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European Networks of Excellence and Japanese/UNESCO Silk Roads

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Abstract
A European Network of Centres of Excellence in Digital Cultural Heritage is being formed. It is proposed that this could be linked with NII's broadband network in Japan and with UNESCO's proposed digital silk roads project. Following a survey of key developments in technology and virtual museums some of the reasons for these new networks are outlined: namely, the possibilities of augmented culture; the need for new links between local, regional, national and global knowledge; the need for a new world view with respect to culture and more methodological reflection about the implications of digital culture.

Keywords
Networks, augmented culture、 digital content, cultural grid

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1 Introduction

Since the founding of the Canadian Heritage Information Network (CHIN) there have been visions of linking memory institutions (museums, libraries and archives) in networks (cf. Marburg Archive). Experiments at a European scale began in the early 1990s and such efforts at networked memory insititutions continue. The G7 Conference and Exhibition on the information Society (Brussels, February 1995) introduced the idea of eleven pilot projects of which number five was devoted to Multimedia Access to World Cultural Heritage. At the G7 Information Society And Developing Countries (ISAD) Conference (Midrand, June 1996) four projects were highlighted under the themes, capture (National Research Council of Canada laser camera, Ottawa); archive (the multimedia system of the Istituto e Museo di storia della scienza entailing links between scientific manuscripts, physical and virtual reconstructions, Florence); display (the reconstruction of the tomb of Nefertari by Infobyte, Rome) and navigate (System for Universal Media Searching (SUMS), Toronto).

The G7 initiative was one of the factors, which led to the European Commission's Memorandum of Understanding (MOU) for Multimedia Access to Europe's Cultural Heritage, which was initiated in December 1995 and signed in June 1996. This MOU established that hundreds of European Cultural Institutions were interested in working together. The MOU led to the MEDICI Framework (inaugurated, Vienna, October 1998), which introduced the idea of a network of centres of excellence to study the methodological problems posed by these emerging networks, to establish criteria for quality in this field and to develop new European Masters and Doctoral programmes in digital culture. This idea of a European Masters with links to other continents was recently restated by Commissioner Reding (Brussels, 29, 11, 2001).

The past three years have seen four major developments. First, there have been dramatic technological developments with respect to broadband and nano-technology. Second, there has been an enormous rise in online museums (over 3000 in Italy alone) and other cultural institutions. Third, there has been an amazing growth in virtual sites, which now extend beyond individual buildings to include whole sections of cities and even entire provinces. Fourth, techniques of augmented reality now allow one to superimpose virtual reconstructions on cultural objects in the physical world. This introduces many new possibilities for augmented digital culture. Following a survey of these developments, it is suggested that the idea of grids for scientific collaboration [1] needs to be extended to create a cultural grid. This cultural grid can contribute to a European Research Area (ERA) and can subsequently be integrated with other international initiatives such as Japan's Digital Silk Roads and UNESCO's world portal for culture and e-learning.

2   Technological Developments

The past decade has seen extraodinary technological developments. Storage space, which was typically limited to one GB even five years ago, is now typically 50-100 GB. With respect to Random Access Memory (RAM), a $5,000 portable in 2001 can readily have 512 MB of RAM, which is the same as a $500,000 Silicon Graphics Machine in 1995. There is talk of computers becoming one million times more powerful within the next decade. New methods are underway which allow 4,000 GB per square inch and, with the advent of DNA storage, it is predicted that one gramme of DNA will hold the equivalent of one trillion CD ROMS. Technologically it will be possible to have access most of the knowledge in the world's memory institutions in an object of only a few grammes. This will give a whole new context to the song of "I've got the whole world in my hands." Ten years ago, technological hurdles were a fundamental concern. In the near future technology will no longer be a limiting factor, assuming of course that we articulate our needs and ensure that these are included within specifications. The rise of nano-technology means that computers can be invisible; that they can become part of every cultural object and effectively that we can have ambient intelligence.

3 Virtual and Imaginary Museums

A decade ago there were a few prototypes of virtual and imaginary museums. There are now well over 10,000 sites in Europe alone. These range from elementary lists of essential information such as opening and closing times, to virtual reality reconstructions of all the rooms of a collection. Museums such as the Louvre provide virtual visits of the rooms in Quick Time Virtual Reality (QTVR). The Metropolitan Museum of Art allows visitors to create their own virtual museum with a selection of paintings/cultural objects which they particularly like. The site of Louvre.edu allows elementary and secondary school children to produce reports using paintings and cultural objects in the Louvre's collection. The Marburg Photo Archive now has one million images available online, free of charge. The Canadian Heritage Information Network has produced a distributed Virtual Museum of Canada making materials from over 600 museums throughout Canada freely avalaible on the Internet.

The American Memory project of the Library of Congress and the Gallica project at the Bibliothèque Nationale de la France have inspired similar projects in the Netherlands (Geheugen van Nederland). A key assumption of these projects, which bring together materials from all kinds of memory institutions, is that materials collected with public money must be made freely available for the public good: i.e. memory institutions are not just there for scholars but must be equally accessible for the average person. This attitude, which has been most articulately voiced by France, and which is supported by the recent image search

function in www.google.com, provides an essential counterbalance to efforts of individuals such as Mr. Bill Gates and more recently Mr. Gordon Getty to buy up rights to images such that culture can be reduced to pay by view conditions.

Images which were scanned at 10-30 MB are now typically being scanned at 100-300 MB. The Uffizi is scanning at 1.4 GB per square meter. The Japanese are scanning some objects at three Gigabytes/image. Using a remarkable V-Zoom technology, allows one to move from the foreground to the background without pixellation effects. The Centre de Recherche et Restauration des Musées de France has 26,000 cultural objects for each of which they have 150 images. This constitutes a database of well over 3 terabytes, which is being converted into a Linux database in order to be made publicly accessible. In short, although the past decade has made enormous available amounts of cultural materials especially with respect to virtual and imaginary museums, this is but a small proportion relative to what has already been scanned.

Problems of copyright have been one of the stumbling blocks in dissemination although this should not affect the realms of education and scholarship where no profit is entailed. Connectivity remains a problem mainly because few persons realize how large are the databases, which are potentially available. So one of the first challenges is to make these materials from memory institutions truly accessible first for the research and educational community and subsequently for the public at large.

The past few years have also seen a series of unexpected applications for virtual museums. One is their use in games. One of the earliest examples was a game of intrigue involving Versailles in the year 1685 (1996). Since then there have been CD ROMS with murder mystery "whodoneits" in the Louvre. There is a new game, Virtual Reality Notre Dame (VRND), which claims to be the first globally accessible multi-user real-time virtual reconstruction [2]. Companies such as DePinxi (Brussels) [3] are creating interactive virtual reality games involving cultural sites such as Mayan cities in Mexico. CINECA, the Italian supercomputing facility near Bologna, in conjunction with the Italian television, RAI, has recently used its virtual reality reconstruction of Pompeii to create a virtual set such that physical persons can have the sensation of walking through the reconstruction. This has major implications for both the future of entertainment and for education (as well as for what is called edu-tainment in America). Such potentials require further research.

4   Virtual Sites, Cities, Landscapes

A decade ago virtual museums were primarily limited to virtual reconstructions of interiors. In the field of archaeology these reconstructions spread to include entire sites [4]. In the past

years, they have spread to include the inner sections of historic towns and cities: e.g. Heusden, Montreal, Pompeii, Heculaneum and sections of Rome. The most dramatic example thus far is the NUovo Museo Elettronico (NUME) project (Bologna) [5], which includes reconstructions covering a millenium such that one can follow the history of the city from the tenth century to the present. Related to this are detailed reconstructions of seventeenth century mills which help provide new insights into the economic history of the city. The Pompeii model is also being designed in such detail that various hypotheses about economic and social life at the time can be simulated. Such developments have enormous implications for education and learning at all levels.

There are also a number of virtual reconstructions of modern cities such as Virtual Paris (both by Canal+ and France Telecom), and Virtual Helsinki [6]. Parallel with this are tendencies to have web cameras in physical cities such that one can follow what is happening at any given time. Perhaps the most extensive project to date is SANTI, which ranges from satellite images of the entire province of Galicia to reconstructions of the interiors of churches. In some cases reconstructions in virtual reality are being used to reconstruct physical buildings, which have been destroyed in war or damaged by earthquakes. The Frauenkirche in Dresden (1993) was perhaps the first example. The Church of San Francesco in Assisi is another. These virtual sites range in size from 50MB to three terabytes and are not yet generally available for two reasons: lack of bandwidth and lack of high powered machines at reasonable costs.

In cases such as the Abbey at Cluny, there have been no less than five different reconstructions in the past decade. Such reconstructions implicitly raise many questions of method. What were the precise sources on which the reconstruction was based? What were assumptions underlying and the concrete steps taken in making the reconstruction? Are these available to persons wishing to study the principles behind the reconstruction in order to determine their authenticity and veracity?

5   Augmented Digital Culture

One of the most dramatic developments of the past years lies in the realm of augmented reality. At the simplest level this entails superimposing a virtual reality reconstruction onto a site in the physical world. For instance, in the Archeoguide [7] project, a reconstruction of the Temple of Hera is superimposed on the present day site of the ancient ruin in Olympia, Greece. A project with Ericsson will do the same in the case of the old town of Stockholm using special glasses to superimpose reconstructions of what was there before onto the existing buildings.

Methodologically this trend is of great importance for it introduces many possibilities for augmented culture [8]. In future, a project such as Archeoguide could offer viewers a history of reconstructions of the Temple of Hera and other sites. Today when a visitor enters a site such as Hagia Sophia (Istanbul) they are confronted by a museum. Previously this was an Islamic mosque and earlier still it was a Christian church. Using glasses and augmented reality a visitor could trace the history of such a church, monument, site or other cultural object in the course of the centuries.

This principle can be extended to other domains. Steve Feiner (Columbia University) has demonstrated the potentials of augmented reality in the context of what he terms architectural anatomy: i.e. using glasses to see the positions of water pipes and electrical wires and other architectural features which are usually hidden under floors, above ceilings or behind walls. IBM has adapted this principle to show that one could superimpose on the heavens the Greco-Roman constellations of the stars such that one can, for instance, see precisely which stars are used in the composition of the Big Bear (*Ursus Maior*) and other figures. Augmented reality can take this principle one step further. The Persians, Indians, Chinese, Mayans, ancient Norsemen and others all produced their own constellations. Thus the same glasses, which allow us to superimpose the Greco-Roman constellations, can be used to impose upon the night sky all possible constellations. In this way we can literally learn to see the world in different ways, and learning to see through the eyes of different cultures becomes more than a cute metaphor. It can become a new method for appreciating the rich complexity of otherness, which is at the heart of culture rather than forcing us to seek only for the least common denominator of sameness, which lies at the boundaries of different cultures.

Traditionally, printed books typically presented only one static version of a given reconstruction. Networked computers can also offer viewers with images of competing or even conflicting reconstructions of the same church, temple or other monument. They can also offer dynamic versions, which show how such reconstructions evolve over time. This again has enormous implications for research and education. For instance, if various archaeological schools were able to put their reconstructions online, one could study how American, British, French, German, and other archaeologists frequently have different interpretations and different reconstructions of a given monument, complex, or site. Augmented reality in a network can make visible alternative worldviews (Weltanschauungen) and help us to study more precisely the cultural dimensions of knowledge.

6 Local, Regional, National, Global

A further reason why new networks are needed entails a shift in our awareness concerning

the relative value of local, regional, national and global. Ever since the nineteenth century there has been a quest for global organizations. This inspired the International Telecommunications Union (ITU); the International Standards Organisation (ISO); the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and many other bodies. A tacit assumption arose that local agreement was good, regional or national agreement was better; and international and global was best of all.

In terms of science, technology and medicine this is undoubtedly true. A definition of zinc; a chemical formula; or a description of the aorta must be the same world-wide if scientists and doctors are to operate properly. The laws of science entail universal principles with no local variants. By contrast, in the realms of culture and the arts the situation is very different. The uniqueness of a cultural object is measured precisely therein by the way in which one local variant is different than other local, regional, national or international examples. Science searches for laws about uniformities. By contrast, culture seeks to identify examples with escape and defy such uniform laws; which are constantly varying and changing. In this sense, science is about universals: culture is about particulars.

Earlier versions of science may help us understand how we got there, but they have no role in everyday practice where only the latest version is relevant. Hence science in this sense is non-cumulative. By contrast, in culture, earlier versions play a crucial role in everyday practice and the latest version is useless if we do not have access to historical context. Hence culture is essentially a cumulative process. English culture is great partly because of Shakespeare and partly because of four centuries of commentaries on Shakespeare. Modern science can pretend to be a-temporal. By contrast, culture, if it becomes a-historical loses its meaning. If we impose the needs of science and technology on culture we are doomed to a McDonaldization of culture: cf. Barber (1995), Ritzer (2000). A challenge lies in using the potentials of science and technology to meet the needs of culture and not conversely.

As a result science focusses on the global dimensions of contemporary knowledge and typically acts as if local, regional and national dimensions are of no importance. By contrast, the particulars of culture require a very different structure, which focusses on the local, but at the same time integrates with knowledge at the regional, national, international and global levels. In the analogue past, this structure was largely created by separate institutions at each of these levels.

In a digital world where all of these institutions are present on the same world wide web, we need new methods to distinguish materials at each of the levels, and at the same time ensure their comparison because seeing particulars in isolation is not enough. They need to be compared such that we can recognize patterns and senses of order in their myriad forms; such

that we can recognize underlying harmonies and develop tolerance. Culture thus requires networks for comparing differences and underlying symmetries; for re-organising knowledge to see more than the chaos of the surface; to discover in our diversity the secret of richness as human beings. It is noteworthy that a similar vision has emerged from the Ruffolo Report in the European Parliament [9].

Herein, lies a way beyond the dichotomies between a global McWorld and a regional jihad perceived by thinkers such as Barber [10]. Herein also lie new dimensions for a semantic web. As early as 1976, Nobel physicist, Joseph Weizenbaum warned of the dangers of trying to create computer systems, which functioned independently of human beings [11]. Nevertheless, the quest to create autonomous robots and agents independent of human intervention continues to gain ground. This helps to explain an increasing emphasis on natural language, or common sense projects such as Doug Lenat's (en-)CYC(-lopedia) project, and formats such as DARPA's Agent Modeling Language (DAML).

Related to this trend are efforts to remove human control of the web [12]. Essentially this quest entails a mechanical approach to intelligence whereby meaning becomes reduced to decision trees and actions. While this has obvious importance in military situations it ultimately removes the role of culture and history from the development of meaning. By contrast an approach, which establishes new links between local, regional, national and international knowledge provides a context for meaning, which is multi-lingual and multi-cultural [13]. This is the kind of semantic web needed for culture. A new cultural grid can provide a context for research required to make this vision a reality.

7. A New World View of Culture

A further reason for these networks is that we desparately need a more global understanding of the varieties of cultural expression [14]. In the West, standard textbooks of art history such as Janson focus overwhelmingly on European developments and only pay lip service to the contributions of other civilizations such as India, China, and Japan. With respect to rock art in caves we learn about Lascaux (France) and Altamira (Spain) but nothing of the 30,000 examples of rock art in Africa, let alone those in Australia, India, Canada or elsewhere. In Christianity, we know that there are important parallels between the spread of the Bible, Christian literature and the rise of narrative art. There are parallels in the case of the Ramayana and Mahabharata in India and southeast Asia; the Shanahmah in Persia, the Tale of Gengi in Japan, and others. We have fields such as comparative religion and comparative literature, but there are as yet no disciplines such as comparative art history or comparative culture.

Recently there has been much attention to the dangers and limitations of fundamentalist religious sects. This should not, however, obscure the enormous contributions to culture made especially by the world's major religions. If there is to be understanding among persons then these great contributions need to be made visible not just in the case of Christianity but equally in the case of Hinduism, Buddhism, Judaism and Islam. We need new ways to make visible the contributions not only of literate and literary cultures but also oral and pre-literate cultures. Since computers potentially entail all five senses (sight, sound, touch, smell and taste), they can serve in recording and in making known much more than the literate cultures which were privileged by the introduction of printing. We need new ways of recording not just the static paintings of the West but also the ephemeral sand paintings of the Aborigines and the Buddhists; the dances of North American Indians, Hindus and many others. Implicit in all this is a more comprehensive approach to culture which goes beyond rhetorical oppositions between low and high culture to include both in a larger framework. For this reason it is all the more urgent that the emergent networks linking cultural memory institutions are linked with centres of excellence in order that contents from a global level can be provided with new frameworks of understanding.

In essence, culture might be defined as shared beliefs, values and identities, which are expressed first in multiple media, increasingly in interrelated media and then further propagated by mass media. At the outset cultures are typically closed and defensive, Thereafter, they often pass through a stage of aggressive openness which may lead to imperialism. Ultimately the test of a higher culture is its ability to share values in a context of tolerance for alternative views. It is thus useful to distinguish six distinct steps through which cultures tend to pass (figure 1), each with different emphasis on intangible culture, tangible culture and the built environment: namely, doing (intangible), making (tangible, built), writing (tangible, intangible), expressing in different media (tangible, built); translating among media (inter-tangible, built) and publishing fairly and tolerantly by mass media (intercast).

Pre-Literate	1. Doing
	2. Making
Literate	3. Writing
	4. Expressing (Written Beliefs) in Different Media
	5. Translating Between/Among Media
	6. Publishing fairly and tolerantly by Mass Media

Figure 1. Six stages in the development of culture.

While we distinguish clearly between pre-literate and literate societies, it is important to recognize that elements found in pre-literate cultures continue to evolve in literate cultures. Unlike some naive models of progress in culture, we do not assume a simple, linear development. Nor do we assume that there is a necessary development in this evolution. Culture is a fragile process. Its growth can be slowed down, interrupted or even destroyed by adverse political or economic conditions, by civil strife or by war. Nonetheless, when conditions are favourable it is possible to move through the various stages. These stages can differ even within a given country. For instance, Nepal has a very advanced culture in Kathmandu and a less advanced but often more coherent culture in the countryside.

Such an approach has fundamental advantages. It is free from Euro-centric, Asian-centric or other viewpoints, which impose their own traditions on the rest of the world. Using the framework outlined above to study the great achievements of cultural history we can arrive at new fields of comparative art history and comparative culture. Instead of simplistic pride in our own tradition, we can learn to appreciate the great achievements of other cultures. This is essential if we are to go beyond the parochialism of the past and move towards a global village wherein the uniqueness of individual villages is not compromised.

While details of such a new framework are clearly beyond the scope of this paper, it is useful to sketch the first outlines thereof. One of the first stages of pre-literate culture lies in achieving identity of a group through everyday profane activities needed for survival, namely, food, drink, clothing, shelter, sounds. These activities serve to connect persons with the earth. In a further stage these everyday activities necessary for survival become the starting points for a number of basic pleasures pertaining to material culture (figure 2).

Parallel with this early stage of profane activities to connect persons with the earth is a second class concerned with ordering the earth (and the heavens) through pattern and ornament, a theme which the late Sir Ernst Gombrich pursued in his *Sense of Order*.

Survival	Survival +→Luxury
Food	Cuisine
Drink	Tea, Coffee, Wine, Beer
Clothes	Fashion
Utensils	Pottery, Metalware
Land	Cultural Landscape
Shelter	Architecture
Sounds	Language

Figure 2. Everyday activities connecting to earth (profane) relating to material survival.

Survival	Survival +→Luxury
Baskets	Basket Weaving
Pottery	Ceramics
Knitting	Embroidery
Trinkets	Jewelry

Figure 3. Ordering the earth (and heavens) through pattern and ornament.

These begin as simple ornamental motifs in crafts and lead eventually to highly complex geometrical and other ornaments. In cultures such as Islam, where figurative expression is typically suppressed, this channel of expression is frequently emphasized (figure 3),Also in parallel with an early stage of profane activities is another set of sacred activities, which aim to link groups with the world beyond. These begin as animism and totemism and lead via myths and legends to religion, theology and also the humanities and social sciences (figure 4).

In a sense our distinction between profane and sacred activities is post facto insomuch that in many (possibly all) of the earliest groups, even everyday activities connected to the earth were also imbued with an animistic dimension, which linked it to the beyond. Even so it makes sense to distinguish between a number of core (profane) activities needed for material survival and sacred customs the importance of which lies primarily in the realm of spiritual values. Although these sacred and profane activities have their origins in the earliest manifestations of pre-literate cultures, subsequent versions continue to develop throughout literate cultures.

As cultures evolve there is an increasing commitment to create specialised objects, sites and built environments to express and to commemorate their beliefs. Initially these are typically totems, magical objects, which serve to connect their users directly with a world beyond. Subsequently such objects evolve into independent branches of artistic expression such as painting and sculpture (figure 5). Expressions which begin as ephemeral, tend to have more enduring forms in later stages. Hence the sand art of the Buddhists, takes the form of thankas

Survival	Survival +→Luxury
Music	Group, Band, Symphony
Dance	Ballet
Song	Choir, Musical, Orchestra
Ritual	Pageants, Festivals

Figure 4. Everyday activities connecting to beyond (sacred customs) relating to spiritual survival. .

Objects	Specialised Objects
Totems	Sculpture
Rock Art	Painting
Sand Art	Canvas Painting, Thanka
Language	Poetry, Literature
Writing	Calligraphy
Caves	Buildings:Temple, Synagogue, Church, Mosque
Dolmens	Sacred Sites, Pilgrimage Places, Holy Cities

Figure 5. Oral beliefs expressed in media.

and the sand art of the aboriginals becomes canvas paintings (partly to meet the taste of Westerners), who are to accustomed to this form. As long as cultures remain oral, their range is limited literally to those who are within hearing distance. An important next step in the evolution of cultures is a literate phase where sacred and literary texts embody the beliefs and values of major religions. These texts in turn inspire expressions in different artistic media. In the West such expressions tend to emphasize the static arts of painting and sculpture. In the East such expressions emphasize the dynamic arts: theatre, dance, puppetry etc. (figure 6).

One measure of advanced culture thus becomes the amount of artistic expressions generated by their key religious book(s). A further measure is the extent to which a theme in one medium becomes translated, especially into other media: i.e. how a book in one language is translated into multiple languages; how the Annunciation described in the New Testament (of the Bible) occurs as a drawing, painting, sculpture, enamel plate, silver, gold, tapestry, wood carving etc. Or how a legend such as the Grail in Parsifal becomes literature (Chrétien de Troyes, Wolfram von Eschenbach), opera (Wagner) as well as frescoes, paintings, sculptures etc.

Religion	Sacred Texts	Literary Texts
Hindu	Vedas	Mahabharata, Ramayana
Buddhist	Tripatika	Tale of Gengi
Hebrew	Torah	…
Christian	Bible	Divine Comedy
Persian	Avesta	Shanahmah
Islamic	Koran	...

Figure 6. Sacred and literary beliefs expressed in different media (sculpture, painting, theatre, dance, puppets).

Pre-literate cultures are typically rather introverted and often rather defensive with respect to other cultures. By contrast, literate cultures tend to be more extroverted and expansive with respect to their traditions and values. Another measure of culture thus becomes the extent to which the mass media (press, radio, television, internet) are used in order to spread the beliefs and values of a culture. On the other hand if the mass media are used blindly, the process becomes mere propaganda. Hence, a further criterion in this publishing via the mass media must necessarily be the tolerance with which alternative cultures are treated.

The development of such a new approach to culture entails many subtle problems and hurdles relating to implicit, tacit, cultural differences. In the Latin West, for instance, art and culture are associated with separation of subject and object, with the creation of aesthetic distance, learning not to take (too) seriously the work of art. In the East, especially in the Buddhist and Hindu traditions, art and culture are associated with a union of subject and object, being at one with nature. In the Orthodox Christian tradition in Greece and Russia, art functions somewhere between these extremes. The icon links subject and object but there is neither western separation nor eastern union.

In the West there is a focus on knowledge of the objects of culture. In the East, particularly in Nomadic cultures where the number of objects one can carry along are minimal, knowledge of relations among persons are paramount. In the West, it is the viewpoint of an individual that often dominates. In the East, it is the consensus of a family, a group, a commune or a party that dominates. A new approach to culture will need to respect these differences and teach us to appreciate very different tacit assumptions about ourselves and our world.

8. Networks of Excellence, Digital Silk Roads and a Cultural Grid

Ever since the Remote Access to Museum Archives (RAMA) project in the early 1990s the European Commission has sponsored the idea of networks linking memory institutions: e.g. AQUARELLE, MOSAIC [15] MENHIR. Such isolated projects continue: e.g. the VAN EYCK Project and the Virtual Heritage Net. The Memorandum of Understanding for Multimedia Access to Europe's Cultural Heritage (MOU signed Florence June, 1996) outlined a more systematic approach to the problem. The MEDICI Framework (Vienna, October, 1998) went an important step with the vision of a Network of Centres of Excellence in Digital Culture in order to co-ordinate research efforts in this field at a European level. In the context of the MEDICI Framework, the Maastricht McLuhan Institute was asked to develop this idea further. From 1998 to 2000 a series of seven basic goals were identified (figure 7).

Interoperability of Content
Identify Quality
European Multimedia Education (European MA, PhD)
Fundamental Research
Contribute to Reflections Concerning Policy Development
Share Existing and Create New Content
International Dissemination

Figure 7. Seven goals for the Networks of Excellence in Digital Culture.

The past two years have brought the methodological challenges introduced by new media ever more into the foreground. A number of these challenges are outlined above. Paradoxically, many of those involved with the new media seem intent on reproducing on their screens the limitations of print to which McLuhan drew attention, rather than exploring the potentials which can be unleashed by the new media. And while there are some exciting new projects, such as a German initiative, which aims to make the slide collections of individual professors accessible through an online distributed database, we desperately need to provide students access to the full richness of the materials, which are potentially available today. Only then can we hope to develop new methods for dealing with the ever evolving new technologies.

In 2001, it was decided that a threefold path of development is desireable. First, key institutions should work toward networks within their own countries. In Italy, the Scuola Normale in Pisa has created the FORMA consortium which includes the Accademia della Crusca, the Centro internazionale Andrea Palladio and the Istituto e museo di storia della scienza. In Spain, the Universidad Complutense has identified eleven universities for a network. In the Netherlands, the National Research Organization (NWO) has created a consortium, which includes the National library, national gallery, national archive, national audio-visual institute, the National Academy of Sciences plus a number of universities and key research institutes. Austria is working on a similar network. In France, Belgium, Germany, Great Britain, and Scandinavia similar national networks are also under discussion.

Second, it was decided that these key institutions at a national level should write letters of intent for co-operation at a European level. The rectors of the universities of Bologna, Cologne, Madrid, Vienna and the Scuola Normale (Pisa) have written such letters confirming their intent to work with the Maastricht McLuhan Institute. In the sciences there has been increasing attention to the need for grids (cf.the Globus project) [16]. A third step will be to link these national initiatives in working towards a cultural grid, which can contribute to the European Research Area (ERA).

Internet developments are, of course, global and must extend beyond the traditional boundaries of Europe. Japan is creating a national network. Hence a first step will be to link the Japanese network with the European High Broadband Network. UNESCO's desire to create a digital silk roads project will create a network linking the cities which once formed the silk and spice routes: Beijing, Almaty, Tashkent, Samarkand, Tehran, Istanbul etc. This can be a next step.

Other networks, which are emerging in Russia, the Far East, in North and South America, Australia and elsewhere must also become part of this vision. As discussed at the Tokyo conference, UNESCO is developing a global portal for cultural heritage and e-learning. This needs to be co-ordinated with similar portals at the international level (e.g. the portal of the European Commission) and at the national level. These regular internet portals need, moreover, to be linked and integrated with the vision of a broadband research network. In the past there were both silk roads and spice roads, which connected east and west. In future, we need their digital equivalents, which go far beyond the bustle of information highways to create many new paths for understanding.

9. Conclusions

The past decade has brought major technological developments resulting in remarkable advances with respect to virtual and imaginary museums as well as virtual sites, cities and landscapes. This has a) resulted in thousands of projects with content ranging from ten megabytes to three terabytes, most of which are not accessible via the regular internet and b) introduced new possibilities with respect to augmented digital culture. From these developments arise many new problems of method. To meet these challenges networks of museums, libraries and archives are preliminary steps. The ICOM virtual library of museums, and UNESCO's Heritage Network are significant advances. The world portal for culture and e-learning by UNESCO is another admirable step forward as are the digital silk roads planned by Japan/UNESCO. These need to be co-ordinated with the portal planned by the European Commission and other national portals such as the Australian Culture and Recreation portal (Canberra) [17], the Canadian Heritage Information Network (CHIN, Ottawa) or the National Inititiative for Networked Cultural Heritage (NINCH, Washington).

In addition, we need a new broadband network of centres of excellence to examine the new content; to study ways to increase its context and communication; to address the new problems of method which they entail; and to study the philosophical, epistemological, sociological, art historical, legal, political and economic implications thereof.
This network must link ordinary computers and supercomputers to create a new grid for culture comparable to the scientific grids being developed in high-energy physics, astronomy,

chemistry and bio-informatics. Initially this might begin as a European network in keeping with Commissioner Busquin's vision of a European Research Area (ERA). New links between the practical content and experience of memory institutions and the theoretical research of universities and institutes can lead to a new world view of culture. This network needs ultimately to be global and build on, rather than compete with, the portals to the regular internet.

Some will say that this is an excellent idea but is not economically viable. These same individuals are frequently economists who ensure that the annual budget for culture in Europe is approximately .01% and falling. But what if we discover, in light of the September 11 emergency, that culture is the key to a social cohesion, which is a pre-requisite for a context that allows a healthy and tolerant society? Almost everyone would agree that we need tolerance which to goes beyond hating America, Islam or any other tradition. Is that not worth much more than 1,000th of our economy? Only with a multilingual, multicultural approach, which includes all traditions can we hope to maintain and develop our cultural diversity, which is as essential to the spirit as is bio-diversity on the bodily plane. That is why the new networks of excellence and the digital silk roads are not a luxury. They are essential to the future of culture and of civilization itself.

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