has an impact on public bodies, memory organisations, researchers, and most business sectors including aerospace, entertainment, finance, and pharmaceuticals.

Digital records and archives form the building blocks for learning and leisure, for scientific and historical research, and for business in the "ambient intelligence landscape". The effective and affordable preservation of digital records (whether digital objects, eContent, or electronic records) of European culture and science is fundamental if the overall aim of the European Commission's IST Programme to provide "new tools and business models for service design and provision and for content creation and delivery" is to be achieved. Scientific research, cultural activities, and entertainment all produce digital objects as either a by-product or result of their processes. It is rare that either when these systems are designed or at the moment that their uses result in the creation of digital objects themselves that preservation challenges are addressed. Archives, libraries, and museums keep digital objects of

[3] Lisbon Council (2000), "Presidency Conclusions: Lisbon European Council", http://europa.eu.int/european_council/conclusions/index_en.htm (from where there is a link). These conclusions were reinforced by the *e*Europe 2002 Action Plan for which clear methods for measuring the success of its targets were established. See the *eEurope 2002 Final Report* (2003): http://europa.eu.int/eur-lex/en/com/cnc/2003/com2003_0066en01.pdf

cultural and scientific significance that are worth preserving over time. In a variety of research programs academic institutions, commercial enterprises (e.g. pharmaceuticals), and public sector organisations are seeking reliable solutions to the long-term curation and preservation of the digital heritage.

The European Commission and the Swiss Federal Government recognising that action was needed to address these issues supported beginning in 2001 ERPANET (Electronic Resource Preservation and Access Network), which works to enhance the preservation of cultural and scientific digital objects. ERPANET, a European Commission funded activity (IST-2001-32706), is led by the Humanities Advanced Technology and Information Institute (HATII) at the University of Glasgow (United Kingdom) and its partners the Schweizerisches Bundesarchiv (Switzerland), ISTBAL at the University of Urbino (Italy), and Nationaal Archief Nederland (Netherlands). Our initial funding stream of some 1.2 million euros runs for thirty-six months until November 2004. As generous as the funding from the Commission and the Swiss Government may seem, as we shall see below, without the commitment of professionals from across Europe, Australia, New Zealand, Canada and the USA ERPANET would not have been able to achieve its objectives. These experts have donated time, thought, effort, and knowledge. Since the aim of digital preservation is to make authentic, understandable, and reliable digital materials accessible across time, the activities ERPANET leads help enable effective knowledge management and contribute to the development and sustainability of the Information Society.

ERPANET addresses the lack of awareness, fragmentation of knowledge and skills amongst the stakeholder communities about how to handle existing digital preservation problems, and the paucity of guidance as to how to plan effectively for the future. It addresses the lack of identification and focus on core research/problem areas, and brings coherence and consistency to activities in this area. ERPANET helps its community to develop skills and know-how to protect and to exploit to its full potential this intellectual wealth - Europe's next generation of renewable resources.

ERPANET facilitates the realisation and exchange of knowledge on state-of-the-art developments in digital preservation and the transfer of expertise between individuals and institutions. More specifically ERPANET delivers research, content creation, advi-

sory services, training seminars, thematic workshops, case studies, and outreach to both the information creation and user community. It makes accessible tools, knowledge, and experience. We set ourselves the following specific objectives in 2000 after the team designing ERPANET reviewed current practices, needs, and challenges posed by digital curation and preservation:

- To identify and raise awareness of sources of information about the preservation of digital objects across the broad spectrum of national and regional cultural and scientific heritage activity in Europe. ERPANET identifies, tracks, and filters sources.

- To appraise and evaluate information sources, to document developments in digital preservation, and to make available results of research, projects, and best practice.

- To provide an online advisory service on digital preservation issues, practice, technology, and developments.

- To implement a suite of thematic workshops to bring together experts from a range of disciplines to examine key preservation issues and to initiate associated thematic discussion.

- To run training seminars based on best practice and to identify where and what further practitioner training and staff development initiatives might be undertaken.

- To conduct research through case studies that would improve our understanding of practices. Among the results of our analysis of these case studies would be best practice guidelines.

- To stimulate further research on digital preservation in key areas and encourage the development of standards where gaps and opportunities have been identified. For example, the ERPANET team in Glasgow has studied how to improve the ingest of digital materials into repositories.

- To stimulate ICT companies and software developers to incorporate some of the curation and preservation thinking into newer generations of software.

The Work of ERPANET

Four Directors manage ERPANET on behalf of the main partners in the project. The Directors of ERPANET Niklaus Bütikofer (Schweizerisches Bundesarchiv), Maria Guercio (IST-BAL, University of Urbino), Hans Hofman (Nationaal Archief Nederland, Den Haag), and Seamus Ross (HATII, University of Glasgow) work as a team to develop and refine our initiatives. Only a portion of the time that each of the Directors commits to the project is funded by the Commission and the Swiss government. As a result our institutions have made significant contributions to underwriting the costs associated with this project. The work of the Directors is supported by Content Editors. There is one content editor based at each of our four nodes, covering the British Isles and Nordic Countries, Northwest Europe, Mid-Europe, and Southern Europe. The Co-ordinator (Peter McKinney) is based at HATII (University of Glasgow). The ERPANET Web site is being developed as a key outreach tool and as a community resource. Although the project has a large number of activities, here I am going to discuss three: assessments and advisory services, thematic workshops and training seminars, and case studies.

Assessments and Advisory Services

The quantities of literature on topics related to digital curation and preservation continues to grow quickly. It is increasingly difficult to determine what to read. ERPANET is working to address this challenge. The Content Editors identify information sources, collect, and evaluate documents, standards, technical guidelines, research reports and Web-published material, produced nationally or internationally. They review and appraise relevant research and development projects and related actions under EU Framework Programmes, US National Science Foundation (NSF) funding streams, and other national and international funding programmes. We regularly survey about ninety-five publications to identify literature which might prove a candidate for review. Each week the Directors and the Content Editors discuss candidate publications and select those that we will review. The commentaries are designed to give the reader an understanding of the work in question, to set it in context, and to draw from it the benefits that it brings to an organisa-

tion, the new methods it suggests, or the new research that its results indicate should be conducted next. The objective is not merely to produce an abstract of the work in question, but to create a commentary on the work that adds value through an analysis of it.

We have established an online facility that allows those seeking answers to questions about digital preservation to post them at the ERPANET Web site. The Content Editors and the Directors provide answers, wherever possible. So far few questions have been posted. The Directors of ERPANET have been drawing the attention of audiences at all of our own seminars and workshop to the service, as well as at the roughly seventy conferences at which we have represented ERPANET during the first thirty months. We are currently working on a redesign of this service to make it more effective.

In addition to our online advisory service we have also created best practice guidelines in the areas of preservation cost modelling, risk assessments, technology selection, and digital preservation policy design and development. We are constructing other tools; tools on ingest, audit and evaluation, and metadata are examples. These guides are not intended to be comprehensive, but have been designed as accessible starting points.

These services are now supplemented by ERPAePRINTS, which was launched at IFLA2003 (Berlin)[4]. ERPAePRINTS allows authors to make their work available through a reliable, managed, and OAI-compatible service[5]. The service aims to make accessible and provide long term preservation for literature related to digital curation and preservation whether the submitted work has been published or is grey literature[6]. Usage of ePrints services has in some domains been quite popular, while in others take up has so far been limited. Deposits of material with our service continue to increase slowly, and as the content expands so have the numbers of users accessing and downloading material.

Thematic Workshops and Training Seminars

The Workshops, usually three-day events, enable groups of ex-

[4] *IFLA Express,* issue 7 (8 August 2003), page 8.
On-line version: http://www.ifla.org/IV/ifla69/IE7e.pdf

[5] http://eprints.erpanet.org

[6] Subject, of course, to guarantees that the posting will not raise any intellectual property rights obstacles.

perts to explore core preservation topics, such as: the relationship between digitisation, digital preservation and conservation (Toledo, June 2002); XML for Digital Preservation (Urbino, October 2002); the Long Term Preservation of Databases (Bern, April 2003); Trusted Digital Repositories (Rome, November 2003); and Audit and Certification in Digital Preservation (Antwerp, April 2004). They work to increase the level of awareness within the communities of digital information providers, practitioners, experts, and preservers. After each workshop ERPANET produces a report which summarises the presentations and discussions, and makes recommendations for action, improvements to practices, and new directions for research.

The workshops themselves give participants access to authoritative sources of information and experience that can be further analysed in different environments and enable them to contribute to agenda setting exercises. The workshops are developed over a number of months by ERPANET's Directors and the Content Editors. We begin by identifying a problem domain. We then draw together our preliminary thinking. We build an initial list of speakers and engage in discussion with them about the issues. As a result of our internal discussions and those with potential speakers we draft a briefing paper that forms the backbone of the workshop. This paper and the workshop agenda are available before the event on our Web site. The presentations delivered at the workshop (and in some cases recordings of the presentations themselves) and the report of the workshop are added to the Web site after the meeting. What is evident from these workshops is that the community is hungry for practical case studies and reports of real world experiences. The small size of the pool of experts makes it difficult to identify speakers with suitable technical expertise and presentation skills. The success of the workshops depends on the right mix of speakers and participating attendees; having, for instance, a cross-domain audience helps overcome the barriers between domains. Although we cannot prove this, we have noted that in the twenty-four months since ERPANET started the level of curation and preservation awareness of audiences at ERPANET events appears to have increased with each successive event.

Few practising librarians, archivists, museum professionals, and commercial records or digital object managers possess a sufficiently substantial body of knowledge about the technology and management issues to deal effectively with digital preservation. In

an effort to fill the gap ERPANET runs seminars, which are two-day events focusing on policy and technical preservation issues, namely: OAIS (Copenhagen, November 2002), Policies for Digital Preservation (Fontainebleau, January 2003), Web Archiving (Kerkira, May 2003), Metadata (Marburg, September 2003), Appraisal of Scientific Data (Lisbon, December 2003), File Formats for Preservation (Vienna, May 2004) and Persistent Identifiers (Cork, June 2004). The quality of the training materials is of paramount importance if the participants are to be able to transfer the skills and knowledge they acquire to their home institution. The best experts have not always proved to be the best designers of training materials or the best communicators. The planned binary distinction between thematic workshops and training seminars has not always been maintained. This may reflect, in part, the lack of stable knowledge in the preservation arena that can form the basis of training events focused on skills development. This has meant that presentations, discussions, and interactions at seminars create new knowledge in much the same way that similar activities at workshops do; this contrasts with the more traditional interpretation of a training event.

ERPANET is constantly looking for new ways to develop communities of practice and to promote developmental discussions. Just over a month after the Marburg training seminar in October 2003 we ran an online chat session which enabled speakers and participants to discuss issues further. We found this a very successful approach and intend to conduct similar online events after future seminars and workshops. During the lifetime of the project the mechanisms that we can use to communicate with the community have changed, and the project has attempted to respond to these emerging opportunities.

ERPANET has sponsored a number of events not envisaged at the outset of the project. In August 2002 we hosted a session at IFLA2002 (Glasgow) on *Information for Life: Digital Preservation and Access*, in April 2003 in conjunction with the Nationaal Archief van Nederland we ran a workshop on *Archives Online: moving archives into the digital era*, and in September 2003 we hosted a three day workshop with the DSpace Consortium at Glasgow. We are currently considering the idea of adding two further events to our work programme. One would focus on the preservation of contemporary digital art. The second would examine how the need to handle digital objects and records may reshape the disciplines of archival

studies and records management. In the first thirty months of the project, the members of the ERPANET team have delivered more than seventy presentations at other events about digital preservation and the work of ERPANET.

CASE STUDIES

Despite recognition in the library, archive, and records management communities that the survival of digital information requires action, casual discussion with professionals from these communities indicates that calls for action have so far not resulted in effective and commonly adopted digital preservation strategies. In an effort to understand what organisations are doing to promote preservation of their digital materials, the team at ERPANET have been conducting case studies. These studies are helping us to:

- build a picture of preservation methods and match them against institutional context to underpin guidance on good practice;

- accumulate and make accessible information about the experiences of different digital resource managing communities;

- identify issues which could benefit from new research;

- enable cross-sectoral comparisons of strategies and practices;

- provide sources of experience and methods to facilitate the development of assessment guidance; and,

- create material for training seminars and workshops.

Sectors have been selected to represent a wide scope of information production and digital preservation activity[7]. To build as comprehensive and representative a picture as possible, we are interviewing archivists/records managers, information systems or technology managers, and business managers in organisations that

[7] Update note: As of April 2004, we have contacted over 400 institutions based in Europe. Less than 20% of these contacts have actually resulted in completed case studies.

agree to act as case study targets. This broad assessment of awareness and activity in organisations is providing us with detailed information about the extent of knowledge and practice in organisations, giving us an indication of where ownership for the problem lies within organisations, and offering us material to determine where digital preservation activity is likely to be promoted within organisations. In conducting our interviews we are examining:

a. perception and awareness of risk associated with information loss;
b. how digital preservation affects the organisation;
c. the actions institutions are taking to prevent data loss;
d. how institutions monitor these activities; and,
e. what mechanisms institutions have put in place to enable them to define their digital preservation needs.

One of the immediate outcomes of our work is the Case Study Questionnaire which is available at the ERPANET Web site and which we hope others conducting similar studies might find a useful starting point. The preliminary results of the case studies were outlined in a paper delivered at IFLA2003 (Berlin)[8] and examined in more detail in a paper delivered in Ottawa in September of 2003 at the Canadian Conservation Institute Symposium 2003 on Preservation of Electronic Records: New Knowledge and Decision-Making[9]. This research is providing new material that is enabling us to understand the preservation problem better. The completed case studies are available on the ERPANET Web site for use by researchers and professionals looking for practical experience and approaches. During the summer of 2004 we will be supplementing these detailed studies with the results of a broader survey of current knowledge and practice in digital preservation across European companies.

EVALUATION, DISSEMINATION AND COLLABORATION

We have in place quality control procedures. They cover our as-

[8] http://www.ifla.org/IV/ifla69/prog03.htm

[9] S Ross, M Greenan, and P McKinney, in press 2004, "Digital Preservation Strategies: The Initial Outcomes of the ERPANET Case Studies" in the *Preservation of Electronic Records: New Knowledge and Decision-making,* (Ottawa, Canadian Conservation Institute).

sessments of literature and projects, the case studies we conduct, and the seminars and workshops we run. For seminars and workshops we seek user feedback to ensure that our events are of the highest standard and to enable the community to offer us information about their needs[10]. We seek participants' opinion on such other topics as the documentation (e.g. briefing document, handouts), the speakers, organisation, structure, and focus of the events. Across the board all aspects of the events are highly rated, but early on we did learn some valuable lessons from our evaluations. For instance at the first two events we did not provide copies of the overheads used by speakers to participants before the presentations. Participants asked for these in advance and now, wherever possible, we provide them. We have extended the amount of time at the workshops devoted to breakout discussion sessions in response to participant requests. In addition to evaluating each event, we are about to begin an impact assessment of the first seven events (Toledo, Urbino, Copenhagen, Fontainebleau, Bern, Kerkira, and Marburg) in an attempt to measure the benefits that attendance at an event had on the working practices of individuals and their organisations. This is being conducted as an independent research project led by a specialist in evaluation and impact assessments from the University of Toronto (Canada).

Our Web site is the primary dissemination mechanism. It is from this service that users gain access to our products from our assessments to our case studies. As not everyone who is interested in attending our seminars and workshops can afford either the time or travel and accommodation costs, we encourage all speakers at our events to provide ERPANET with their presentation materials for distribution both at the events and on our Web site, and only one speaker has formally declined to do so. Wherever possible we record the presentations. For some events we have made the audio recordings available online alongside the presentation

[10] Update note: The reports of user evaluations of the individual seminars and workshops, and a summary evaluations we have completed so far, are available on the ERPANET Web site. Across the events held between June 2002 and April 2004, roughly eighty percent of those attending our workshops and approximately eighty-five percent of those attending our seminars reported that the events met their expectations. In the case of both types of event more than ninety percent of those attending reported that they would be likely to attend another one; those who have attended multiple events, and there have been quite a few individuals who have done so, have helped to bring an intellectual continuity to our activities.

slides. The reports of all our seminars and workshops are available online and in 2005 we will be publishing these reports in print. The papers delivered at the Marburg seminar on Metadata will be published jointly with the Archivschule (Marburg) and those given at the Rome workshop on Digital Repositories will be published jointly with the Accademia dei Lincei. Papers from several of the other workshops have appeared in *Archivi e Computer*.

As a collaborative activity ERPANET depends upon synergy with other organisations and engaging professionals. So far nearly twenty European and international organisations have worked at corporate level with ERPANET to make our training seminars and thematic workshops viable and successful. These have included in addition to the four core partners: The Biblioteca Nacional España, Caja Castilla la Mancha, The Royal Library (Denmark), Archives de France - Le Centre des Archives Contemporaines (Fontainebleau), Trivadis AG, Ionian University (Kerkira, Greece), Archivschule (Marburg), Accademia dei Lincei, Ministero per l'universitá e la ricerca (Italy), DSPACE Consortium (including the Cambridge University and Library and MIT), National Library of Portugal, CODATA, the Stadsarchief Antwerpen, Österreichische Nationalbibliothek (Vienna), University College Cork, Digital Curation Centre (UK), and Minerva[11]. In mid-2003 we concluded a partnership agreement with PADI at the National Library of Australia and are in the process of redesigning our literature and project assessment databases, so that we can exchange commentaries with PADI and thereby eliminate the duplication of effort.

Collaborative Contributions

Preservation is a problem domain that demands collaborative action. ERPANET has worked to ensure that it provides its expertise and that of its community to the work of other projects as well. For example, we played a role in the drafting of the Spanish

[11] Update note: By April 2004 more than ninety professionals from nearly as many organisations contributed lectures and led discussions at these events. The Research Libraries Group (Mountain View, CA) and the National Archives Records Administration (NARA) in Washington DC have helped build our programmes and have generously shared their expertise. Staff at the Electronic Records Archives Program at the National Archives and Records Administration (NARA) in Washington DC has been especially supportive of the project.

Resolution on Digital Preservation[12]. The European Commission's FP5 funded digital library activity DELOS and the National Science Foundation (NSF) established working groups to study the digital library landscape and define research agendas surrounding a number of core challenges facing digital libraries[13]. Among the eight working groups one examined Digital Archiving and Preservation. Colleagues from ERPANET contributed to the development of its report, *Invest to Save: Report and Recommendations of the NSF-DELOS Working Group on Digital Archiving and Preservation* (2003)[14]. This report charts the research that is needed if digital libraries are to have access to the experience, methodologies, practices, and technologies necessary to ensure the long term accessibility and usability of the digital assets they will hold. Members of the ERPANET consortium have joined DELOS2[15] to press forward research in the area of digital preservation and digital libraries. The DELOS2 Preservation Cluster during its first eighteen months will investigate the development of a digital preservation testbed, the design, deployment and management of digital repositories, file formats and their classification, the viability of documentation of functionality and behaviour of digital objects, and the creation of preservation functionality modelling tools. These are all issues that ERPANET's case studies had found were core technical problem domains.

Our case studies have demonstrated that institutions are waiting for external developments of preservation utilities that they can adopt, or off-the-shelf solutions they can implement. During the coming year ERPANET will work to raise awareness among software developers and the ICT industry more generally of the need for "preservation enabled applications (PEAs)". The development of "preservation aware" applications would open new opportunities for the EU software industry and especially SMEs. By encouraging ICT and software developers to contribute to the work of ERPANET and increase their awareness of the challenges and

[12] Spanish Presidency Resolution on Digital Preservation, Council Resolution of 25 June 2002 *on preserving tomorrow's memory - preserving digital content for future generations* (2002/C 162/02). The text of the resolution is available on appendix to this book.
[13]http://delos-noe.iei.pi.cnr.it/activities/internationalforum/Joint-WGs/joint-wgs.html
[14]http://delos-noe.iei.pi.cnr.it/activities/internationalforum/Joint-WGs/digitalarchiving/Digitalarchiving.pdf
[15]http://www.delos.info

market opportunities raised by the preservation of digital objects, ERPANET aims to enable them to acquire the knowledge necessary to incorporate new kinds of functionality into their applications. We are, however, not the first group to adopt this line of attack. At the conclusion of the *DLM Forum'99 -European citizens and electronic information: the memory of the Information Society* the participants agreed a DLM-Message to Industry (Brussels, 19 October 1999)[16] which stressed the needs for more widespread support from the ICT industry in the development of strategies, practices, and applications that supported preservation. By DLM-Forum 2002 a greater level of ICT participation and awareness could be seen at the Forum, but it had not, and still has not, reached a level where we are seeing new products coming to market and new digital curation and preservation services emerging[17].

Conclusion

Through its Web site, events, and contribution to other activities, ERPANET provides a substantial resource for the European community. ERPANET itself faces its most substantial challenges as it moves towards the end of its first phase of European funding. We are attempting to define business models that will give ERPANET sustainability and we will decide in July 2004 how, if at all, ERPANET will be continued beyond November 2004. Our work indicates that Europe is hungry for guidance in the area of digital preservation and that rather than shrink this demand will continue to grow. While we hope that ERPANET will continue to play a part in satisfying this need, there are many more players needed if as a community we are to develop effective preservation capabilities across public, commercial, and consumer sectors. Indeed one of the primary reasons for describing ERPANET's activities and ways of working, is the hope that similar organisations might be established in other parts of the world either at regional or national levels.

ERPANET was delighted to contribute to the work led by the

[16]http://europa.eu.int/historical_archives/dlm_forum/doc/dlm-message-to-industry-en.pdf

[17] *Proceedings of the DLM-Forum 2002 @ccess and preservation of electronic information: best practices and solutions*, Barcelona, 6–8 May 2002, (Luxembourg: Office for Official Publications of the European Communities, 2002). Online version: http://europa.eu.int/historical_archives/dlm_forum/doc/dlmproceed2002.pdf

Italian Presidency of the European Union and the Italian Ministry of Culture in cooperation with the European Commission and MINERVA[18] to develop this international conference on digital memory preservation. A major outcome of this meeting is the *Firenze Agenda*. This Agenda lays the foundation for ensuring that the Council Resolution *on preserving tomorrow's memory - preserving digital content for future generations*, developed and adopted under the Spanish Presidency, is effectively implemented[19]. ERPANET will contribute to the implementation of the Firenze Agenda. Alongside the activities supported by the Firenze Agenda, greater attention needs to be given to development of professional training in digital curation and preservation. Participants in ERPANET have noted that as digital technologies are impacting on digital object creation and curation they are leading to fundamental changes in how archivists and records managers work. In an effort to develop a better understanding of this change, ERPANET will host a workshop in Bern (October 2004) to bring together a group of experts to explore how the challenges posed by digital objects are reshaping the archival and records management disciplines.

[18] http://www.minervaeurope.org
[19] Council Resolution of 25 June 2002, quoted.

THE MINERVA PROJECT

Rossella Caffo
Coordinator of the Ministerial Network for Valorising Activities in Digitisation (MINERVA)

MINERVA is a project funded by the DG Information Society of the European Union, within the Fifth Framework Programme for research and technological development.

The MINERVA Project, which officially began on the 1st of March 2002, is a network of Culture Ministries of EU Member States, coordinated by Italy and aimed at implementing the Lund Action Plan and the various decisions taken by the National Representatives Group (NRG), whose members are formally chosen by each government as national experts on cultural heritage digitisation. The group was initially composed of 15 representatives and later, during the current Italian Presidency of the European Union (second semester of 2003), it was extended to 10 new accessioned States, plus Israel and Russia. The group meets every six months, under the aegis of the Presidency in office.

Thus, the MINERVA-NRG network works as a European reference group on the issue of cultural heritage digitisation. On the basis of various tools produced by MINERVA, the NRG works for ensuring a full implementation of the Lund Principles and Action Plan – and this way of structuring the process which is proving to be very successful.

The project focuses on the integration of digitisation activities carried out by the various institutions which are responsible for heritage management, such as archives, libraries, museums, local bodies, etc., and is aimed at promoting knowledge, dissemination and online access to heritage for an increasingly wide public.

MINERVA identifies the major lines of action and translates them into recommendations and guide lines, focusing on the following issues: quality in cultural Web sites (seen as points of access to culture), digitisation processes, interoperability of systems, long term preservation of digital resources, benchmarking; identification of best practices, development of a technological platform, at the European level, for the creation of national inventories of digital fonds, and protection of copyright and intellectual property rights.

These activities are carried out by five European working

groups, which see the participation of experts chosen by the national representatives. These groups are focusing on: benchmarking, discovery of digitised fonds, interoperability of systems, best practices, and quality in the Web. The groups are further supported by national groups. In Italy, for example, we have created four working groups: benchmarking and best practices, interoperability and inventories, quality in the Web, and copyright.

One of the most relevant results achieved by the MINERVA-NRG network has been that of ensuring an institutional continuity to the various actions undertaken by each European Union Presidency. On this point, our Minister Mr Giuliano Urbani recently noted that this project, based on the cooperation of all Member States and on the support of the European Commission, "contributes to the creation of a rolling agenda, a common European programme aimed at ensuring the continuity of actions, by concentrating our efforts on objectives which are agreed and shared by all Member States".

Italy, which coordinates the project, has strongly supported this common effort, as we believe that this is the right strategy for adding European value to our activities.

The Italian Presidency particularly insisted on two points of this rolling agenda:

1. Long term preservation of cultural resources, on the basis of the Council Resolution *on preserving tomorrow's memory* (2002/ C 162/02), prepared by the Spanish Presidency and approved on June 25, 2002. The Danish Presidency had then continued this work, through a Workshop held in Copenhagen (December 11, 2002) - and now the Italian Presidency has organised this conference here in Florence.
2. Quality in digitisation activities, cultural Web sites and points of access to cultural heritage.

MINERVA already published two handbooks, one on quality in cultural Web sites and another on best practices for digitisation. The latter is called *Guide to Best Practices*, and it will be presented in Rome on October 29, 2003, during "Bibliocom" - a forum organised every year by the Association of Italian Librarians (AIB). The handbook is already available in English, and we are currently translating it into Italian. On the other hand, the *Handbook for Quality in Cultural Web Sites* will be presented in Parma, during MI-

NERVA's European Conference (November 20-21, 2003). In 2003 we also published a *Progress Report*. This report provides a European overview of programmes and projects for cultural heritage digitisation. During the spring of 2004, we shall produce a follow-up report.

MINERVA carries out a wide range of activities, which are all aimed at a number of common objectives:

a. ensuring quality of digitisation projects;
b. guaranteeing quality for Web sites and ensuring the creation of points of access on the basis of users needs;
c. developing systems interoperability;
d. carrying out a census of existing inventories of digital/digitised fonds and working on the issue of multilingualism; and,
e. identifying best practices and competence centres.

MINERVA is developing a common European framework of reference for standards, recommendations and guidelines; on this basis, we will promote the creation of a National Portal for Culture, Tourism and Production. This project will be presented in Parma, during MINERVA's European Conference.

In conclusion, I wish to say that, in my opinion, MINERVA represents a valid model of cooperation - which is an extremely relevant aspect of any digitisation activity. MINERVA's approach to cultural heritage is focused on the relation between heritage and new technologies, which are considered as a key factor for supporting heritage dissemination and for making it accessible to an increasingly wide public.

In this sense, MINERVA also functions as an open network for European Culture Ministries to exchange information on the issue of long term preservation of digital resources - and, specifically, on the Firenze Agenda, a strategic proposal made at this Conference and which we shall also present at the next NRG meeting of Parma.

PRESERVATION INITIATIVES OF THE MINISTER FOR INNOVATION AND TECHNOLOGY

Vincenzo Fortunato
Consultant of the Minister for Innovation and Technology (IT)

THE ISSUE

The issue of digital data preservation is rapidly turning into an "emergency" of the modern world.

The amount of data "at risk" is explosive. According to the Information Data Corporation (IDC), only in the business world the quantity of exchanged e-mails will increase from 2.6 trillion in 2001 to 5.9 trillion in 2005.

Data, access and decoding languages, and hardware are all subject to a serious ageing process. Critical issues are manifold:

- Bit coding formats change continuously and, over the years, their obsolescence makes it extremely difficult to decode and read the information they keep (just think of the evolution of word processor formats and image compression systems/JPEG).

- Hardware can contain huge data volumes and, potentially, their mass storage capacities could grow exponentially. On the other hand, these media are subject to a more serious degradation than that affecting paper copies, when well preserved: if one single hw unit is damaged, the loss of information is enormous (just think of the latest hard disks in commerce, with capacities of several tens of gigabytes).

A remarkable example of data loss concerns the problem of global warming, a phenomenon which is hard to analyse because data from the NASA satellite observations of 1970s are not readable anymore.

PROBLEMS IN DIGITAL PRESERVATION

As a consequence of technological evolution, the components of information systems change continuously. Machines must "understand" the language in which a software is written: thus, this language cannot be a "natural" language.

But the costs for ensuring that hardware platforms remain compatible with the different software generations are prohibitive. For example, producing new electronic chips that can fully support software released in the 1980s costs millions of Euros, because twenty years ago electronic chips were produced by means of a special tincture treatment which no longer exists.

DIGITAL PRESERVATION TECHNIQUES

Today, different techniques have been developed for ensuring the preservation of digital data.

TECHNIQUE	DESCRIPTION	PROS	CONS
Migration	Periodical conversion of digital data into next generation formats.	Data are made immediately accessible.	From one generation to the next, copies get deteriorated.
Emulation	Based on the writing of a software which emulates older sw and hw, and imitates the original platforms of the applications.	No need to alter data.	The imitation is hardly perfect; sooner or later any emulator chain will fail.
Encapsulation	Digital data are encapsulated in physical and software "capsules", providing future users with indications for reconstructing them.	Information for interpreting data is never separated from data.	New capsules need to be created each time a new format or software is released. And it doesn't work well for non-text data.
Universal Virtual Computer	Specifications for a simple sw decoder are filed on a paper record, and all data are stored in a language which the decoder can read.	Paper lasts for centuries, and the machine does not depend on a specific hw or sw.	It's hard to sum up all the needed specifications on a paper record of reasonable size.

OTHER RELEVANT REMARKS

The issue of digital storage is urgent, yet there does not seem to be a general awareness of the risks we're running. That of ICT is a sector which, by definition, is not interested in the past, but only in the future: today's sw and hw engineers have no need to know anything about old generation systems, as they never have to use them.

Research is extremely expensive and even major IT corporations invest very little money in this field. In 2003, within the whole of the IBM there was only one researcher who had been granted funding for studying the Universal Virtual Computer.

Communication is rather problematic. There is no clear perception of the quantity of data which we have lost while entering the digital era. In this sense, the example of the Wayback Machine Project[1] is emblematic. Through its Web site you can surf the ten billion pages visited by this archive in the last five years: "*The Internet Archive is building a digital library of Internet sites and other cultural artefacts in digital form. Like a paper library, we provide free access to researchers, historians, scholars, and the general public.*" But, unfortunately, many of its links are already "dead".

DIGITAL CONTENT PRESERVATION IN THE CULTURAL SECTOR AND INITIATIVES OF THE MINISTER FOR INNOVATION AND TECHNOLOGY

The issue of preservation is very important for cultural heritage, for two main reasons: the first is the potential degradation of physical cultural assets and, consequently, the second is that we now have a chance to preserve these assets in digital form.

Moreover, by setting up a digital archive of human creations we'll have the great opportunity of disseminating, through the Net, cultural heritage at worldwide level.

The *Rapporto innovazione e tecnologie digitali in Italia*[2] (October 9, 2003), edited by the Centro Studi of the Minister for Innovation and Technology, states that: "Digital technologies are offering mu-

[1] http://www.archive.org

[2] The Report on Innovation and Digital Technologies in Italy is available (in Italian only) at:
http://www.innovazione.gov.it/ita/news/allegati/rappo_innovazione_italia091003.pdf

seums and cultural institutions such a great opportunity that we can almost talk of a second life for these institutions. In the last ten years communication networks, computer science and, particularly, computer graphics, have made it possible to enhance both local and remote access to cultural resources. On the other hand, a large number of technologies remain unexploited in the cultural sector, or are under-exploited in the cataloguing and safeguarding of cultural heritage. (…) Through new technologies for human-machine interaction, we can now offer visitors dynamical and immersive tools for exploring exhibitions or reconstructing the environment where pieces were originally located. This is the trend followed by many European projects, such as Archeoguide - where visitors can virtually reconstruct a given site by means of a head mounted display, ear phones, and a mobile terminal. Virtual reality technologies also are growing in importance, as they offer the opportunity of visualising the past in a way that no traditional technology was ever able to perform: visitors can now "move" through the site in question and observe it from different perspectives. Moreover, thanks to the spreading of the broadband, these applications might soon be made remotely available. An interesting example is that of the Scrovegni Chapel Project in Padua, carried out by the Consiglio Nazionale delle Ricerche.

The cultural and scientific inheritance of our country represents an extremely valuable resource, which has driven for centuries the social and economic development of our communities. Digitisation is the first step towards the creation of a "new content" by which Digital Italy will distinguish itself, and represents a crucial activity to ensure the preservation of the cultural inheritance and diversities of the Italian Regions, while providing full access to citizens. (…) The enhancement of cultural heritage through digitisation offers great opportunities in terms of economic development, for example in the tourism sector[3]; in order to promote scientific research and education, and create and maintain digital archives, substantial investments are required, and the problem of copyright protection must be faced".

The development of broadband services, their multimedia and interactive nature, and the issue of cooperation between private

[3] In Europe, it is estimated that the value of cultural assets as "tourism consume products" is of 335 billion of Euros per year. See T. Nypan, *The Cultural Heritage Market and Built Heritage Maintenance Management*, Cebit, 2003.

stakeholders and the public sector at central and local level, will be the issues at the centre of the European Council on Telecommunication and the Information Society (Brussels, 20 November). Plus, other initiatives are likely to support the growth of a market for digital contents – for example, the Directive on the re-use and exploitation of data kept by public administrations which we should soon pass. We must find a balance between the need of ensuring the widest possible dissemination of cultural contents, with that of protecting the IPR of content creators. In particular, an appropriate strategy for promoting broadband access will have to take into account all issues related to the adoption of Digital Rights Management, which is a strategic tool for creating and consolidating reliable network business models and for providing the required guarantees to stakeholders. In this sense, the initiatives undertaken by the Italian Government are aimed at promoting the prompt and uniform development of both infrastructures and contents based on the broadband.

Digitisation requires substantial investments and, according to the above mentioned report on innovation and digital technology in Italy, "digitising and managing cultural heritage is highly costly, and these costs can't be covered exclusively by public funding. The digitised heritage must be enhanced and exploited, providing return on the investment made.

Digital technologies make this possible, as these reduce the "non-exclusiveness" which often characterises "analogical" cultural heritage. "Non-exclusiveness" means that any consumer can access the asset in question with no limitations. Yet if, for example, you couldn't generally have people paying a ticket to enter a city rich in art, you could easily expect visitors to get a ticket to enter a museum[4]. Similarly, one could think of both free and paying tours on the Web sites of museums and artistic collections. Actually, digitised cultural heritage could well be enhanced and promoted through a "use on demand" approach, that is to say asking real or virtual visitors to pay for having access, whenever they need or like to, to a given information or to more in-depth documentation . As far as Web sites are concerned, this could easily be achieved by classifying access to certain areas of the Web site. Some interesting

[4]See Stale Navrud and Richard C. Ready, *Valuing Cultural Heritage, Applying Environmental Valuation Techniques to Historic Buildings, Monuments and Artefacts*, Edward Elgar Publishing Ltd, June 2002.

applications of this concept could be developed by delivering information services based on mobile terminals and wireless technologies, informing tourists or visitors of the existence of relevant cultural heritage in their area, and providing them with all the multimedia information they might need."

On the basis of the above considerations, the Italian Government and, particularly, the Minister for Innovation and Technology and the Ministry for Cultural Heritage launched the project of the Italian Digital Library (Biblioteca Digitale Italiana, BDI). The *Feasibility Study* for the BDI project states that "considering the richness and variety of our heritage, our main objective is prominently one of cultural nature. And the same can be said for all other countries in the world, both when the building-up of a digital library is aimed at supporting higher-education and when the focus is on historical documentation and memory preservation. Actually, as the international review illustrated below will show, these two approaches complement each other, and at the end of the day the problem turns into what choices should be made, right from the earlier phase of a digital library project, in order to implement it in both directions, in a thorough and uniform way. As for the Italian case, focusing on local memory and supporting research could be the two ideal lines defining the borders within which any digital library project is to be carried out and funded. Finally, it must be noted that such a cultural objective could also be a driving force in creating new jobs and professional skills, and promoting the culture of our country at international level"[5].

[5] See www.iccu.sbn.it/bdi.html

GOVERNING DIGITAL PRESERVATION

Gianbruno Ravenni
Directorate General for Education and Cultural Heritage
of the Region of Tuscany

Starting from the consideration that we are moving towards a future in which the collective memory of society will be mostly in digital form, we must, first of all, advocate the need for public policies on digital memory preservation as an outmost urgency. "What survives - according to Jacques Le Goff - is not the whole body of what existed in the past, but the result of both choices made by forces acting throughout time within the evolution of the world and of humankind, and of choices made by those in charge of studying past and present times, such as historians"[1]. In the absence of strong public policies, the preservation of memory would be a matter left to chance, or to factors such as the market and the structure of social relations.

Recently, I participated to a conference on archives where I illustrated the Italian regional policies for the preservation of our oral and audiovisual archives. On that occasion, the member of a Portuguese TV channel showed us a documentary they had realised with the purpose of illustrating the techniques and procedures used for preserving their newscasts in digital form. On that occasion, everybody in the audience couldn't avoid noticing how huge is the gap between the tools within the reach of a TV channel for preserving the newscasts, and the tools within our reach for preserving the most relevant records of the memory and history of the Italian people.

Jan Assman very clearly explains that "the contents of cultural memory, the way cultural memory organizes those contents and the length of time during which one gets to preserve something, are all aspects depending, by far and large, not on control or inner capabilities, but on exterior conditions, which are of social and cultural nature"[2].

[1] Translated from the Italian version, Jacques Le Goff, *Storia e memoria*, Torino, Einaudi, 1982, p. 443.
[2]Translated from the Italian version, Jan Assmann, *La memoria culturale*, Torino, Einaudi, 1997, p. XV.

Consequently, what we are facing here is a central issue for the future of European democracies in the context of the Information and Knowledge Society. Thus, and above all, in order to preserve our digital memory a strong action aimed at governing this process is needed. By "governing" I here mean identifying shared priorities for the enhancement and preservation of digitised materials - which also represents a precondition for developing adequate projects in terms of both scope and technologies. In the absence of an overall vision, comparable to that which inspired the creation of the great libraries' databases (such as the SBN Index), there is a real risk that all our initiatives might, at the end of the day, turn out to be highly fragmented and incapable of facing the challenge of new technologies and of their dizzy-speed evolution.

Aware of this, the Region of Tuscany started listing all digitisation projects implemented or proposed by libraries, archives, and public or private organisations within our region. This is, in our perspective, an essential precondition for starting up a coordination action, ensuring that the available human and financial resources are used more efficiently, and that all projects meet the required standards. In planning our digitisation activities, both the feasibility study commissioned by the Ministry for Cultural Heritage and Activities and the guide lines which were later defined by the Guidance Committee for the Italian Digital Library provided an essential framework of reference, along with the metadata standards produced by the ICCU working group and the guide lines developed by MINERVA. As a first step, we focused on the creation of a database of local periodicals, as suggested by many Tuscany libraries in virtue of the strong demand of the public for this kind of records. This initiative will improve the accessibility and usability of local newspapers, while preserving the integrity of paper originals, which are likely to be damaged if consulted by a great numbers of users.

In addition, we organise workshops for updating our libraries' personnel, and we published, on the Web, a handbook for designing the Web sites of Tuscany's public libraries. Furthermore, in cooperation with the Università La Tuscia, the Region has started up a complex and long-term project, aimed at defining guide lines for the building-up of digital libraries in Tuscany and at integrating the various services offered by libraries. In practice, this means integrating OPAC and digital resources, enhancing local fonds by digitising them, but also publishing digital educational materials

which could be prepared by libraries - considering the role that these institutions are expected to play in terms of the so-called e-learning and life-long learning programmes.

The last important point which has been raised during this conference, and which I'd like to mention, is the need for an infrastructure for archiving and preserving digital resources, based on the integration of local, regional and national levels.

I wish to end my brief intervention noting that it is absolutely crucial to strengthen the process of integration and cooperation between the different institutional levels, carrying forward that shared approach which yielded good results in the past and is essential for the success of digitisation projects.

LIBRARIES AND WEB PUBLISHING

Antonia Ida Fontana
Director of the Biblioteca Nazionale Centrale of Florence

The Web space, as we know it today, has been the object of multiple studies and interpretations. Seen from the perspective of national libraries, the Web is the place where "digital memories" express themselves: in other words, the Web is a way for delivering to the public - that is to say, publishing - information, research and knowledge. National libraries have long since started to document the editorial production of their countries. In this sense, guaranteeing access for today and tomorrow's users is part of their natural mission. And so, since the Web has now appeared on the scene, we must extend our traditional and long-established role to this new kind of editorial materials. This is particularly true in the case of the so called "born digital materials", a huge amount of "digital memories" having no equivalent on paper.

Naturally, we all know very well that things aren't that simple when it comes to the Web: should we consider those materials as proper "publications" or not?[1] Are they all worth preserving? Is it technically possible to archive the Web, or does its dynamism clash with the very notion of archive? There are three important experiences that might help us in this discussion, and I shall briefly illustrate them.

The first is that of the Internet Archive, a non-profit organization which in 1996 started collecting the worldwide Web. Since 2001, this archived Web can be freely accessed by anyone, through the Wayback Machine[2]: in its founder's opinion, Brewester Kahle, "preservation without access is dangerous - there's no way for reviewing what's in there". Up to now, they have stored more than 300 terabyte, at a rate of 12 terabyte per month[3].

The existence of the Internet Archive, of Google and of other search engines, proves that archiving or indexing the Web on a wide scale is not impossible. Nevertheless, if "comprehensiveness"

[1] "Archives are interested in Web sites when they contain records, libraries when they contain publications", from *Collecting and preserving the Web* (2003): http://www.jisc.ac.uk/uploaded_documents/archiving_feasibility.pdf.
[2] http://www.archive.org
[3] http://www.archive.org/about/faqs.php#9

is the objective, both Google and the Internet Archive are far from achieving it: both projects are in fact based on the regular carrying out of "harvesting" procedures - they crawl the Web and take samples, but any change which might occurs in between each "harvest" would not be documented.

Moreover, literature on this topic tells us that there also exists a *deep Web*, which is far larger (400 to 550 times larger) than the *surface Web* (the Web that gets indexed by search engines)[4]. As you might know already, "deep Web" means by convention that part of the Web which search engines cannot access, for two major reasons: either because of access restrictions (for example, the internal Web site of an institution, accessible only by the institution's staff; or an electronic journal or newspaper where subscription is required); or because the contents of certain sites can be accessed only through an interactive query to a specific database. For example, even a search engine as sophisticated as Google cannot list Gallica's 70,000 digitised texts[5], as these texts are only delivered on the basis of direct queries made by users.

The second experience began with the end of the NEDLIB Project (Networked European Deposit Library). The year 2000 was almost over, and the project had left an important legacy: firstly, it had contributed to the ISO model of persistent digital archive (the OAIS model); in addition, NEDLIB had released under public license a software for harvesting Web sites. From that moment on, many national libraries started national projects on *digital preservation*. So, in cooperation with EUROPE Project, the Biblioteca Nazionale Centrale di Firenze (BNCF) is now experimenting the voluntary legal deposit of electronic publications issued by the Firenze University Press and by 12 other publishing companies which agreed to participate. Many of the archived publications come from the deep Web (to access them on the Web you must purchase a license), and we use the NEDLIB harvester to acquire them. Concerning voluntary deposit of electronic publications coming from the deep Web, there also other experiences which are worth mentioning: for example, the Dutch National Library - for-

[4] For a detailed analysis of the deep Web, see GAMBARI, STEFANO - GUERRINI, MAURO. *Definire e catalogare le risorse elettroniche*. Milano: Bibliografica, 2002 p. 288-299. A research which is often mentioned is: Bergaman, Michael K. *The deep Web: surfacing hidden value,* in «The journal of electronic publishing», 7 (2001), 1. On-line version: http://www.press.umich.edu/jep/07-01/bergman.html

[5] http://gallica.bnf.fr

mer coordinator of the NEDLIB Project - made an agreement with Elsevier and Kluwer publishers for the voluntary legal deposit of their electronic periodicals. The Dutch experience of DNEP (Deposit of Electronic Dutch Publications) is unquestionably at the forefront also in terms of technologies used for ensuring the persistence of electronic publications.

Finally, I would like to mention the interesting experience of the PANDORA Project, developed by the National Library of Australia (NLA) - a case of rigorous application of the selection principle. Since 1997, NLA has been collecting only "Web publications considered useful to the needs of research". They are chosen on the basis of guidelines for the selection of Web publications, produced by NLA itself[6]. The Project is carried out in cooperation with other Australian libraries and institutions[7]. For each collected Web site, NLA signs an agreement with the site's owner. In January 2003, NLA had archived more than 3,300 titles (monographs and serial publications). Each title has a MARC record and appears in the OPAC NLA. The archived publications are freely accessible through OPAC (but commercial publications are only accessible on NLA terminals). This archive grows at a rate of 125 new titles per month (equivalent to about 21.5 GB). It was estimated that the annual costs "of exercise" are of about € 500,000[8].

These experiences prove the intense and widespread efforts made by national libraries (and others) since 1996. As you can see, these projects cover topics such as "comprehensive" harvesting, selective harvesting, and accessioning the deep Web, specifically in the case of materials that can be accessed only by purchasing a license (mostly electronic periodicals).

In August 2003, 11 national libraries and the Internet Archive created a consortium: the IIPC (International Internet Preservation Consortium). In the future, the activities of the Consortium will be documented on its Web site, www.netpreserve.org. The Bibliotèque Nationale Française coordinates the project, which sees the participation of the Biblioteca Nazionale Centrale di Firenze, the British Library, the National Library of Australia and the Canadian National Library. In addition, the Swedish, Finnish, Norwegian, Danish and Icelandic Libraries shall contribute by provid-

[6] http://pandora.nla.gov.au/selectionguidelines.html

[7] *Collecting and preserving the Web* (2003), quoted. "The collaboration process itself is expensive in terms of effort and resources but remains important to the NLA."

[8] *Collecting and preserving the Web* (2003), quoted.

ing the results of their national Web space harvestings, which they're carrying out in order to build up the Nordic Web Archive[9].

And I am proud to say that today, here at this Conference, the Biblioteca Nazionale Centrale di Firenze has the honour of making the first official statement of the Consortium. The Consortium recognises that the Web doesn't have borders, and that the perspective of national Web spaces is totally insufficient. In the absence of a shared and interoperable infrastructure, even the slightest chance of following links would be strongly compromised - as links inevitably move from an archive to the other. Thanks to the participation of the Internet Archive, we will be able to accession earlier Web sites (and in many cases that of the Internet Archive is the only source available) - and it must also be said that their experience in the field is more than relevant.

The Consortium will set up working groups on specific issues and will develop projects aimed at producing tools of common interest (and in any case, all software will be open source). Up to now, we have created six work groups:

1. Definition of a framework for Web-archiving, explicitly referring to the OAIS model.
2. Deep Web treatment.
3. Tools for users access.
4. Survey of requirements expected by researchers.
5. Content management (it is impossible to catalogue everything with the bibliographic traditional model, but it is equally impossible to manage archives without having some kind of information on contents).
6. Tools for measuring and controlling Web-archiving activities.

The first project, that we are just about to begin, is the implementation of a latest generation crawler, designed on the basis of the most relevant experiences in this sector. The new crawler will also sample the Web space in an intelligent way: it will visit most "important" sites more often - which will be selected on the basis of a relevance ranking model-, together with more frequently updated sites [10].

Funding has yet to be decided, both at international and at

[9] http://nwa.nb.no/

[10] Masanès, Julien. *Towards continuous Web archiving,* «D-lib magazine», 8(2002), 12. http://www.dlib.org/dlib/december02/masanes/12masanes.html

European level. For what concerns the financial participation of the BNCF, our Directorate General for Book Heritage - through the Istituto Centrale per il Catalogo Unico (ICCU) - has already guaranteed that they intend to support this initiative as much as possible. It goes without saying that it would be very important for Italy to be an active member of the Consortium and co-fund its projects.

This initiative will give us a chance to develop a service for addressing the needs of research (as well as those of the educational, production, marketing sectors, etc.), and the preconditions for its success actually seem to be in place. It would have probably been hard to conceive a better project, considering that this initiative is bringing together experiences of world-class level.

In this context, it might be useful to outline that digital preservation is not exclusively a problem of "memory" organisations. The issue of reliability and persistence of digital information is increasingly pressing: it concerns personal archives of digital photos, which we would all like to preserve for our grandchildren to see them one day, as much as it concerns databases containing the results of global observations of climate change or containing the locations of radioactive waste[11]. The case studies on emergencies prepared by ICCU, and presented here yesterday, reveal a lot on this problem[12].

As memory institutions, part of our mission is to raise awareness on this issue. As suggested by Margaret Hedstrom[13], it could be very useful to make a parallel between digital preservation and health care. In both sectors there are patients (the many digital collections at risk), doctors (the experts), and we also know what the disease is and how to prevent it (for example, proprietary formats should not be used). But we still haven't found a cure and, most of all, we don't have enough "hospitals" - and so, just as they do in the health care sector, we should invest in the building up of such

[11] Hedstrom, Margaret. *Digital preservation: a time bomb for digital libraries,* in: http://www.uky.edu/~kierman/DL/hedstrom.html

[12] *Preservation of digital memories. Risks and emergencies. Six Case Studies.,* edited by Alessandra Ruggiero, in press 2005.

[13] Hedstrom, Margaret. *Digital preservation: a time bomb for digital libraries,* in: http://www.uky.edu/~kierman/DL/hedstrom.html

[16] *Preservation of digital memories. Risks and emergencies. Six Case Studies,* quoted.

[17]Werf, Titia van der. *Experience of the National Library of the Netherlands,* in: http://www.clir.org/pubs/reports/pub107/vanderwerf.html

hospitals, rather than waiting to find a cure to all diseases.

In conclusion, I propose to explicitly mention in the *Firenze Agenda* the UNESCO Charter, which was illustrated yesterday. Moreover, the *Firenze Agenda* should also clearly say that memory institutions will not be able to fulfil their mission in the absence of an adequate legislation framework. Existing legislations on cultural heritage (and legislations for legal deposit are surely the most relevant) should be extended to include digital memory: libraries, archives and museums need to rely on adequate resources and on the existence of national and international coordination agencies.

THE NETHERLANDS: SECOND NATIONAL STATUS REPORT

Marius Snyders
Ministry of Education, Culture and Science (NL)

DIGITISATION POLICIES AND EMERGING INITIATIVES

Dutch digitisation policy aims at more efficient and effective (public) investments in digitising cultural and scientific collections, measured in their long-term contribution to the knowledge society. This not only has implications for heritage institutions but also for the conditions that need to be created at national level. One year since the last Status Report and two years since the Lund take-off, the future of Dutch digitisation policy and its ensuing initiatives can be described as better focused and financially secured. For 2004, the frameworks need to be put in place.

With next years' financial intensifications in digitisation of cultural collections, the public libraries' infrastructure and cultural education, the government acknowledges the cultural sector as an important pillar to the knowledge infrastructure - the very basis for an upward Dutch economy. As a result, in a period in which most public and private sectors will continue to tighten their belts, funding for digitisation was never so present. A secured yearly budget of €9 million (2007) is appointed to the improvement of the entire digitisation spectrum, from capturing to enrichment and making accessible, by meeting three preconditions:

1. INVESTING IN A SELF-PROVISIONAL QUALITY-MANAGEMENT SYSTEM FOR DIGITISATION

Focus will be on standardisation and durable digitisation. This will only be realised when institutions are willing and stimulated to adhere to the norm because it has proven its worth. Therefore, the establishment of a knowledge management centre for digitisation, where proven and stipulated standards and procedures are collected and made available, will be supported. It will issue digitisation guidelines and manuals tailored to the various sectors and types of institution. Governments, funding bodies and individual institutions can turn to this centre to collect appropriate or en-

forceable conditions for digitisation programmes and projects. As a result, when setting targets and deciding on grants, government authorities and culture funds will be able to invoke clear procedures and standards composed by the sector itself.

2. Investing in Knowledge Transfer and Professionalism

Knowledge transfer and professionalism play a central role in digitisation and standardisation and will require considerable investment. To improve the backlog in the field of basic registration - which is often still regarded as a precondition for knowledge transfer - the embedding of museum information in an open knowledge infrastructure with two-way traffic of knowledge and information must be guaranteed. Besides a substantial investment in tools and a physical infrastructure, this requires an almost equally substantial investment in human capital, a larger focus on a hypermedia approach to heritage in education, dismantlement of strongholds within institutions, a change of behaviour and mentality of the middle management of the institutions and, in particular, growing professionalism, continuing education, training and intellectual support.

3. Stimulating R&D Programmes

Action research on knowledge enrichment and metadata is being considered as an important precondition for increasing the efficacy and efficiency of digital access and reinforcing the knowledge infrastructure. A national research proposal for the digitisation of heritage by the Netherlands Organisation for Scientific Research (NWO) was prepared in 2003 by a diversely composed consortium of heritage institutions, IT-businesses and computer science research departments at major universities

Cooperation Developments

Organising Lund

A National Steering Group to support implementation of the Lund principles and the coordination of the national activities within the EU-framework was established at the end of 2001. Participators are the National Archives (Nationaal Archief), the National Library

(Koninklijke Bibliotheek), the Netherlands Digital Heritage Association (Vereniging Digitaal Erfgoed Nederland, DEN), the Netherlands Institute for Image and Sound (Beeld en Geluid) and the Ministry of Culture. In 2004 the group will be enlarged, with the participation of the national bodies for archaeology and monuments. Issues that remain open are how to better define competence and responsibility of the group, and how to promote wider visibility and participation of small and medium heritage institutions.

ALM-Cooperation

Access by mapping and description process charts, is already used by some institutions as a procedure for developing their own (be it limited) exchange process, which is usable for combining and exchanging object information from different heritage sectors. A project proposal to map the digital information on the collections of public libraries and heritage institutions was created by the Association for Public Libraries (Nederlands Bibliotheek en Lektuur Centrum, NBLC) and DEN. The project is funded for two years by the Ministry of Education, Culture and Science.

Benchmarking

Benchmarking in the Netherlands is coordinated by the Dutch Ministry of Culture, Department for Cultural Heritage. From the benchmarking data structure, elements have been transferred to the evaluation structure that has to complete digitisation projects within the "Memories of the Netherlands" Programme. This conforms to the widely supported vision that benchmarking in the Netherlands should be embedded in existing preparatory or evaluation phases, so as not to burden the sometimes over-regulated field with new time-consuming forms to fill in.

Institutions are encouraged to participate in the benchmarking activities by two lines of approach:

1. benchmarking will be part of the evaluation process that is built into the fund application procedure;
2. benchmarking will be presented as a tool for self-assessment and raising the quality of project plans.

Benchmarking more initiatives has yielded valuable knowledge as

how the phrasing and wording of the indicators should be to get a maximum result. 60 initiatives have been benchmarked so far, most of them under the digitisation programme of the Mondriaan Foundation and the "Memories of the Netherlands" Programme. The website www.cultuurtechnologie.net tracks the progress of the benchmarking efforts and, consequently, grows with the activity. Backgrounds of the benchmarking activities and documentation about the MINERVA programme and the eEurope initiative are disseminated through this site, and cumulative benchmarking results are also published on the website, together with short descriptive analyses of the results. The site is currently being rebuilt to better serve automated analyses. Furthermore, it is being translated in the Dutch language to better serve Dutch institutions, instead of being only an international communication channel.

EU-PRESIDENCY AGENDA

During July - December 2004 the Netherlands will preside over the European Union and, as a result, will host the 7th official meeting of the National Representatives Group (NRG) for the implementation of the Lund Action Plan. The meeting will be held on September 17, following a two day conference on innovative retrieval and disclosure of digitised cultural collections and knowledge (Sep. 15) and digital durability and long term preservation of memory (Sep. 16). Objective of the conference is to sketch out new action lines supporting the creation of a "European area for digitised cultural resources".

POLICIES AND STRATEGIES FOR DIGITAL PRESERVATION

Costis Dallas
Member of the Steering Committee of DigiCult Forum,
Chairman of Critical Publics

Digital preservation is clearly becoming one of the most important issues in the management of our cultural heritage. For this reason, tribute is due to the Italian presidency, for putting it under the limelight in the context of this international conference.

A lot of light has been shed by previous speakers on key aspects of the problems faced in the field of cultural heritage management as both physical transports of information and channels of cultural communication are being increasingly dominated by information society technologies. As last contributor to this panel discussion, I shall raise a few specific points that may reinforce or be complementary to those raised by others, rather than attempt to provide a comprehensive viewpoint.

Points raised in this intervention are from my perspective as a member of the Steering Committee of DigiCult Forum[1], and of the Advisory Committee of the European Resource Preservation and Access Network[2], and also from the practical experience of advising the Information Society office the Greek government on planning its cultural assets digitisation programme, currently in the stage of implementation[3]. In the past, I have been involved with semantic representation of cultural knowledge - I worked at the Benaki Museum in cooperation with the Institute of Computer Science in Crete that provided a foundation for the subsequent development of the CIDOC Conceptual Reference Model[4]. Today, in our work in Critical Publics[5], we put a lot of emphasis on understanding the intellectual perspective of the main audiences of a cultural organisation - the way these "critical publics" understand and conceptualise cultural objects, according to their differing cultural capital, interests and needs. Evidently, the issues of what is needed

[1] www.digi cult.info
[2] www.erpanet.org
[3] www.psifis.gr
[4] www.cidoc.ics. forth.gr
[5] www.criticalpub lics.com

to develop a capable and sustainable infrastructure for digital cultural collections that will produce actual value to scholarship and the citizen, both at national and international level, are very much in the centre of my concern.

The first point regards the definition of the object of digital preservation. There are current cultural practices that depend on digital technologies - web sites, web logs, Internet art, hypertext literature, interactive multimedia, electronic mail, digital virtual communities - which will increasingly contribute to the cultural record, and which pose problems of their own for digital preservation (in fact, these problems are shared with digital preservation issues in other domains - public administration, health, or the financial world, to name but a few). However, seen from the perspective of existing European cultural heritage, digital preservation concerns, to a great extent, a narrower issue: the enterprise of using digital technologies in order to capture, preserve and use digital surrogates of cultural objects - documents, resources - that have existed for centuries in material, non-digital form. The challenge governments and cultural heritage organisations face today is how to plan the transfer of their cultural assets to digital form, in order to ensure the creation of capable and sustainable digital collections. Raising awareness of the issue of long term digital preservation at this stage is, in fact, an insurance policy, so that systems, methods and practices that will be adopted by the cultural heritage field are appropriately insured for digital obsolescence.

The most important instrument, therefore, where digital preservation policies are going to be manifested in cultural heritage is information systems entrusted with the storage, management and use of digital collections. There is significant effort and funding invested currently in digitisation initiatives, in the institutional, national and European level; libraries, archives and museums are also increasingly dependent on collection management systems for the documentation of their assets, and on the Internet for the provision of information and services to their critical publics. Digital preservation comes as an additional consideration in these practical strategies currently adopted by cultural heritage organisations with regard to using digital technologies. While preservation-grade digitisation cannot be a priority for all cultural organisations - this depends on their mission as well as on the type of cultural material they hold - it should, nevertheless, become a "mainstreaming" consideration for their existing and planned investments in digital

technologies. In that sense, digital preservation may be defined as a horizontal policy, rather than as an entirely separate pillar.

Assuming, therefore, that digital preservation in cultural heritage concerns mostly the preservation of physical, non-digital cultural assets through the use of digital technologies, manifested through initiatives leading to the creation of collections of digital surrogates, a key question arises: what are the necessary conditions so that these digital surrogates can be accessed adequately for research, education and pleasure in the long term? To provide for adequate intellectual preservation of these digital cultural objects, it is evident that we need to provide, with the digital surrogates, symbolic representations or descriptions on the objects, their functional, formal and cultural-signifying properties, their history and meaning - what is commonly known by the misnomer of metadata. There are here significant challenges, that have to do not just with defining appropriate description languages (what we would commonly find in an object documentation standard, such as Spectrum of the CIDOC core categories for museum objects), but with defining conceptual representations (subject languages, ontologies) for academic disciplines such as history, anthropology, archaeology and art history, and for common knowledge about cultural objects, as is typically represented in the practice of visiting exhibitions, watching cultural documentaries or reading books. Of this very broad range of challenges, I will mention just one: what Howard Besser called some years ago "the interrelation problem"[6]. We assume that we can ensure digital preservation through encapsulated, atomic objects that will contain accurate and stable digital surrogates and will be annotated by a metadata record; however, a lot of the evidential or other value of these digital objects is manifested by their interrelationships, and by their relationships with systems of reference (encyclopaedic, terminological and others), which cannot be encapsulated within atomic, interoperable digital records. This constitutes, undoubtedly, a major challenge.

The second point concerns the relationship between preservation and access. The need for long term preservation of cultural resources, and the appropriateness of using information technology to achieve it, is self-evident; cultural memory is, indeed, a pre-

6 Besser, Howard. 2000."Digital Longevity". In *Handbook for Digital Projects: A Management Tool for Preservation and Access*, edited by Maxine Sitts. Andover, Mass.: Northeast Document Conservation Center, 2000, pp. 155-166.

requisite for the continuous advancement of knowledge in the human sciences, and for the continuity in the cultural experience provided to future generations via the increasingly digital channels of communication and interaction. Unfortunately, as we talk about digital preservation sometimes we divorce the strategic goal of preservation from the practices and requirements of access. Contrary to a "preservation vault" approach, it may be argued that digital preservation and digital access are best seen as the two sides of a coin, in the context of an integrated policy, for the reasons I shall explain hereby.

Integrating the mechanisms and the practical contexts for widespread access of digital cultural resources provides, perhaps, the only possible strategy to exercise our digital memories, and thus to ensure that we control, and possibly minimize, the unavoidable semantic shift between the conceptual organisation of the digital archive and the evolving intellectual perspectives of future users - because, clearly, both the questions scholarship asks and the interests of society will change, and this change is better monitored in the course of continuous use. Assuming that we have developed adequate symbolic representations for cultural objects to start with, these symbolic representations and the frames of reference on which they depend (schemas, ontologies, and the like) will gradually become less reliable and adequate. If we do not exercise our digital preservation systems continuously, and if we do not have a strategy so that our methods of representation evolve with the shift in intellectual perspectives by future users, we run the risk of finding out, one day, that our digital cultural heritage has become indecipherable. This suggests that digital preservation policies should have a strong policy perspective of encouraging active use of the digital cultural record by a large and varied constituency of users - scholarship, education, cultural virtual tourism - and of incorporating a roadmap for "semantic layer refreshing", equivalent to the media refreshing already accepted for the physical layer.

Dependence of the adequacy of records on access and usage raises another point. In a multicultural, evolving Europe, perspectives by different user constituencies are bound to be culturally loaded. Different groups defined on ethnicity, gender, religious conviction, or just lifestyle, may have differing perceptions of the nature and meaning of cultural experience. As we consider digital longevity for cultural heritage, we should take seriously into account a cultural policy aspect that will ensure, from the organisa-

tional to the technical level, the preservation of alternative ways of understanding and interpreting cultural objects. We need to answer questions such as: Who has the authority to represent the viewpoint of a specific constituency, in the process of creating digital cultural collections for preservation? Which viewpoints should be represented, and which, less widespread, be left to obsolescence? What auditing mechanisms should we establish in order to ensure fair and equitable representation and access? And, if our goal is digital preservation, these questions are not for the future, but for now.

The third, and final, point regards the European agenda to support the development and coordination of policies for digital cultural preservation, encapsulated in the Firenze agenda document. The major promise in this initiative is that, using instruments such as the National Representatives Group, it will tackle directly the issue of co-ordination of action between national governments and the European Union, a very welcome fact. Indeed, if we wish to see the results of important research within the European Union research framework be more aligned to current practice, and therefore achieve greater interoperability and best practice among the initiatives and policies of Member States, we need to strive for better communication and co-ordination, so that governments talk to each other and to the Union. A relevant point, in this respect, is that, apart from establishing direct contacts and cooperation, it is important that key stakeholders are also involved directly in the context of the 12-month agenda.

Firstly, representative cultural organisations should be directly involved, perhaps by participating in small testbeds or by being engaged in charting the territory - what are their perceived needs, what obstacles they see for incorporating digital preservation perspectives in their practices. While fully supporting the idea of broadening the constituency that will be involved in understanding the current situation and proposing priorities, we should note that the field of culture is not, necessarily, one amenable for standardisation or total integration, at the national or international level. As understood both by the European Treaty and by democratic constitutions, culture, including the creative arts, is a field where authorities have a responsibility for protecting a healthy diversity between different actors and organisations. The state, or, worse, Brussels, are not necessarily seen as benevolent guardians of culture by the literary, artistic and creative communities. At a time

when community memory - the stories of the individual citizen, or of the small cultural organisation at the local level - becomes an important factor of the cultural record, we should take care to encourage diversity in the mechanisms and intellectual perspectives supported by our digital preservation initiatives, without compromising, of course, the promotion of interoperability and best practice.

Secondly, an effort should be made to better understand and match the interests of European citizens - the great variety of linguistic, ethnic and cultural groups constituting today's Europe. This could be achieved by establishing research initiatives taking into account the needs and interests of European audiences that could be served by digital heritage initiatives, and anticipating future needs for digital preservation and access. But, most significantly, it could be achieved by combining any current initiatives for digital preservation with a strong element of public access, so that the European citizen would see the public money spent for projects as a direct contribution to the improvement of cultural offerings.

This is the course set by the Greek Information Society authority with in its cultural digitisation programme, funded for almost 50 million euro and launched last summer. A few hundred applicants for funding - not-for-profit cultural institutions - were called to provide information and justification on digital preservation aspects of their planned digitisation project, and to adhere to core standards for cultural documentation, resource description and discovery; most significantly, they were called also to undertake a commitment that a significant part of their digital collection will become freely available through the World Wide Web for the benefit of the general public and the educational community.

To summarise, the current situation calls for the following recommendations:

- Digital preservation should be seen as a horizontal "insurance policy" for existing and planned digitisation actions, broadened so as to include the resolution of intellectual preservation issues such as the "inter-relation problem".

- A strong element of public access should be built in digital preservation actions, so as to ensure that collections are continuously exercised, and that the intellectual perspectives of diverse user

communities remain well-represented, now and in the future.

- The active support of cultural heritage organisations should be enlisted at grassroots level, the needs and aspirations of current and future audiences should be studied and publicly accessible collections should be created, so that awareness and support by the European citizens at community level is assured.

Digital preservation is a relatively new word in the vocabulary of cultural heritage management. As society depends more on digital technologies for information access and communication, it is bound to become a major consideration for policy, which should be seen in the context of both cultural preservation and public access policies. The Florence conference comes at a critical juncture for collective thinking about an issue that, if not tackled soon, may become a major concern for institutions and policy makers in the not so distant future.

APPENDIX

FIRENZE AGENDA

FLORENCE AGENDA, 17 OCTOBER 2003

The Italian Presidency, the European Commission, and the ERPANET and MINERVA Projects are the promoters of this initiative, developed in the spirit of eEurope and linked to the National Representatives Group.

The group of experts proposes an agenda made of a limited number of specific objectives, aimed at facing the challenge of digital memory preservation.

The focus is on creation, preservation and access of both digitised and born-digital objects.

Moreover, the agenda wishes to fully take the interests of museums, libraries and archives into account, respecting the differences between the various media formats in use.

It covers a short time frame (12-18 months), identifying a series of practical and realistic actions which are to be carried out within an open process, aimed at integrating on-going actions with efforts made by the experts on a voluntary basis.

For each action, the experts have identified initial responsibilities, which will be reviewed during the Dutch Presidency.

The European Commission will submit the Firenze Agenda for approval to the National Representatives Group at their next meeting, which will be held in Parma on next November, and will invite each Member State to support the initiative. Future Presidencies are invited to coordinate the follow-up phase.

Firstly, what are the problems and risks at stake? (Action area 1)

Probably the most important task, today, is that of raising, at all levels, awareness of current risks and problems among decision-makers.

Secondly, which are the on-going initiatives and which technologies are available at the moment? (Action area 2)

Thirdly, which are the current legal and regulatory implications, which responsibilities should immediately be assigned, and who is responsible, at the moment, for finding solutions for digital memory preservation and developing a policy agenda (Action area 3)?

ACTION AREA 1: CREATING AWARENESS AND DEVELOPING COOPERATION MECHANISMS

Building consensus and creating a community are the first steps to be taken. The initial focus is on decision-makers.

The experts group shall work together with communities of users, in order to achieve an understanding of their needs and suggestions, and develop an adequate approach to address those needs. The group shall promote consensus-building, particularly among professionals of the involved sectors, and will cooperate with other initiatives in the field.

The experts group will report regularly on the progress made and on the planning of activities.

- Activities and events organised by the workgroup, such as workshops, seminars, publications, help-desks and online forums;
- report to NRG every six months.

ACTORS: The ERPANET and MINERVA projects as coordinators.

ERPANET: coordination and Web services for the experts group, including forums, projects and literature assessments, help-desk advisory service, ERPAePRINTS. Workshop on "Trusted Digital Repositories" (Rome, November 2003); seminar on "Scientific Digital Objects" (Lisbon, December 2003); publication of the final reports of workshops and seminars.

MINERVA: network of national representatives for promotion and data collection; organisation of workshops, seminars, or events, such as "Bibliocom" (Rome, 30 October 2003); NRG progress report on the initiative (end of 2003).

DELOS: annual digital preservation summer school; state-of-the-art studies prepared by the cluster of institutions responsible for the conservation of digital memory.

PrestoSpace: organisation of workshops, seminars or events; annual studies on the state-of-the-art of digital preservation for audiovisual archives. Workshop on "Users Requirements for Audiovisual Preservation"(Amsterdam, March 2004).

ACTION AREA 2: EXCHANGING BEST PRACTICES AND DEVELOPING A COMMON VISION

We need to collect information on current practices, and select and promote best practices, in order to use at best the progress made and develop a common understanding of which approaches and technologies have proved to be more adequate. Here the focus is on identifying the "missing pieces".

Lessons learned from examples of best practice should be the object of educational materials and other publications (on digital collections, trusted repositories, metadata, IPR, selection criteria, and Web-archiving, for example) and should be the basis for defining a "European interoperable platform".

- State-of-the-art of existing initiatives, selection and promotion of best practices;
- technology watch reports on emerging issues;
- proposal of a research agenda on technological priorities and on the challenges of digital preservation;
- training (skills) initiatives and programmes;
- stakeholders and users.

ACTORS: The ERPANET and DELOS projects as coordinators.

ERPANET: collecting and analysing data in order to identify best practices; description and analysis of the single and collective case studies of erpaTools; promotion of the erpaAdvisory services; updating of a preservation research agenda (see below).

DELOS: continual review and coordination of the NSF/DELOS Digital Preservation and Archiving Research Agenda; publication of studies and papers; production of recommendations.

DigiCult Forum: technology watch reports and tutorials; contribution in terms of technology specifications for a research agenda; creation of an "Action for the Preservation of Memory" area in the DigiCult.info newsletter.

PrestoSpace: technology specifications for a research agenda for audiovisual archives; production of recommendations; in collaboration

with the IFTA annual conference, meeting on "Technical Specifications and System Architecture for an Audiovisual Integrated Preservation System" (Marseille, October 2004).

MINERVA: infrastructure for collecting data on best practices; training programmes, in cooperation with ERPANET and DELOS, on the long-term preservation of digitised scientific and cultural objects.

ACTION AREA 3: LONG-TERM POLICIES AND STRATEGIES

Today, the lack of a clear framework of policies and responsibilities represents a serious risk for the future preservation of our memory.

The experts group will encourage national institutions and organisations in the sector to develop policies, research and training programmes and provide tools for digital preservation.

In particular, the current legislation on collections of electronic resources and on the related archival and deposit procedures seems quite incomplete, and not just for what concerns libraries and archives but also within the e-government, education and research domains, as well as within other domains of the Information Society.

A common agenda could be a useful tool for concentrating efforts, at the national level, around a coordinated European programme, and for directing investments towards public/private collaborative projects.

- Identifying organisations, within the Member States, which may act as coordinators of national initiatives and produce recommendations.
- Analysing and comparing the current legal and regulatory contexts, in order to define the needed specifications for the creation of infrastructures ensuring that stakeholders, memory institutions in particular, can have permanent access to digital archives (with a particular attention to born-digital objects) and to online registers of trusted repositories.
- Studying and proposing adequate business models, costs analysis and long term funding strategies for public institutions.
- Fostering cooperation with emerging international activities, such as the one currently developed under the aegis of UNESCO.

- Validating and promoting a research agenda of the European Union and of single Member States; in particular, encouraging national funding bodies to allocate resources for research, as stated in the agenda.
- The Italian Presidency will coordinate this action area, in cooperation with the future Presidencies and with Member States authorities.

ACTORS: the Italian Presidency as coordinator, followed by the other Presidencies.

Italian Presidency: further extending the survey on *Risks and Emergencies,* with at least four more case studies, and the survey on *Legislations, Rules and Policies for the Preservation of Digital Resources*; implementing a dedicated Web site for the initiative and ensuring continuity in cooperation with future Presidencies.

PrestoSpace: Bridging the gap between technical results and service delivery (Paris, December 2004).

ERPANET: Improving our understanding of e-government in terms of benefits for citizens, and ensuring the authenticity and integrity of digital objects on the long term; producing an annual review of national policies and strategies; enhancing and promoting policy and legal tools.

CHARTER FOR THE PRESERVATION OF DIGITAL HERITAGE[1]

PREAMBLE

The General Conference,

CONSIDERING that the disappearance of heritage in whatever form constitutes an impoverishment of the heritage of all nations,

RECALLING that the Constitution of UNESCO provides that the Organization will maintain, increase and diffuse knowledge, by assuring the conservation and protection of the world's inheritance of books, works of art and monuments of history and science, that its "Information for All" Programme provides a platform for discussions and action on information policies and the safeguarding of recorded knowledge, and that its "Memory of the World" Programme aims to ensure the preservation and universal accessibility of the world's documentary heritage,

RECOGNIZING that such resources of information and creative expression are increasingly produced, distributed, accessed and maintained in digital form, creating a new legacy – the digital heritage,

AWARE that access to this heritage will offer broadened opportunities for creation, communication and sharing of knowledge among all peoples,

UNDERSTANDING that this digital heritage is at risk of being lost and that its preservation for the benefit of present and future generations is an urgent issue of worldwide concern,

PROCLAIMS the following principles and ADOPTS the present Charter.

THE DIGITAL HERITAGE AS A COMMON HERITAGE

ARTICLE 1 – SCOPE

The digital heritage consists of unique resources of human knowledge and expression. It embraces cultural, educational, scientific and administrative resources, as well as technical, legal, medi-

[1] Adopted by the 32nd session of the UNESCO General Conference, October 17th 2003.

cal and other kinds of information created digitally, or converted into digital form from existing analogue resources. Where resources are "born digital", there is no other format but the digital object.

Digital materials include texts, databases, still and moving images, audio, graphics, software and web pages, among a wide and growing range of formats. They are frequently ephemeral, and require purposeful production, maintenance and management to be retained.

Many of these resources have lasting value and significance, and therefore constitute a heritage that should be protected and preserved for current and future generations. This ever-growing heritage may exist in any language, in any part of the world, and in any area of human knowledge or expression.

ARTICLE 2 - ACCESS TO THE DIGITAL HERITAGE

The purpose of preserving the digital heritage is to ensure that it remains accessible to the public. Accordingly, access to digital heritage materials, especially those in the public domain, should be free of unreasonable restrictions. At the same time, sensitive and personal information should be protected from any form of intrusion.

Member States may wish to cooperate with relevant organizations and institutions in encouraging a legal and practical environment which will maximize accessibility of the digital heritage. A fair balance between the legitimate rights of creators and other rights holders and the interests of the public to access digital heritage materials should be reaffirmed and promoted, in accordance with international norms and agreements.

GUARDING AGAINST LOSS OF HERITAGE

ARTICLE 3 – THE THREAT OF LOSS

The world's digital heritage is at risk of being lost to posterity. Contributing factors include the rapid obsolescence of the hardware and software which brings it to life, uncertainties about resources, responsibility and methods for maintenance and preservation, and the lack of supportive legislation.

Attitudinal change has fallen behind technological change. Digi-

tal evolution has been too rapid and costly for governments and institutions to develop timely and informed preservation strategies. The threat to the economic, social, intellectual and cultural potential of the heritage - the building blocks of the future - has not been fully grasped.

Article 4 – Need for Action

Unless the prevailing threats are addressed, the loss of the digital heritage will be rapid and inevitable. Member States will benefit by encouraging legal, economic and technical measures to safeguard the heritage. Awareness-raising and advocacy is urgent, alerting policy-makers and sensitizing the general public to both the potential of the digital media and the practicalities of preservation.

Article 5 – Digital Continuity

Continuity of the digital heritage is fundamental. To preserve digital heritage, measures will need to be taken throughout the digital information life cycle, from creation to access. Long-term preservation of digital heritage begins with the design of reliable systems and procedures which will produce authentic and stable digital objects.

MEASURES REQUIRED

Article 6 – Developing Strategies and Policies

Strategies and policies to preserve the digital heritage need to be developed, taking into account the level of urgency, local circumstances, available means and future projections. The cooperation of holders of copyright and related rights, and other stakeholders, in setting common standards and compatibilities, and resource sharing, will facilitate this.

Article 7 – Selecting what should be Kept

As with all documentary heritage, selection principles may vary between countries, although the main criteria for deciding what digital materials to keep would be their significance and lasting cultural, scientific, evidential or other value. "Born digital" materials

should clearly be given priority. Selection decisions and any subsequent reviews need to be carried out in an accountable manner, and be based on defined principles, policies, procedures and standards.

Article 8 – Protecting the Digital Heritage

Member States need appropriate legal and institutional frameworks to secure the protection of their digital heritage.

As a key element of national preservation policy, archive legislation and legal or voluntary deposit in libraries, archives, museums and other public repositories should embrace the digital heritage.

Access to legally deposited digital heritage materials, within reasonable restrictions, should be assured without causing prejudice to their normal exploitation.

Legal and technical frameworks for authenticity are crucial to prevent manipulation or intentional alteration of digital heritage. Both require that the content, functionality of files and documentation be maintained to the extent necessary to secure an authentic record.

Article 9 – Preserving Cultural Heritage

The digital heritage is inherently unlimited by time, geography, culture or format. It is culture-specific, but potentially accessible to every person in the world. Minorities may speak to majorities, the individual to a global audience.

The digital heritage of all regions, countries and communities should be preserved and made accessible, so as to assure over time representation of all peoples, nations, cultures and languages.

RESPONSIBILITIES

Article 10 – Roles and Responsibilities

Member States may wish to designate one or more agencies to take coordinating responsibility for the preservation of the digital heritage, and to make available necessary resources. The sharing of tasks and responsibilities may be based on existing roles and expertise.

Measures should be taken to:

a. urge hardware and software developers, creators, publishers, producers and distributors of digital materials as well as other private sector partners to cooperate with national libraries, archives, museums and other public heritage organizations in preserving the digital heritage;
b. develop training and research, and share experience and knowledge among the institutions and professional associations concerned;
c. encourage universities and other research organizations, both public and private, to ensure preservation of research data.

Article 11 – Partnerships and Cooperation

Preservation of the digital heritage requires sustained efforts on the part of governments, creators, publishers, relevant industries and heritage institutions.

In the face of the current digital divide, it is necessary to reinforce international cooperation and solidarity to enable all countries to ensure creation, dissemination, preservation and continued accessibility of their digital heritage.

Industries, publishers and mass communication media are urged to promote and share knowledge and technical expertise.

The stimulation of education and training programmes, resource-sharing arrangements, and dissemination of research results and best practices will democratize access to digital preservation techniques.

Article 12 – The Role of UNESCO

UNESCO, by virtue of its mandate and functions, has the responsibility to:

a. take the principles set forth in this Charter into account in the functioning of its programmes and promote their implementation within the United Nations system and by intergovernmental and international non-governmental organizations concerned with the preservation of the digital heritage;

b. serve as a reference point and a forum where Member States, intergovernmental and international non-governmental organizations, civil society and the private sector may join together in elaborating objectives, policies and projects in favour of the preservation of the digital heritage;
c. foster cooperation, awareness-raising and capacity-building, and propose standard ethical, legal and technical guidelines, to support the preservation of the digital heritage;
d. determine, on the basis of the experience gained over the next six years in implementing the present Charter and the Guidelines, whether there is a need for further standard-setting instruments for the promotion and preservation of the digital heritage.

COUNCIL RESOLUTION OF 25 JUNE 2002 ON PRESERVING TOMORROW'S MEMORY- PRESERVING DIGITAL CONTENT FOR FUTURE GENERATIONS (2002/C 162/02)

THE COUNCIL OF THE EUROPEAN UNION,

RECALLING the strategy set by the European Council on 23 and 24 March 2000 in Lisbon aiming at preparing the transition of the European Union "to a knowledge-based economy and society by better policies for the information society and R&D"; as well as the "eEurope 2002" action plan, presented to the European Council held in Santa Maria da Feira on 19 and 20 June 2000, that called for increased digitisation and use of the Internet, e.g. in e-commerce, in public service, in health services and in cultural institutions,

RECOGNISING that European society and the economy as a whole are increasingly dependent on digital information and that the archiving of this information will be essential in the future in providing a comprehensive view of European development and collections,

NOTING that the cultural and intellectual assets of our society, which are created, usable and available in digital form and which form the memory of tomorrow are dependent on rapidly changing technologies, on fragile media and are widely distributed geographically and that these assets are, therefore, at great risk of being irremediably lost unless positive measures are taken to preserve them and to keep them available for the future,

FURTHER NOTING that memory institutions such as archives, libraries and museums have a central role to play in these actions,

ALSO NOTING that the digital preservation extends the existing vast publicly held collections and that a significant quantity of digital content is also in the possession of various private actors (such as publishers and broadcasters etc.), which should be taken into account when analysing the situation and planning long-term preservation measures,

NOTING that Decision No 182/1999/EC of the European Parliament and of the Council of 22 December 1998 concerning the fifth framework programme of the European Community for research,

technological development and demonstration activities (1998-2002)[1] includes actions "to enable linguistic and cultural diversity" and scientific and technological objectives such as "accessing scientific, cultural and other items through the networking of libraries, archives and museums";

FURTHER NOTING that research into new information society technologies providing improved access to and preservation of cultural and scientific resources will remain essential for the foreseeable future,

NOTING that the Council Resolution of 26 June 2000 on the conservation and enhancement of European cinema heritage[2] emphasised that through the cinema heritage the citizens, in particular future generations, will "have access to one of the most significant forms of artistic expression of the last 100 years and a unique record of the life, customs, history and geography of Europe" and that the Resolution recalled, among other things, the interdisciplinary nature of the problems involved, the absence of specialist vocational training and the transnational nature of the response demanded,

RECALLING that the Council Resolution of 21 January 2002 on culture and the knowledge society[3] called on the Commission and the Member States to, *inter alia,* "assist in the digitisation of cultural content and in the interoperability of the related systems with a view to preserving, protecting and raising awareness of the European cultural heritage and European cultural diversity",

NOTING the vast changes in methods of creating, storing and preserving records, documents and archives, in particular in digital form;

and STRESSING the need to continue to develop methods and guidelines for long-term preservation of these records, documents, collections and archives essential for safeguarding the heritage of Europe,

CONVINCED that it is therefore essential to target practical actions, shared by all of the Member States, that will address the high fragmentation of approaches across different cultural sectors and taking into consideration not only the technological challenges but also the broader socioeconomic implications,

[1] OJ L 26, 1.2.1999, p.1
[2] OJ C 193, 11.7.2000, p.1.
[3] OJ C 32, 5.2.2002, p.1.

NOTING the need for long-term digital preservation work which takes account of what has already been undertaken or is under way in different international networks and organisations, in particular the Council of Europe,

PROPOSES the following objectives and indicative measures for further analysis:

- stimulating the development of policies for preserving digital culture and heritage, as well as their accessibility, through

  - establishing cooperation frameworks and mechanisms between Member States for exchanging experiences on policies, programmes and related regulatory issues, and for developing shared approaches,

  - supporting the relevant custodial organisations (e.g. archives, libraries and museums) collectively and individually, in their responsibilities for collecting digital content and keeping it accessible over time,

  - examining the organisational infrastructures and technical standards needed to support stable and compatible networks of trusted preservation repositories,

- advancing advocacy and awareness, through networks which support the sharing of experiences and progress, the adoption of appropriate standards, and the measurement and dissemination of good practices,

- considering appropriate investment, and analysing the cost and the impact on current and future funding, as well as the potential synergy between public and private funding,

- improving the skills base, by creating mechanisms for the exchange of knowledge and skills, and for the ongoing identification of emerging skills requirements and training needs,

- stimulating research into problems and solutions, through the devel-

opment of research programmes, technology trials and experimental large-scale applications,

CALLS UPON THE COMMISSION AND THE MEMBER STATES, as appropriate, and within their respective areas of competence and respecting fully the subsidiarity principle, to undertake, develop or study the feasibility of the said measures,

INVITES THE COMMISSION

- in collaboration with Member States, to assess the situation,

- to report back to the Council (in principle every two years after the adoption of this Resolution),

- to draw up an action plan, as appropriate.

EUROPEAN CONTENT IN GLOBAL NETWORKS COORDINATION MECHANISMS FOR DIGITISATION PROGRAMMES

THE LUND PRINCIPLES: CONCLUSIONS OF EXPERTS MEETING, LUND, SWEDEN, 4 APRIL 2001

The eEurope 2002 Action Plan was endorsed by EU Member States at the Feira European Council in June 2000. Objective 3(d) of the Action Plan is to stimulate European content in global networks in order fully to exploit the opportunities created by the advent of the digital technologies.

Within that objective there is a specific action for Member States and the Commission jointly to:

> *Create a coordination mechanism for digitisation programmes across Member States.*

On 4 April 2001, representatives and experts from Member States met at Lund in Sweden to discuss the issues involved and to make recommendations for actions that support coordination and add value to digitisation activities in ways that would be sustainable over time.

> *Europe's cultural and scientific knowledge resources are a unique public asset forming the collective and evolving memory of our diverse societies and providing a solid basis for the development of our digital content industries in a sustainable knowledge society.*

The experts endorsed the findings of a preparatory meeting held in Luxembourg on 15/16 November 2000. They highlighted the value and importance of Europe's digitised cultural and scientific content which provides:

AN ACCESSIBLE AND SUSTAINABLE HERITAGE: Europe has unique and significant wealth in its cultural and scientific heritage. Digitisation of its resources is a vital activity for providing improved access for the

citizen and for preserving Europe's collective cultural heritage (both past and future).

SUPPORT FOR CULTURAL DIVERSITY, EDUCATION AND CONTENT INDUSTRIES: Digitised cultural assets are crucial in sustaining and promoting cultural diversity in a global environment. They are also a key resource for education and for the tourism and media industries.

DIGITISED RESOURCES OF GREAT VARIETY AND RICHNESS: Member States have invested significantly in programmes and projects for digitising cultural and scientific content. Such digitisation activities cover a diversity of domains and content types, such as museum artefacts, public records, archaeological sites, audio-visual archives, maps, historical documents and manuscripts.

However, there are a number of key problems which risk limiting realising the potential of these resources, whether culturally, socially or economically.

The main barriers identified are:

FRAGMENTATION OF APPROACH. Though widespread, the digitisation activities to date are highly fragmented, depending on the policy instruments and mechanisms in the different Member States. Moreover, the absence of a coherent European view of what cultural content has been digitised or of how this content is selected for digitisation results in the potential duplication of resources, effort and

investment.

OBSOLESCENCE. Digitisation is a costly exercise requiring high investments usually from public funds. There are significant risks to these investments due to the adoption of inappropriate technologies and standards. This can result in creating resources which are quickly obsolete and unusable or which require the investment to be repeated within a short time frame.

LACK OF SIMPLE, COMMON FORMS OF ACCESS FOR THE CITIZEN. Access by the citizen to the different resources, at national and at EU level, is compromised by the lack of common approaches and technical standards as well as by lack of support and systems for multilingual access.

INTELLECTUAL PROPERTY RIGHTS (IPR). The various stakeholders in the digitised content (e.g. original owners, intermediaries, and end-

users) have different legitimate interests. These needs must be recognised and balanced. Solutions for handling and managing rights need to be understood and applied by the cultural sector if the economic value of the content is to be realised in a sustainable way.

LACK OF SYNERGIES BETWEEN CULTURAL AND NEW TECHNOLOGIES PROGRAMMES. There is an increasing need for improved linkages between cultural and new technologies programmes at national and EU level in order to identify priorities and where there is European added value to be gained.

INSTITUTIONAL INVESTMENT AND COMMITMENT. Digitisation requires a commitment from individual organisations, frequently the memory organisations such as archives, libraries and museums, to long-term, expensive and technically demanding actions. The use of digitisation technologies and tools requires the adoption of new skills and practices by the cultural institutions.

In order to address these issues, it would be desirable if the Member States could commit themselves to:

CREATING AN ONGOING FORUM FOR COORDINATION, by establishing a coordinating group representative of each Member State. This group should develop frameworks to support ongoing discussions and exchanges, and establish procedures for reporting to the Member States, both at European level and at national level.

SUPPORTING AND DEVELOPING A EUROPEAN VIEW OF POLICIES AND PROGRAMMES by establishing Web sites with current, publicly accessible and easily understandable information on their policies and programmes in line with an agreed baseline common profile, to which a central site should link.

PROMOTING AND SUPPORTING GOOD PRACTICE AND ITS HARMONISATION AND OPTIMISATION WITHIN MEMBER STATES AND ACROSS THE EU, by continuing work on a qualitative benchmarking framework aiming at its adoption and implementation through appropriate national coordinating bodies and networks, and by working through a nominated group of experts to develop quantitative approaches to benchmarking processes. This requires also identifying mechanisms for the definition and collection of core indicators, and specifically the relevant eEurope indicator, and for liaison with na-

tional standards/statistical bodies.

ACCELERATING TAKE-UP OF GOOD PRACTICE AND OF APPROPRIATE SKILLS by disseminating across Europe examples of good practice, identified according to agreed features (typology). This should support issues such as consistency of practice and process, assets and rights management, and lead to new definitions of the skills required.

MAKING VISIBLE AND ACCESSIBLE European cultural and scientific content by setting up national inventories (of projects, or of selected content). These inventories should be aligned with the European infrastructure for digitised content by complying with standards and technologies which support quality and usability of the content, unified access for citizens, affordability and openness of software tools, and long-term accessibility and availability.

For these initial actions to be realised as fast as possible and to ensure that the solutions adopted can lead towards sustainable organisational and technical infrastructures, the European Commission, in the context of its current IST activities and other ongoing programmes, should work with Member States to:

SUPPORT PRACTICAL COORDINATION ACTIVITIES, by creating a secretariat or facilitating agency to support the activities of the coordinating group. The secretariat should manage any ad hoc technical advisory groups which may be required.

ADVANCE THE DISSEMINATION OF GOOD PRACTICE by promoting centres of competence which can provide leadership and support for stakeholders on key issues and technologies. Whilst current domains include metadata, multilingual support, imaging technologies and digital preservation technologies, the establishment of competence centres must be open to emerging topics.

FOSTER THE DEVELOPMENT OF BENCHMARKING FOR DIGITISATION PRACTICES, by creating guidelines for data collection and by continuing development of qualitative and quantifiable indicators.

OPTIMISE THE VALUE AND DEVELOP SHARED VISIONS OF EUROPEAN CONTENT, by developing criteria and a framework for an EU collaboration plan for digital cultural and scientific content, together with an appropriate implementation means (Charter, MoU etc). The plan should aim at establishing an eCulture infrastructure for access to

digitised cultural and scientific heritage, through identifying added value conditions for European content (e.g. selection criteria) and establishing technical standards for conformance to interoperability requirements. This work should be carried out through the coordinating group and its secretariat.

IMPROVE QUALITY/USABILITY OF CONTENT, PROMOTE UNIFIED ACCESS FOR CITIZENS AND INCREASE AWARENESS OF LONG-TERM PRESERVATION ISSUES, through developing: agreements on interoperability standards; guidelines for digital preservation and content longevity; and coherent models and good practices for rights and asset management together with the development of associated eculture business models.

In order for Member States to identify and implement strategies and agreements on content production, quality, discovery and use, a number of current and emerging technical issues need to be addressed through short and longer term RTD initiatives.

The Commission should:

ADVANCE THE DEVELOPMENT OF QUANTITATIVE BENCHMARKING, through background studies and ground clearing work on indicators and statistics.

Launch STUDIES INTO DIGITISATION IN EUROPE and supporting technical and organisational infrastructures, and on promoting European cultural content, identity and diversity in support of accessibility to all citizens.

SUPPORT INTEROPERABILITY AND THE PERSISTENT DISCOVERY OF RESOURCES, by launching work on metadata, registries and schemas.

COUNTER THE RISKS OF CREATING A "DIGITAL DARK AGES", by developing advanced research agendas into: digital technologies and preservation of content; improved applications of advanced technologies for digitisation of cultural and scientific content (e.g. multi spectral imaging), adding value to the significance of the content over time. This work should be carried out in close collaboration with industry.

Investigate opportunities under the IST Programme for PILOT PROJECTS reflecting the above research foci.

The following tables were edited by Dr Bernard Smith, DG Information Society of the European Commission - and are introduced and illustrated in Dr Smith's paper (*European Policies and the Preservation of Digital Cultural Heritage*, p.85).

TABLE I
MAJOR EUROPEAN UNION COUNCIL RESOLUTIONS IN THE CULTURAL DOMAIN (FROM 2000)

OJ C 193/1 of 11.7.2000 on the Conservation and Enhancement of European Cinema Heritage. Calls for co-operation on restoration and conservation (using digital technology), the exchange of good practice (European guidelines are mentioned), and the networking of European archival databases (possibly for education and scientific purposes).
OJ C 73/6 of 6.3.2001 on Architectural Quality in Urban and Rural Environments. In addition to stressing the cultural and social importance of architecture, the resolution noted the importance of research in the fields of architectural heritage and the built, spatial and social environment.
OJ C 32/1 of 5.2.2002 on Culture and the Knowledge Society. Calls for digitisation and work on interoperability, multilingualism, training, and the exchange of good practices. The need to encourage "quality initiatives" is explicitly mentioned, as is the need to ensure that citizens can access cultural information by the most advanced technological means possible.
OJ C 32/2 of 5.2.2002 on the Role of Culture in the Development of the European Union. Stresses the need to develop cultural cooperation, European artistic creativity and cultural exchanges, and with a view to assessing the Articles on Culture in the present Treaty.
OJ C 162/4 of 6.7.2002 on Preserving Tomorrow's Memory - preserving digital content for future generations. Calls for co-operation between Member States, support for custodial organisations, and the examination of new "organisational structures and technical standards needed to support stable and compatible networks of trusted preservation repositories". In addition the needs for more research, technology trials and experimental large-scale applications was explicitly mentioned.

OJ C 13/5 of 18.1.2003 on European Cooperation in the Field of Culture: European added value and mobility of persons and circulation of works in the cultural sector. Calls on a series of actions, and in particular those that address, reach and benefit the European citizen.
OJ C 39/5 of 18.2.2003 on "eAccessibility" - improving the access of people with disabilities to the knowledge-based society. Calls for a major package of accessibility related actions, including the development of new technologies for delivering eAccessibility, a portal on the issues, the development of standards and the use of WAI guidelines, and educative and informative measures. Persuasive instruments and/or legislative measures, including an "eAccessibility mark" and the harmonisation of Member State accessibility criteria, are also mentioned.
OJ C 113/2 of 13.5.2003 on Archives in the Member States. Calls for concrete action on prevention of physical damage to archives and collaboration on authenticity, long-term preservation and availability of electronic documents and archives.
11332/03 AUDIO 13 dated 16 July 2003 on the Deposit of Cinematographic Works. Draft Council Resolution looking to put into place efficient deposit systems (or other equally effective measures) for audio-visual heritage. It also stresses that the works should be available for educational or research use on a non-commercial basis, whilst respecting intellectual property rights. The exchange of good practices is the third point.
11590/03 CULT 44 dated 24 July 2003 on Museums (title under discussion). Draft Council Resolution on co-operation between museums, calls for co-ordination in research and training, in the protection of heritage, on documentation, inventory and digitisation of collections, and on the conservation of collections.

TABLE II
USEFUL EUROPEAN DOCUMENTS (POST 2000) AND WEB SITES CONCERNING CULTURAL HERITAGE

Draft Report on Cultural Industries of the European Parliament (2002/2127(INI)) of the 4 June 2003 (www.europarl.eu.int/meetdocs/committees/cult/cult20030707/499292en.pdf), prepared by Myrsini Zorba. The latest draft calls for a map of European cultural industries and a European Commission Green Paper on the topic. The issue of the inadequacy of cultural statistic in Europe is mentioned several times. The report also calls for an increased research capability in the area of culture, and a stronger link between culture, education and training.
Communication on Certain Legal Aspects Relating to Cinematographic and other Audiovisual Works COM(2001) 534 final of 26.09.2001 (www.europarl.eu.int/meetdocs/committees/ cult/20020417/com(01)0534_en.pdf). And draft report on the same subject prepared by Luckas Vander Taelen (2002/2035(COS)) of the 2nd of April 2003 (www.europarl.eu.int/meetdocs/committees/cult/20020603/462575en.pdf). The Communication notes the consensus on the need to preserve and safeguard Europe's audiovisual heritage. The issues of legal deposit, the creation of a registration scheme, and right-holders databases are discussed. The latest draft report stresses the need for compulsory legal deposit and a set of basic procedures to protect audiovisual heritage. In addition it calls for a co-financing measure to digitise audiovisual archives.
Cultural Policies in the EU Member States is a European Parliament report from 2001 (doc. EDUC 107A EN), available on www.europarl.eu.int/estudies by selecting "education and culture". The report collected information from Member States, and offered suggestions on European culture and art in the 21st century. The first part of the report presents, for each EU Member State, the principles, decision-making approach, funding models, fiscal policies, the role of the private sector, and the support for creativity. The second part offers opinions for the future from selected artists.
Cultural Industries and Employment in the Countries of the EU is a European Parliament study from 1999 (doc. PE 167.889) available on www.europarl.eu.int/estudies and select "education

and culture". The report suggests that public authorities create jobs and strengthen community building through the exploitation of Europe's cultural wealth. It proposes a revival and redefinition of cultural tourism as a basis for innovative measures linked to new technologies and the media. It notes that public authorities do not exploit their local culture, and that equally un-integrated cultural tourism could damage a region's socio-economic balance. The initial focus should be interactive cultural activities on "high culture" tourist sites, e.g. archaeology sites, monuments, etc...
DigiCult (www.cordis.lu/ist/ka3/digicult/home.html) is the site describing all the activities of the culture unit in the Information Society Technologies programme. It provides information on all the projects funded, as well as on eEurope digitisation, etc.. The eCulture newsletter archive is also on the same site (www.cordis.lu/ist/ka3/digicult/newsletter.htm#newsletter). With the introduction of the new 6th Framework Programme you can expect the site to go through a major face-lift and reorganisation in the coming months.
Culture in the European Union (europa.eu.int/comm/culture/eac/index_en.html) is the central policy site for cultural issues in the EU. It covers the work of the programme Culture2000, the cultural capitals of Europe and general support issues for cultural organisations. It houses the Culture2000 newsletter and the culture portal.
City of Tomorrow and Cultural Heritage (www.cordis.lu/eesd/ka4/home.html) covers physical protection and conservation issues funded under the previous Fifth R&D Framework Programme. It lists 34 projects on topics such as combating decay and corrosion, restoration of stone, laser cleaning, paper restoration, and microclimate monitoring.
Fact Sheets (www.europarl.eu.int/factsheets) offer EU policy descriptions for R&D, tourism, culture, the audiovisual industry, telecommunications.
Council of Europe has a rich Web site dedicated to cultural co-operation, which covers policies, assistance and development programmes, etc. (www.coe.int/t/e/Culture%5Fco-operation/). One interesting link is to a compendium of cultural polices in Europe (www.culturalpolicies.net). A series of studies are also presented on issues such as digital culture, on the educational and cultural potential of new information technologies, and public access and freedom of expression. Concerning cultural heritage, mention is

made of the EU-funded HEREIN project (www.european-heritage.net) that focused on built heritage, including the digitisation of cultural property.
Mention is made elsewhere of a Draft European Convention of the Council of Europe that will call for compulsory legal deposit of "moving image material forming part of its audio-visual heritage and having been produced or co-produced in the territory of the Party concerned".

TABLE III
STATUS OF DIGITISATION IN EUROPE (2003)

The below table contains a personal extraction of the most salient points taken from the 2003 progress report on digitisation in Europe (www.minervaeurope.org/publications/globalreport.htm), updated with information from the National Representative Group (NRG) meeting held in Corfu, Greece (www.minerva europe.org/structure/nrg/documents/corfu.pdf).

The NRG (http://www.minervaeurope.org/structure/nrg.htm) can be contacted to obtain further information on policy developments in their respective countries.

Austria - In the past no formally established coordination network existed for digitisation in Austria, however there is now a national coordination platform with a focus on digitisation, research, and ebusiness. A new eCulture Austria site (www.efit.at/eculture) now exists. There is no national inventory of existing or on-going digitisation, however there are centres of competence and good practices, e.g. the National Library, and in the major universities.

Belgium - Belgium is characterised by the fact that the different Communities (Flemish, French, German and Federal) have specific competences in the cultural domain. No large-scale national digitisation programme exists, however the different Communities support several large digitisation projects. The Flemish Community collects and lists the complete range of museums, archives and cultural heritage in Flanders (www.museumsite.be and www.okvweb.org), and is developing a culture and tourism site (www.culturenet.be not operational) and a portal for exhibitions and museums (www.erfgoedweekend.be). They have also opened a site on policy and practice on digitisation (www.vlaanderen.be/cultuur/digitaal) and have completed a study on the relationship

between education and museums. The French Community has performed a study on inventory building, has digitised numerous collections (www.cfwb.be), and is building a Walloon museum portal. A digitisation study was completed for Federal Scientific Institutions and the Royal Film Archives, and a funding plan is being considered for the 10 sites of "priceless indivisible heritage", e.g. State Archives, Royal Library, Royal Museums of Fine Arts, Film Archives, etc.. There is a "Belgian Art Links and Tools" site (balat.kikirpa.be/web/index-fr.html), and five new federal digitisation projects are being launched, ranging from the ethnomusicological sound archives of the Royal Museum of Central Africa through to Belgian penal statistics. A Federal portal on digital heritage is planned for September 2003. The Belgian Presidency sponsored the Council Resolution on "Culture and the Knowledge Society" (OJ C 32/1 of 5.2.2002).

Denmark - The primary culture portal is Culturenet Denmark (www.kulturnet.dk). The Ministry of culture has made digitisation and digital content creation one of its priorities, and a national digitisation strategy is being prepared. Culturenet Denmark lists all existing and on-going digitisation projects and the Danish Cultural Heritage Agency (www.kuas.dk) has become a competence centre for digitisation. All the different State institutions, Libraries, Film Institute, public broadcasters, etc., are active in digitisation, and the Danish Library Agency has recently commissioned a report on digitisation policy for research libraries. New digitisation resources are now being allocated from the 3G licence sales. A national policy for preservation of digital memory has been presented and debated in Parliament, and the report is available in Danish from Ms. Ea Gallt Sørensen (egs@kum.dk). A research report on the topic of digital preservation was recently completed. It is agreed that the Copyright Act will be changed and that resources will be provided to cultural institutions for primary digital preservation. During the recent Danish Presidency an expert meeting was held on the topic of long-term digital preservation (www.kum.dk/sw5047.asp).

Finland - There now exists a set of national and regional policies on digitisation (www.minedu.fi/minedu/fidigi/nationalpages-1-fin.html). No up-to-date list of digitisation projects exists, however a central data management centre has been established to provide future coordination. The aim is to create a "Finnish Museums Online". A tradition of institutional cooperation does exist

in Finland as can be seen through projects such as Muisti (www.lib.helsinki.fi/memory/etusivue.html) and the National Arts Register (at www.fng.fi). Recently it was stated that a new copyright law will be discussed which would enable broader digitisation without copyright fees.

France - In 1996 France launched a national digitisation programme (€2.6 million funding for 2003). This compliments the activities of the national institutions (Le Louvre, the National Library, the National Institute for Audiovisual Archives, and the work of the Ministry of Research in opening a portal to humanities reviews, e.g. "La revue de l'art", etc.). Substantial results have been obtained with more than 2 million images and 2,000 hours of sound recordings digitised and made available in large collections such as Joconde (www.culture.fr/documentation/ccmf/pres.htm) and Mémoire (www.culture.fr/documentation/memoire/pres.htm). The national directory of digitised collections is being revised (www.cultu re.gouv.fr/culture/mrt/numerisation/fr/f_02.htm), and a new version of the national portal www.culture.fr is now available. Considerable experience and expertise exists in the French institutions, e.g. see www.louvre.edu for a site designed for school use and www.cul ture.fr/culture/arcnat/fr/index.htm for a complete list of collections. A portal for sound heritage has been opened (catalo gue.cdmc.asso.fr/CDMC/) and a open source tool is also available to help publish sound archives in the MPEG7 format. Major Web exhibitions were opened recently on Victor Hugo (www.victorhugo2002.culture.fr) and on the XVIIth century composer Marc Antoine Charpentier (www.charpentier.culture.fr). Also a Franco-Belgian site on the organ has just opened (www.org ans.european-heritage.net). The National Archives and the Federation of Genealogy has opened a portal on genealogic information (www.genefede.org/daf). The National Library (www.bnf.fr) has completed a study on audience and usage of the Gallica digital library. In 2002 Bruno Ory-Lavollée published a major report on digitisation of heritage as part of culture policy, and a policy document on digitisation was also published. The National Archive has published a guide on the preservation of digital data. Recently it was announced that a new programme is planned for the digitisation of major French monuments in 3D. France has an excellent series of publications covering the cultural domain, e.g. "La Lettre d'Information" of the French Ministry of Culture and

"chroniques" of the National Library.
Germany - Germany has a highly decentralised structure of political responsibilities where culture issues are the prerogative of the 16 Bundesländer. As such Germany does not have an overall national strategy for digitisation but works through different plans and project frameworks. It is for this reason that EUBAM (www.eubam.de) has been so valuable in acting as a focal point for cultural digitisation in the EU context, and in bringing together actors from archives, museums and libraries. Despite this, digitisation work started as early as 1977 with the creation of an art and social history collection (www.fotomr.uni.marburg.de) and, more recently, of the nation-wide digital library catalogue (www.ubka.uni-karlsruhe.de/kvk.html) and the virtual art history catalogue (www.ubka.uni-karlsruhe.de/vk_kunst.html). A recent initiative concerns a portal for museums, archives and libraries (www.bam-portal.de) and the "digital library forum" (www.dl-forum.de), bringing together information on digitisation projects and programmes run by the Federal Ministry of Education and Research. In terms of bringing together cultural offerings a new portal is under construction: www.kulturportal.de. Germany has three recognised centres of digitisation expertise, namely in Munich (www.bsb.muenchen.de/mdz/) and Göttingen (gdz.sub.uni-goettingen.de), as well as the Archive School in Marburg. Very recently a number of new Federal projects have been launched in the general field of long-term archiving. It should also be noted that the German Research Council is planning to benchmark past digitisation projects.
Greece - Culture remains strongly associated with tangible heritage almost as an integral part of Greek national identity. However, the national profile (www.hdpweb.org) also shows that there is a digitisation network and a national digitisation committee. The Web sites lists 46 digitisation projects in Greece, covering both technological developments as well as actual digitisation campaigns (15 projects are recognised as significant). They also host a questionnaire to capture new project information. During the Hellenic Presidency, a benchmarking questionnaire was tested and the initial results help understand better the role that such an approach could have. In terms of competence centres, both the high Performance Information Systems Laboratory (http://www.hpclab.ceid.upatras.gr/en/home.html) and the Centre for Cultural Informatics

(www.ics.forth.gr/isl/cci.html) are recognised leaders in their fields.

Ireland - Ireland has recently launched a Web site that will provide pointers to digitised assets and guidelines and standards being used (www.askaboutireland.ie and www.askaboutireland.com). The national profile also covers the Irish digitisation initiative database as well as best practice guidelines. Past activities have been project based, e.g. information on natural and built heritage (www.heritagedata.ie) or assets of the National Library (www.nli.ie). A new strategy for public libraries is expected in September 2003. Plans are advanced for the incoming Irish Presidency, where a "back-to-basics" review will be made of progress in Europe to date.

Italy - As in many other EU countries, many Italian cultural institutions are under the responsibility of regional authorities, however there is a national commission for the harmonisation of policies and programmes on digitisation, and 3 working parties on Web site quality, benchmarking and good practice, and metadata and inventories. The national profile (www.librari.beniculturali.it/coord_digit/nationalpages-3-it.html) offers quite a complete overview of the work in Italy. The Italian authorities have been active in digitisation and today there are 6 major national initiatives. This ranges from the general catalogue (www.iccd.beniculturali.it/progetti/index.html) and photographic library (www.fototeca.iccd.beniculturali.it), to the focus on the preservation and management of cultural heritage with the risk map of Italy (www.uni.net/aec/riskmap/english.htm). There is also a €15 million digitisation project of the archives of the Senate and Chamber of Deputies. There is increasing interest concerning services for the recovery of stolen art goods. There does not appear to be a central inventory of cultural heritage in Italy, although there is much activity in metadata standards and a strong cooperation with the French Ministry of Culture has emerged on this issue. There is considerable digitisation expertise in Italy, starting with the cataloguing institutions (e.g. www.iccu.sbn.it), as well as in specific institutions, e.g. the Uffizi (www.uffizi.firenze.it/Dta/daddi-eng.html), and organisations, e.g. Alinari (www.alinari.com/). There is a particularly strong tradition in Italy of archaeology and physical restoration. www.culturalweb.it is an online cultural daily paper prepared by the Italian Ministry of Culture. Recently it has been decided to start a €17 million project to build an Italian cultural portal. Under the Ital-

ian Presidency a meeting is planned on "The Future of digital Memory" in Florence, 16-17 Oct. 2003. In Parma there will be a major event on "Quality for Cultural Web Sites: Online Cultural Heritage for Research, Education and Cultural Tourism Communities", 20-21 November 2003 (www.minervaeurope.org/events/parma/parmaconference.htm). And in Naples there will be conference on "Territorial Information Systems for the Conservation, Preservation and Management of Cultural Heritage".

Luxembourg - There is no national coordination network in place, however there are active national institutions, namely the National Museums of History and Art (www.mnha.lu) and Natural History (www.mnhn.lu), the Public Records Office (www.etat.lu/AN/), and the National Library (www.BnL.lu). This last institution cooperates with the Swiss, French, German and British Libraries. Digitisation priorities are in the National Audiovisual Centre and with the European Navigator on the history of the construction of Europe (www.enafree.lu).

Netherlands - The national profile and main initiatives, including those started under the 2001-2004 National Policy Document on Culture, can be found on www.cultuurtechnologie.net. A policy document of digitisation was debated in Parliament in 2002 (www.cultuurtechnologie.net/policy27may2002.htm) and digitisation will be included in the national cultural policy (2005-2008), with a particular emphasis on regulation and coordination on national and international digitisation standards. There is a shift of focus away from the individual use of specific collection and towards a more holistic view of a network of interacting collections. However, it is still true that digitisation has not been fully integrated into the information management systems of the institutions. There are several on-going projects, such as the Memory of the Netherlands (http://www.geheugenvannederland.nl/gvnnl/all/index.cfm/language/en). The opportunity to adopt Napster-like services for cultural heritage was studied in 2003. A number of centres of advice on digitisation exist in the Netherlands, and the Royal Library is recognised as a leader in developing long-term digital preservation policies and services. A large national research programme (€61 million), called the "Digital Production Line", has been launched - covering preservation, IPR, metadata, interoperability, knowledge management, and navigation and presentation issues (www.nwo.nl/NWOHome.nsf/pages/NWOP_5M2GN6/$file/Di

gitalProductionLine%20(def).pdf?openelement)
Portugal - There is an Information Society National Plan that includes a government portal (www.portugal.gov.pt/SiteEntry), as well as a Culture portal. All information concerning the inventory of digitised material in Portuguese museums is on www.matriznet.ipmuseus.pt. The Portuguese Institute of Museums not on-ly provides public access but also acts as a content and online service provider (www.ipmuseus.pt). The National Archaeological Museum (www.mnarqueologia-ipmuseus.pt) won a "Web Art d'Or 2002" for its Web site. Immovable heritage is being encoded using a geographic information system and maps and images are available for Lisbon, Santarém, Faro, Ravira, Évora and Beja (www.ippar.pt/patrimonio/patrimonio.html). The National Library (www.bn.pt) provides access to Portuguese book heritage (aref.bn.pt) and is completing a digital libraries project (bnd.bn.pt), involving a €1 million investment in services and equipment. The National Archives (www.iantt.pt) has an on-going digitisation programme on "church memories" from 1758.
Spain - A major Spanish programme called Patrimonio.es has been launched to digitise, preserve, disseminate and exploit cultural heritage, and by the end of 2003 www.patrimonio.es will become the portal for digitised cultural, scientific and natural heritage. The first steps are benchmarking past digitisation projects and the creation of a Digital Heritage Inventory (more than 165 digitisation projects have been identified so far). The virtual library of Miguel de Cervantes (cervantesvirtual.com/index.shtml) in the university of Alicante is recognised as a centre of excellence for building digital libraries, and the Spanish State Archives have already digitised more than 12 million images. Virtual visits of several well-known Spanish monuments have been prepared. Three new pilot projects have been launched with the Spanish Film Institute, the National Library, and the Museo del Prado and Museo Cerralbo. Under the Spanish Presidency, the Council Resolution on *Preserving Tomorrow's Memory - preserving digital content for future generations* was passed (OJ C 162/4 of 6.7.2002).
Sweden - There has been increasing pressure to see Sweden's cultural institutions working more closely together (www.kultur.nu is seen as an entry point to Swedish culture), and national plans on digitisation, collection building, and long-term preservation were

proposed. Several sources of digitised material already exist with the national archive (www.ra.se), "Images of Swedish Heritage" (www.raa.se/kmb/indexe.asp), and the Swedish land survey (www.lantmateriet.se). No national guidelines or recommended standards exist, however many of the larger institutions are very experienced in digitisation projects. In a reassessment of the tasks of the Royal Library, digitisation is likely to play an important role, and a national plan for the digitisation of printed texts is envisaged. A joint work between museums, libraries and archives called "Image databases and digitisation" was recently concluded (an executive summary can be found at abm.kb.se, with a series of commonly agreed recommendations on policies, standards, data elements and authority file structures. A state enquiry on archival issues concluded that much work is urgently needed on long-term digital preservation, and a project has been launched to create a competence centre on digital preservation.

United Kingdom - The United Kingdom has an active policy concerning digitisation and online access, with the creation of Culture Online (www.cultureonline.gov.uk). The national profile and a set of good practice projects can be found on the People's Network Web site (www.peoplesnetwork.gov.uk), and numerous different programmes have funded digitisation campaigns, e.g. see the list of projects funded by the Research Libraries Support Programme (www.rslp.ac.uk). Recently, an €81 million programme of digitisation of learning resources has been launched, with the portal www.enrichUK.net containing information on the 150 project already launched (there were a set of mandatory guidelines and technical standards on www.peoplesnetwork.gov.uk/content/technical.asp). A single quality-assured portal is planned for school learning resources (www.curriculumonline.gov.uk) and €140 million has been allocated for schools to purchase resources through the portal. In addition, a Culture Online funding of €17 million has been allocated for 20-40 projects with a focus on individual creativity and the use of digital TV, Internet, mobile phones, etc.. The Collection Description Framework is being used to record collection-level descriptions for all English museums (www.cornucopia.org.uk). A test of DC.Culture is on going with three museums (Fitzwilliam Museum, Norfolk Museums Service, and the Tank Museum) from www.24hourmuseum.org.uk. The Joint Information Services Committee (JISC) was awarded €14

million for 8 new further and higher education digitisation projects (topics cover official publications through to new archives). A Digital Preservation Coalition (www.dpconline.org) has been established with a focus on research and implementation of digital preservation solutions. There is an increasing focus on bringing different types of institutions together to provide a collective reply to user expectations, and on the importance of cultural resources for education.

TABLE IV
RECENT PROJECTS ACTIVE IN THE CULTURAL HERITAGE DOMAIN (OR DIRECTLY RELATED)

Basic information on projects being funded can be found on www.cordis.lu/ist/ka3/digicult. Check out the eCulture newsletter at www.cordis.lu/ist/ka3/digicult/newsletter.htm. Additional information on specific projects can be found in the "ezine" archive of www.cultivate-int.org. DigiCult forum www.digicult.info provides a newsletter and technology watch.

NEW RESEARCH PROJECTS (UNDER NEGOTIATION)

BRICKS (under negotiation) - This is a major research initiative ("integrated project") on digital libraries. It brings together 25 European partners around the concept of a BRICKS factory for European Digital Memory. Topics covered include service discovery, decentralised metadata storage, content and metadata management, indexing, collection management, search and browsing, query personalisation, heterogeneous metadata and ontologies, annotation, user authentication, decentralised rights management, trust models, decentralised public key infrastructures and distributed certification. Four application areas are: reconstruction of knowledge for professional users on archaeological sites, management services for small and medium sized museums, support for real and virtual exhibitions (i.e. Vienna 1945-55), and a scriptorium for accessing rare, distributed, digital texts. The project already includes Ministerial organisations in Italy, Belgium and the UK, as well as prestigious collections such as the Museum of Cycladic Art in Athens, the Austrian National Library in Vienna, the Uffizi Gallery in Florence, and the Vatican Secret Archives. In addition, the initial BRICKS user community includes interested par-

ties from Japan, Israel, South Africa, Norway as well as UNESCO, the site of Pompeii, the Fitzwilliam Museum in Cambridge, UK, etc..
Project leader: Nucci@eng.it

PRESTOSPACE (under negotiation) - This is a major research initiative ("integrated project") on audio-visual archive preservation. It brings together 37 European partners around the concept of a preservation factory. Topics covered include preservation information systems (playback devices, robotics and automation, media condition assessment), restoration integration and evaluation (restoration tools, algorithms, and sub-systems), storage and archive management (technologies, preservation and access planning, preservation management tools), metadata access and delivery (discovery, public access, delivery formats), systems architecture, and user requirements. This project builds on the work of PRESTO (presto. joanneum.ac.at), BRAVA (brava.ina.fr) and DIAMANT (diamant. joanneum.at). The project already brings together the archives of French Institut National de l'Audiovisuel (INA), the British Broadcast Corporation (BBC), Radiotelevisione Italiana (RAI), the Netherlands Institute for Sound and Vision (B&G), and the Austrian Radio & Television Archives (ORF). These archives will contribute ~2.5 million hours of audio-radio material, 1.4 million hours of music, and ~2 million hours of TV material.
Project leader: dteruggi@ina.fr

TNT (under negotiation) - This is a new focused research project to develop a visual simulation engine for 3D objects and a visualisation and collaborative real-time exploration service for viewing digital models of artefacts, sensors scans and scientific data. It will test a service for pre-history data for professionals (e.g. Neanderthal Species), as well as an archaeology channel (Internet and mobile) for popular science, culture and tourism. It targets a substantial reduction (>25%) in the cost of service building. The project brings together the Neanderthal man collections of 4 European natural history museums. These institutions are active in 3D scanning of fossils and artefacts, and are visited by >2 million people annually. At the end of the project >300 Neanderthals and their sites will be accessible in 3D.
Project leader: steffen.kirchner@artcom.de

AGAMEMNON (under negotiation) - This is a new focused research project to develop site visit possibilities using 3G, e.g. on an archaeological site. It will integrate visitor profiling, dynamic route

(re-)scheduling, voice and speech dialogue, etc., in to a cost-effective package for small museums and sites. It will allow on-site visitor flow control, site maintenance, security and damage checks, as well as analysing visitor behaviour and expectations. It will use imaging matching to determine user location and attention focus. It targets a 50% cost reduction in creating personalised site visits, as well as a 25% increase in revenue from site visits. The system should be able to track the position of 500 concurrent users and re-schedule visitor paths through 50 different locations within 2 seconds. The new technology will be tested in Paestum in Italy and Mycene in Greece, and later at Pompeii.
Project leader: salvatore.virtuoso@txt.it

ON-GOING RESEARCH PROJECTS

ARCO (Augmented Representation of Cultural Objects) - This is a research project to develop technologies for museums to create, manipulate, manage and present 3D objects in virtual exhibitions. Topics covered include virtual models and scenes (object modeller based upon stereo photogrammetry, and a 3D interactive tool for model refinement and rendering), management of virtual object collections, and virtual exhibition creation. London's Victoria and Albert Museum and the Sussex Archaeological Society in the UK are test sites. A prototype was presented at COMDEX Fall 2002 in Las Vegas, USA.
Project coordinator: M.White@sussex.ac.uk
Web address: www.arco-web.org

CHIMER (Children's Heritage Interactive Models for Evolving Repositories) - This is a research project on how children learn how to obtain information, how they can pass information on to other children, and how information can be made usable and appealing. The focus is on understanding and demonstrating how children can use new technologies to document items of cultural interest in their local communities. Topics covered include an evolving digital archive, e-maps, GPS and location-based services, mobile portals, and the cognitive principles behind learning. Local sites are in England, Spain, Czech Republic, Germany, the Netherlands, and Lithuania.
Project coordinator: j.spee@bedrijfsregion.nl
Web site: www.chimer.org

CHLT (Cultural Heritage Language Technologies) - This a small research project on creating computational tools for the study of early modern Latin, classical Greek, and Old Norse texts in the form of a distributed digital library. It provides generic tools for multi-

lingual information retrieval, concept identification and visualisation, vocabulary analysis and syntactic parsing. It is a partnership between 5 European and 4 US research teams, where the NSF funds the US teams. The project builds on a well-established cooperation between the teams, and brings together the Linda Hall history of science collection, the Perseus Greek and Roman collections, the STOA Neolatin texts, and the Newton Manuscripts project.
Project coordinator: d.iorizzo@ic.ac.uk
Web site: www.chlt.org

CHIPHER (Enabling Communities of Interest Promoting Heritage of European Regions) - This is a research project on the ways to create cultural forums that allow the active construction of narratives with and across digital content. The CHIPHER toolbox consists of ontology-driven tools for dynamic narrative presentation, discovery tools, tools for creating personal and shared spaces, and language technologies and templates for contextualising media. Four test forums are planned for Irish cultural and natural heritage, Nordic heritage and storytelling, shared heritage of Central Europe, and technical innovation centred on Bletchley Park in the UK (already running).
Project coordinator: z.zdrahal@open.ac.uk
Web site: www.chipherweb.open.ac.uk

COINE (Cultural Objects in Networked Environments) - This is a research project that aims to provide tools to create structured Web environments (capture, store, describe, locate, link, and maintain digital objects in "digital spaces") that permit people to tell their own stories.
Project coordinator: p.brophy@mmu.ac.uk
Web site: www.uoc.edu/in3/coine

DHX (Digital Artistic and Ecological Heritage Exchange) - This is a research project about establishing a networked virtual reality infrastructure and content development environment for museums and cyber theatres. This is a distributed infrastructure for globally shared immersive experiences. It uses Europe's high-bandwidth infrastructure (GEANT) to interconnect large-screen presentation facilities for virtual shared exportation, virtual sightseeing, and remote education.
Project coordinator: martin.goebel@imk.fhg.de
Web site: www.eurasian-dhx.org

MEMORIAL (Digital Document Workbench for Personal Records) - This is a research project on retrieving information in per-

sonal records. It involves scanning with special optical filters, improved image processing and pattern recognition, and a workbench to produce highly interactive, editable and linkable documents suitable to create Web-based virtual memorial services. The test material are files on prisoners in Nazi concentration camps, and the work also encompasses the social, ethical and legal issues around creating digital libraries of genocide information.
Project coordinator: geschke@zfb.com
Web site: www.memorialweb.net

MULTIMOD (Simulation of Multiple Medical Imaging Modalities) - This is a research project on visualisation and interaction with data relating to musculo-skeletal structures, with a focus on relevance to task rather then realism of imaging. The focus is on integrating real and synthetic data in a single visualisation environment, the integration of static medical images with movement data, the integration of diagnosis with computer simulations, and 3D and time-based presentations for the non-expert user. Four demonstrators are planned in the medical field - knee operations, hip replacements, skeletal reconstruction, and knee anatomy for teaching. This is seen as a special case of a digital library, but one that stresses future visualisation and simulation functionalities.
Project coordinator: c.zannoni@cineca.it
Web site: www.techno.ior.it/multimod

OMNIPAPER (Smart Access to European Newspapers) - This is a research project on ways to enhance multilingual access to different types of distributed information resources in a self-learning environment. It will create a blueprint for knowledge retrieval, and test it is a newspaper prototype. Topic maps will be used to create cross archive searching and navigation, and provide users with a single view of a "virtual super archive". In addition, the navigational and search behaviour of users will be tracked to enhance the quality and relevance of retrieval.
Project coordinator: met.lenaers@lrd.kuleuvan.ac.be
Web site: www.omnipaper.org

ORIEL (Online Research Information Environment for the Life Sciences) - This is a large digital libraries research project on ways to integrate and exploit large-complex and disparate digital resources, using life-science data as an example. The aim is to understand how to handle the exponentially growing mass of genomic sequence-related information. The focus is on integrating analysis tools with databases and bibliographic data, literature analysis tools, mining

tools that help interpret, integrate and visualise genomic information, and new ways to stimulate user interaction (e.g. collaborative browsing and creation and editing of ontologies are initial targets). The project includes the major partners of the European Molecular Biology Laboratory. An ontology editor and organiser tool have recently been placed in the public domain.
Project coordinator: les.grivell@embo.org
Web site: www.oriel.org

PUREFORM (The Museum of Pure Form) - This is a research project on the way to build a virtual gallery of digitised sculptures where the visitor can interact and feel the physical contact (sight and touch) with 3D models of statues and other art forms. The focus is on integrating 3D acquisition and both virtual reality and haptic interfaces, and testing with demanding geometries, e.g. medieval and contemporary sculptures. Actual long-term exhibitions are planned in both the Galician Centre for Contemporary Art in Spain and in the Museum of the Cathedral in Pisa.
Project coordinator: bergamasco@sssup.it
Web site: www.pureform.org

VIHAP3D (Virtual Heritage: high-quality 3D acquisition and presentation) - This is a research project on developing new computer graphic tools for 3D scanning (including texture and reflection characteristics), post-processing on low-cost platforms, and presentation and navigation in collections of 3D objects. Exhibitions are planned that display real objects alongside 3D models.
Project coordinator: hpseidel@mpi-sb.mpg.de
Web site: www.vihap3d.org

VITRA (Veridical Imaging of Transmissive and Reflective Artefacts) - This is a research project on new ways to collect, store and visualise architectural details of historic buildings, in particular stained glass windows, frescos, mosaics and decorative mouldings. A robot platform will ensure "in situ" capture of colormeterically accurate images of both reflective and transmissive surfaces. Six German churches and three English churches are test sites.
Project coordinator: l.w.macdonald@colour.derby.ac.uk
Web site: www.vitra.org

VS (Virtual Showcases presenting Hybrid Exhibits) - This is a research project on the creation of hybrid (mixed, real and virtual) exhibits inside a "traditional" showcase environment. The objective is to combine the real and virtual objects in such a ways as to create a 3D hybrid object. Several people should be able to observe and in-

teract with the hybrid object. Topics covered include the use of spatial augmented reality, the authoring and management of mixed-reality content, interaction techniques and advance rendering techniques. The challenge is to create an acceptable aesthetic and technical solution that can be integrated into an established museum context and be accessible to all types of users. Test museums are from Germany, Austria and Portugal.
Project coordinator: joerg.voskamp@rostock.igd.fhg.de
Web site: www.virtualshowcases.com

NEW NETWORKING PROJECTS (UNDER NEGOTIATION)

DELOS (under negotiation) - This is a large-scale "network of excellence" working in the filed of digital libraries. It builds on the work of a past network (see delos-noe.iri.pi.cnr.it) and is focused on a series of joint EU-NSF working groups and a 10-year grand challenge. It brings together >100 researchers in 40 different European teams. Topics covered include architectures, access and personalisation, audio-visual and non-traditional objects, user interfaces and visualisation, knowledge extraction and semantic interoperability, preservation, and evaluation. It will continue the successful European Digital Libraries conference series (e.g. www.ecdl2003.org), as well as a series of summer schools. In the first 18-months a complete test suite and metrics for Digital Libraries will be provided, including INEX for XML retrieval (qmir.dcs.qmw.ac.uk/INEX) and CLEF for cross-language information retrieval (clef.iei.pi.cnr.it:2002). A formal framework for user descriptions will be developed as well as toolkits for user profiling, personalisation, and user-centred testing. Demonstrators of audio-visual interfaces are planned. A virtual D-Lib centre will be created starting with ISTI-CNR in Pisa, UKORN in Bath, and NetLab in Lund.
Project coordinator: bruno.le_dantec@ercim.org and technical coordinator: costantino.thanos@isti.cnr.it

ITEACH/TECHNE (under negotiation - provision title) - This is a large-scale "network of excellence" working at the interface between new technologies and heritage sites and visitor experiences. It is a new network and brings ~400 researchers in >80 European teams. The focus is on the application of digital technologies for archaeological research and presentation at museums, monuments and historical sites. Topics covered include field recording and data cap-

ture, data organisation, provenance and standards, reconstruction and visualisation, heritage education and communication, and the sustainability of heritage projects. In the first 18-months demonstration projects could include underwater archaeology, augmented reality, interactive storytelling, virtual exhibitions, and multi-lingual and multi-channel presentation and visitor guides. It will continue the Virtual Reality, Archaeology, and Cultural Heritage conference series (e.g. www.eg.org/Events/VAST2001) and participate in Computer Applications in Archaeology (www.caaconference.org).
Project leader: D.Arnold@brighton.ac.uk

MINERVA (an extension MINERVAplus for Europe's New Accession States (NAS) is also under negotiation) - This is a thematic network of Member State Ministries responsible for digitisation of cultural and scientific content. The focus is on establishing national profiles, good practices and guidelines, benchmarking policies and practices, inventories and resource discovery, training, quality of content, and digital preservation. The initial network brought together authorities from 7 Member States. The MINERVAplus extends the network to another 5 Member States and 8 other countries, many being New Accession States (NAS). This network supports the work of a National Representative Group (NRG) created to be guardians of the Lund Principles, and an Action Plan that defines how and why Member States should work together (www.cordis.lu/ist/ka3/digicult/eeurope-overview. htm). A major report on progress in the Member States is available (www.minervaeurope.org/publications/globalreport.htm). In addition, MINERVA has issued for comment a good practice handbook and a handbook on quality in public cultural applications.
Project leader: Rcaffo@beniculturali.it
Web site: www.minervaeurope.org

CALIMERA (under negotiation) - This action is focused on smaller, often local, cultural institutions and their need to develop new strategies based on emerging technologies. It brings together 39 partners over 34 different countries, with a particular focus on local cultural institutions in both Europe's New Accession States (NAS) and the Balkan States. Specific topics include business models and research needs for building local services, evaluate the usability of new technologies and their potential impact on local services, training guidelines, and publish best practice guidelines and policy ground rules. A national and local policy report will be presented. It builds on the success of PULMAN (www.pulman

web.org). PULMAN published 20 different guidelines (social policy, management and technical) in 29 different languages).
Project leader: ana.runkel@cm-lisboa.pt

ON-GOING NETWORKING PROJECTS

ERPANET (Electronic Resource Preservation and Access) - This is an on-going thematic network dedicated to best practices and skills development for digital preservation. ERPANET extracts relevant information on digital presentation from journals, projects, list servers, as well as listing different policy documents. It provides extensive reviews of 200 key articles on preservation taken from >100 journals. It provides seminars and workshops that are well documented, e.g. see the recent workshops on preserving the Web and long-term preservation of databases. It has an online charter outlining the principles of digital preservation.
Project leader: s.ross@hatii.arts.gla.ac.uk
Web site: www.erpanet.org

MUSICNETWORK (The Interactive Music Network) - This is a thematic network on interactive multimedia music functionalities and new distribution modes. The focus is on music notation, music libraries, multimedia standards and music encoding, music distribution, protection systems, music for the handicapped, and restoration of old music sheets. It provides a portal to all the essential literature on the topic, as well as pointing to all the major projects in the field. It has >200 registered members and organises events and workshops throughout the year.
Project leader: nesi@dsi.unifi.it
Web site: www.interactivemusicnetwork.org

DigiCult Forum (The Digital Cultural Forum) - This is an ongoing action that provides technology watch, newsletters, and a discussion forum on research and technological development for the cultural heritage sector. Integrity and authenticity, digital asset management systems and semantic Web have all been treated in thematic publications. Recently, a major technology watch report covered customer relationship management, digital asset management systems, smart labels and tags, virtual reality and display technology, human interfaces, and games technologies. This project emerged after the conclusion of the DigiCULT report in 2001.
Project leader: andrea.mulrenin@salzburgresearch.at
Web site: www.digicult.info

FIRST (Film Restoration and Conservation Strategies) - This is

an on-going action on the conservation, restoration and exploitation of historic film collections. It has working groups on digitisation, restoration, archival and storage, cataloguing and retrieval, distribution and access to archived material. It will provide recommendations on widely accepted practices and guidelines, as well as a set of research needs. In addition to the Association Européenne des Cinémathèques (ACE) the participants include the French Institut National de l'Audiovisuel, the Radio Television Belge (RTB), the Belgian telecommunications company Belgacom, and the European Multimedia Forum.
Project leader: cinematheque@ledoux.be
Web site: www.film-first.org

MUSENIC (The Museum Network Information Centre) - This is an on-going action to start a new Internet top-level domain called ".museum". The focus is on domain policy, registration, naming conventions, and including technical facilities and awareness building. The model must work for museums, and be reproducible for other communities such as libraries, archives, monuments, sites, etc.. The project consortium includes The International Council of Museums and the J. Paul Getty Trust.
Project leader: ck@nrm.se
Web site: musedoma.org and naturally musedoma.museum

Culture 2000 funds a number of multi-annual projects designed to bring together expertise, promote awareness through exhibitions, etc., and provide a cultural resource for future use. Some examples are:
Ubi erat Lupa (www.ubi-erat-lupa.org) - a kind of access portal to antiquity as a way to highlight Europe's common past;
Art Nouveau in Progress (www.artnoueau-net.org);
Ceramics-Culture-Innovation (www.ceramic2000.org);
North-European Shipwreck Sites (www.mossproject.com) - promoting underwater cultural heritage;
Gaudi on European architecture (www.gaudi-programme.net);
Rinascimento Virtuale (http://www1.uni-hamburg.de/RV/) - on discovering texts on palimpsest manuscripts;
Archives of European Archaeology (www.inha.fr/area-archives/);
Archaeological Records of Europe (ads.ahds.ac.uk/arena/).

GRAPHIC APPENDIX

1990 2001

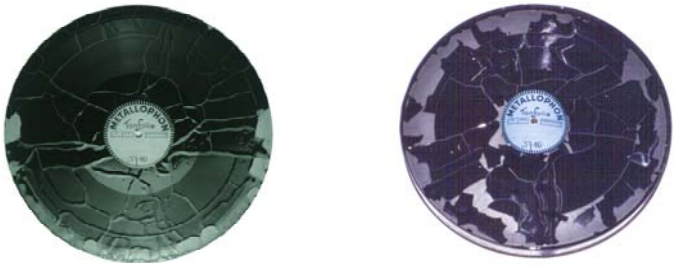


Fig. 1: Instantaneous disc.

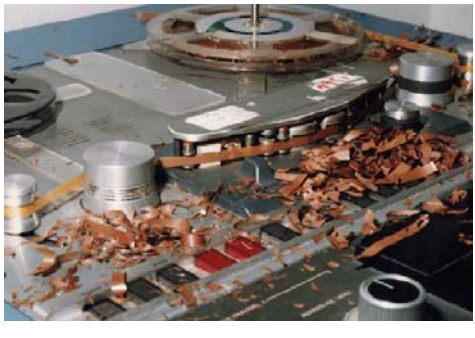


Fig. 2: Magnetic tape.

1. DIGITISATION WITH VERY HIGH ACCURACY AND COLOUR CALIBRATION

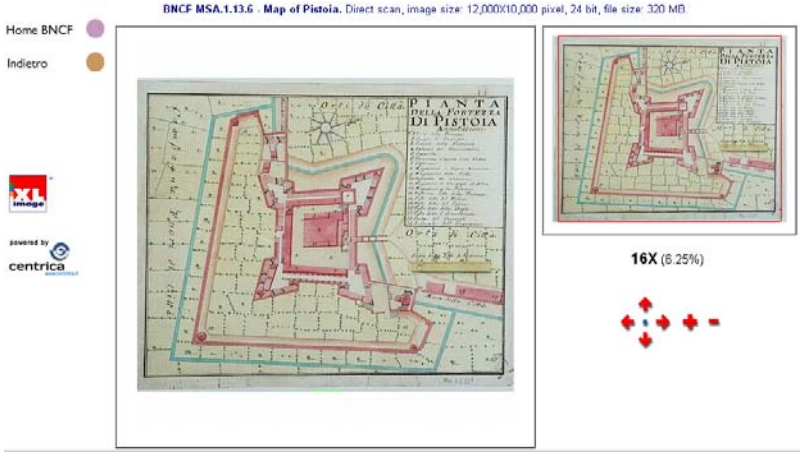


Fig.1a

Fig. 1b

Fig.1c

2. *Virtual Restoration*

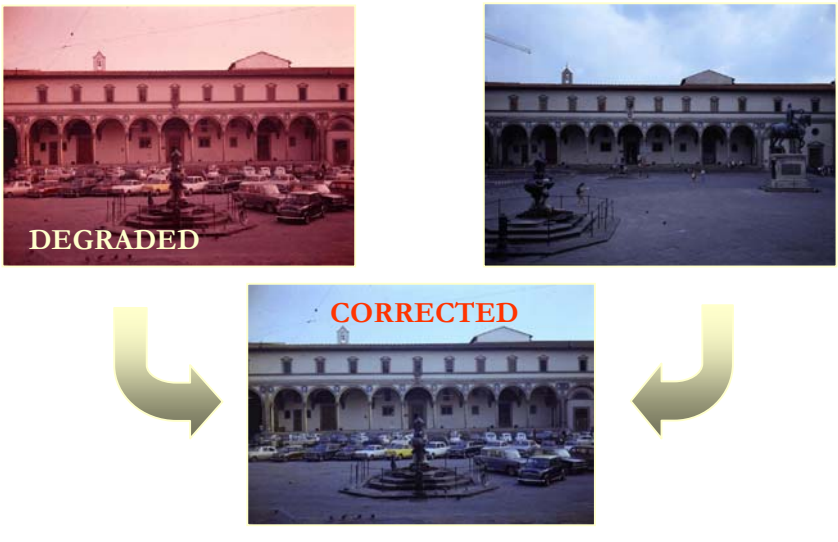


Fig. 2

[Photo of P.za della S.S. Annunziata, Florence.
Source: Archivi Alinari, Florence.]

Fig. 3

[Piero della Francesca, *Storie della Vera Croce, La Morte di Adamo* (detail),
Chiesa di S. Francesco, Arezzo.]

Fig. 4

[Duccio di Boninsegna, *Madonna Rucellai* (detail),
Galleria degli Uffizi, Florence.]

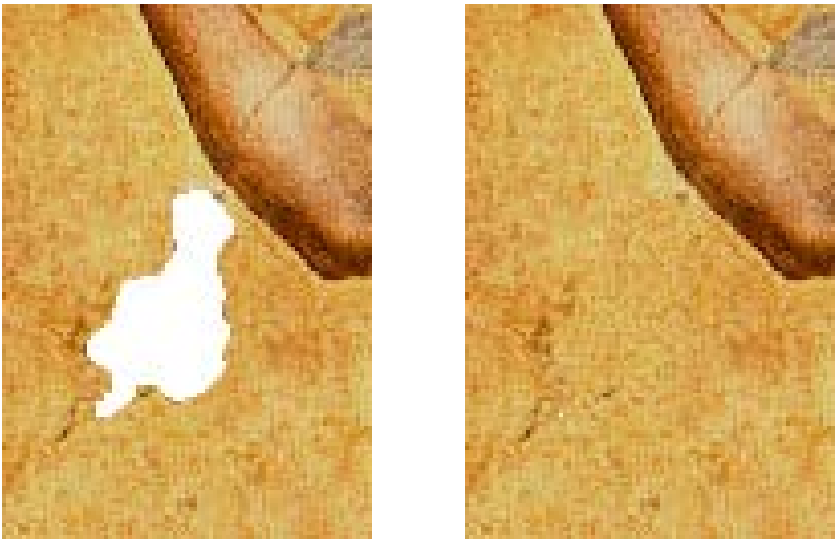


Fig. 5

[Correggio, *San Giovanni Evangelista,* Parma, Chiesa di San Giovanni.]

Original picture

Restoration of some lacunas with "Puntino technique"

Fig. 6

[Duccio di Boninsegna, *Madonna dei Francescani* (detail)*,* Pinacoteca, Siena.]

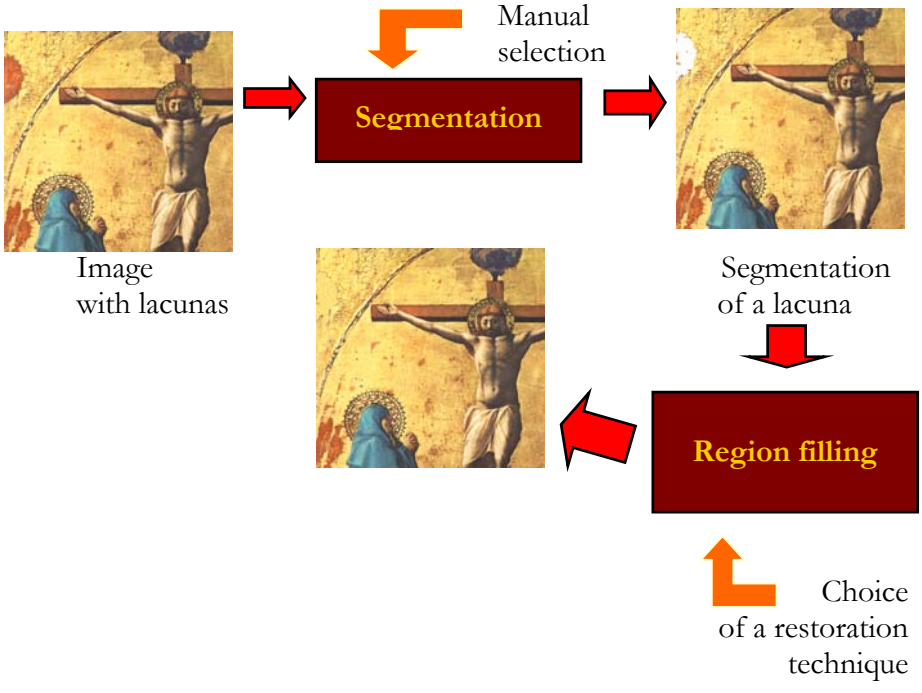
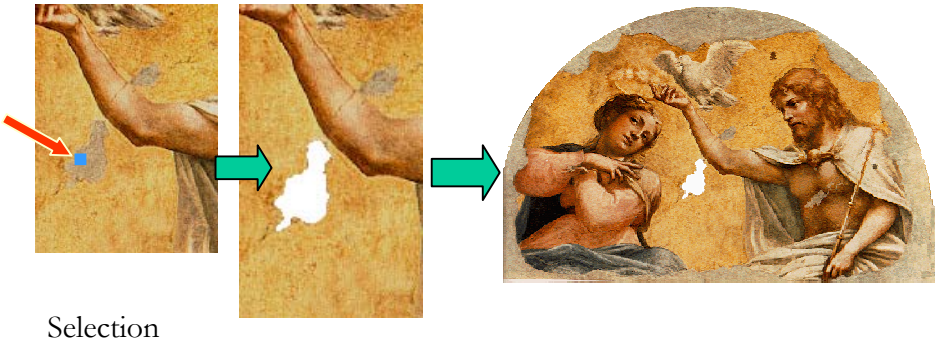


Fig.7

[Masaccio, *Crocifissione* (detail), Museo di Capodimonte, Naples.]

Frescos with similar
neighbouring lacunas



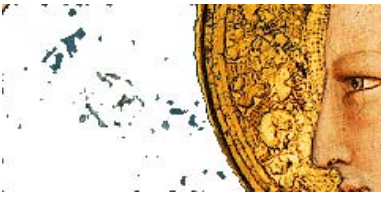
Selection
of a starting region

Segmentation result

Fig.8

[Correggio, *San Giovanni Evangelista,* Chiesa di San Giovanni, Parma.]

Similar neighbouring lacunas



Segmentation using R.G.
and thresholding

Segmenation using
a new technique

Fig.9

[Simone Martini, *Santa Elisabetta* (detail),
Chiesa Inferiore S. Francesco, Assisi.]

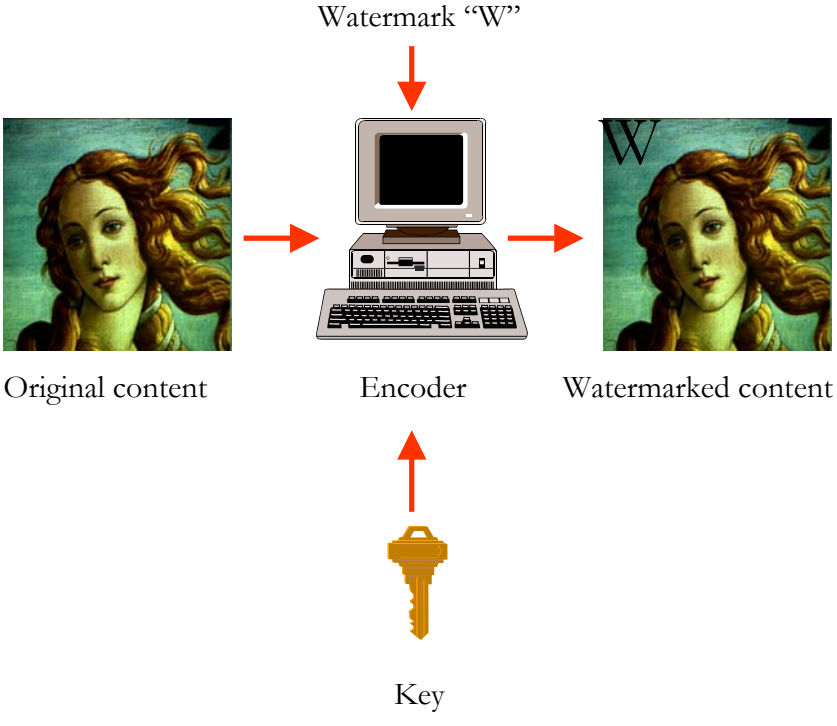


Fig.10: Watermark insertion.

[Sandro Filipepi, known as Botticelli, *La nascita di Venere* (detail), Firenze,Galleria degli Uffizi.]

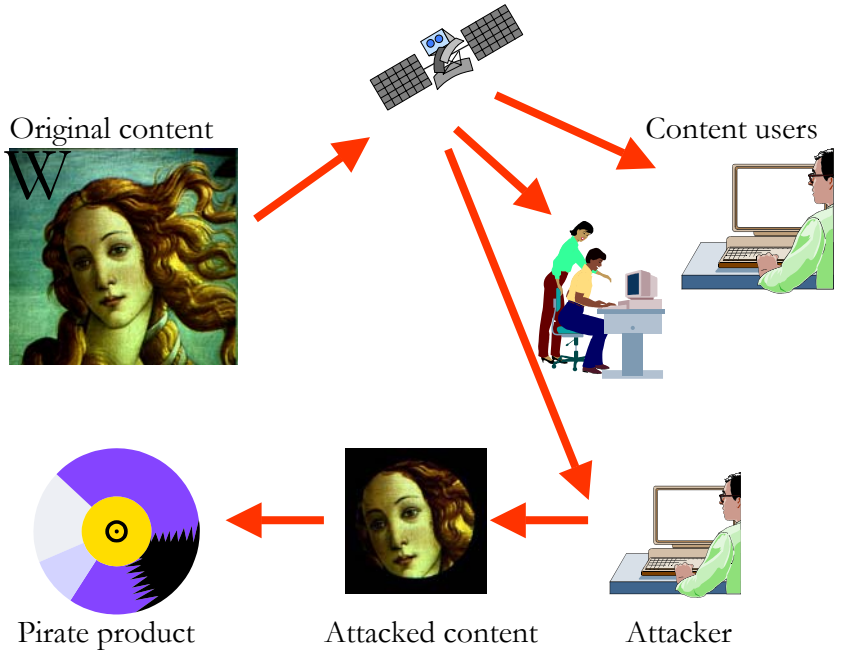


Fig. 11: Content distribution.

[Sandro Filipepi, known as Botticelli, *La nascita di Venere* (detail), Firenze, Galleria degli Uffizi.]

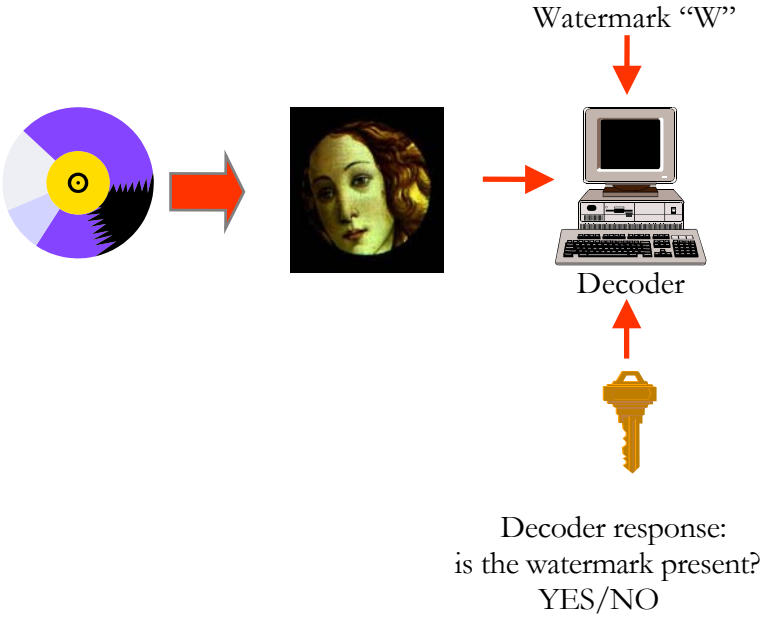


Fig.12: Watermark detection.

[Sandro Filipepi, known as Botticelli, *La nascita di Venere* (detail), Firenze,Galleria degli Uffizi.]

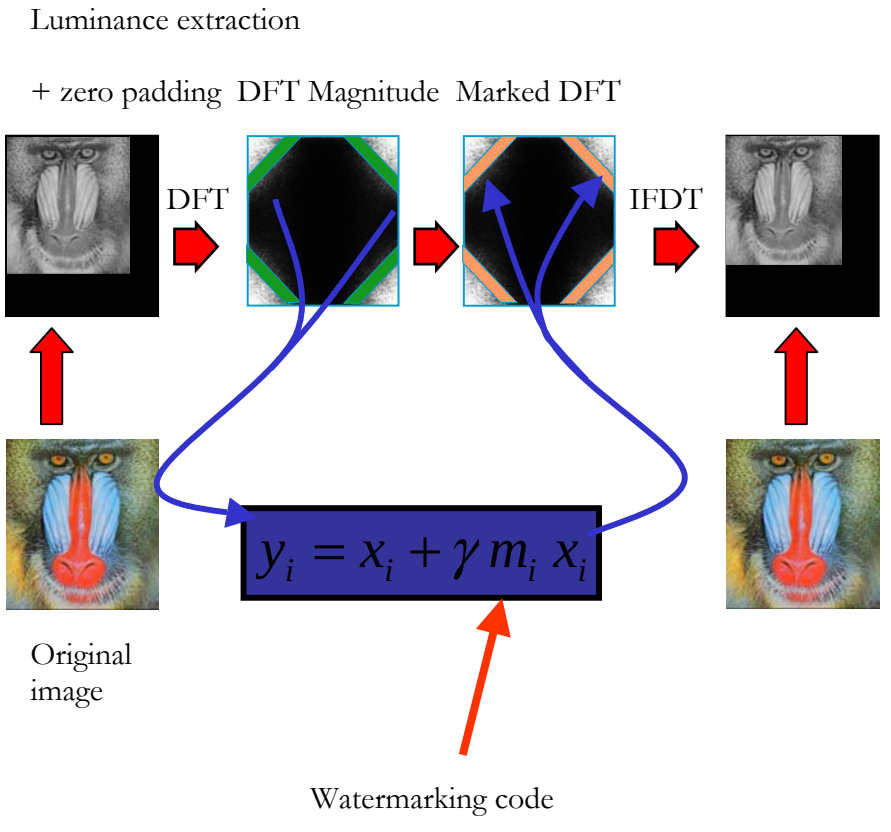


Fig.13: Example of digital marking.

[Laboratorio Comunicazioni e Immagini – Department of Electronics and Telecommunications, University of Florence.]

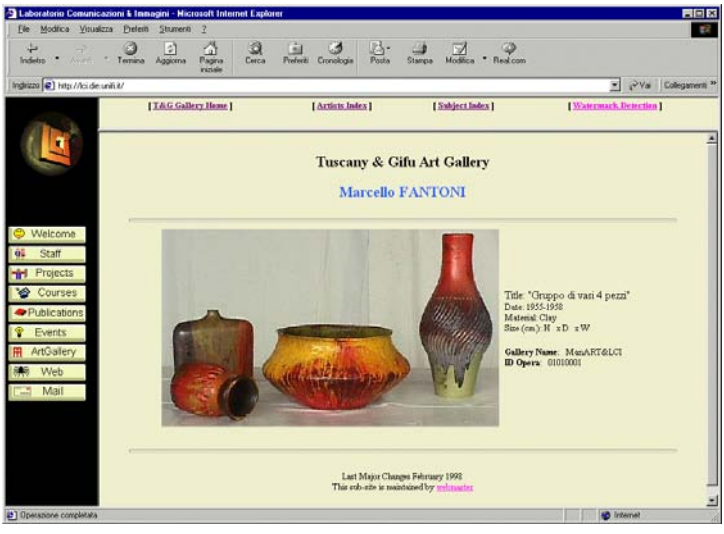


Fig. 14: A screenshot of the Tuscany and Gifu Art Gallery.

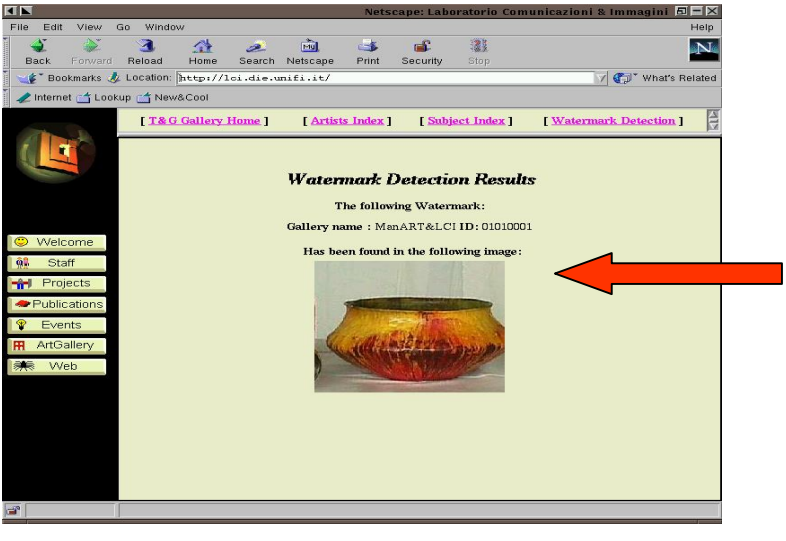


Fig.15: Mark detected on an image
of the Tuscany and Gifu Art gallery.