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Media, Languages and the Integration of the Processes of Communication

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Abstract
Modern science and new technologies such as the Internet are typically global. They bring with them the need for global solutions and standards in a quest for interoperability. By contrast, culture entails shared customs and expressions, which are typically local, regional and national. Although its formulae can be translated into many languages, science is most efficient if it functions in a single language. By contrast, culture is essentially multilingual and loses in richness if these many languages and dialects are reduced to one. 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.

The lecture outlines a number of steps in answering this challenge. Whereas science requires only international standards, culture in a global context requires a re-organization of knowledge, whereby international concepts are linked with national, regional and local variants. These will bring into focus cultural and historical dimensions of knowledge. In the West we have developed a Eurocentric vision of cultural history and art history in particular. This vision focused particularly on the so-called high culture of literate societies. Needed are new models, which extend to pre-literate societies (e.g. aboriginals and Inuit) and include the richness of cultures all over the world. One of unexpected dimensions of the new media is an ability to bridge the literacy/illiteracy divide: offering new ways of sharing knowledge between persons, whether they can or cannot read. In this context the potentials of using technologies for new kinds of augmented culture are also outlined.

The world wide web is expanding at a rate of some 7 million new pages per day. As a result enormous amounts of cultural information are becoming available. Many

provisional networks are emerging (e.g. the ICOM virtual library of museums, the Virtual Heritage Network). Needed, however, is a cultural grid, whereby research institutes will be linked by broadband networks. In Europe there are plans for a network of Centers of Excellence in Cultural Heritage, which can become part of the European Research Area, as foreseen by Philippe Busquin (DG Research, European Commission). Needed is a broader vision, which would link these plans with Japanese work on Digital Silk Roads.
Science has discovered that the quest for standards must not undermine our bio-diversity. The new technologies can help us to ensure a corresponding cultural diversity.

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1. Introduction

This paper explores possibilities introduced by new media and examines some challenges against multilingualism. Some of these are simplistic. Others are linked with a vision of the American military to exclude humans from the decision-making process. Historically, in a larger context, there has been over-optimism about the potential of international agreement with respect to knowledge and linguistics in particular. The limitations of such global approaches are noted. Thinkers such as Barber[1] perceive an opposition between the local (jihad) versus the global (McWorld). By contrast, we suggest that a new synthesis of local, regional, national and global knowledge is required if we are to avoid the false dichotomies outlined by Barber, Ritzer[2] and others.

Underlying these claims is a recognition that the international approach as it evolved in the nineteenth century is particularly useful in the fields of science and technology but does not apply in the same ways in the realms of the arts and culture. Indeed, there is a danger in relying too much on mechanical, technological models and solutions in domains of the human spirit. Science is about unchanging rules. Culture is about a cumulative and ever changing set of values expressed in different languages and dialects. The need for models of culture that go beyond Eurocentrism are noted, the possibilities of augmented knowledge are explored and the possible role of a network of centers of excellence leading to a cultural grid is outlined.

2. Scenarios against Multilingualism

In a networked world there are many challenges to multilingualism. Some are simplistic such as the fear that learning other languages is too much work and should therefore be opposed. Some are naïve such as the idea that English is the new *lingua franca* and that there is no need to learn further languages. This is simply not true. Admittedly, a decade ago over 95% of Internet users were English. In 2001, approximately 43% of users have English as their native language, and this figure is predicted to decline to 25% by 2007. In 2001, the second most popular language on the Internet is Chinese with 9.2%.[3] By 2007, it is predicted that Chinese will become the most popular language on the Internet. In 2001, it is claimed that over 70 of the 6,500 languages of the world are seriously represented on the Internet, and there is every reason to believe that this number will increase.

Hence it is a myth to claim that English is the only language on the Internet. Even so, there are unexpected forces that continue to favor this myth and are working systematically to ensure that English plays a disproportionate role in the future. Chief among these are some academics representing certain sectors within the American military.

In *The Tomorrow Makers* (1986), a fascinating book on the development of living brain machines, Grant Fjermedal, extends ideas of Freud and McLuhan: whereas machines are physical extensions of man, computers are mental extensions and robots are both mental and physical extensions of man.[4] Computer scientists such as Carl Hewitt claim that one needs to replace humans with robots in the case of decision systems. The quest is to create machines "that could take care of us, that could be our guardians and that would also be our rulers and policemen. … program computers and robots that could garner all the weapons of mass destruction into a machine controlled system, in the same way that you have to take matches away from children."[5]

According to the supporters of this school, all decision making concerning military actions, when to send planes, throw bombs, etc. needs to be removed from the human sphere; the goal is to turn over the keys[6] for all such actions to robots. To this end the Army, Navy and the Air Force are all working on autonomous decision robots[7]:

> *The necessary turnover in personnel you get in human-based systems, because of their very short lifetimes, seems to throw instability into the system. And the general diversity of human stock we have, in terms of different languages, cultures and interest is not something that can be smoothed out very quickly*.[8]

As Fjermedal, citing the work of Weizenbaum, has been careful to point out, this quest for a technological solution to military and other human incertitude has profound implications for culture. Weizenbaum recalls a decision in a computerized project on earthquake epicenters, which rejected data before 1961 because it was not in a convenient format:

> *The computer has thus begun to be an instrument for the destruction of history.* […] *For when society legitimates only those 'data' that are 'in one format' and that 'can easily be told to the machine,' then history, memory itself, is annihilated.* […] *And the curious paradox is that the immortality of knowledge means the death of culture*.[9]

Connected with this vision of autonomous decision robots is a quest for a non-biological intelligence, which, according to Richard Jarrow, founder of NASA's Goddard Institute, is destined to replace humans altogether.[10] Speculation aside, this goal of creating autonomous decision robots helps to explain a growing commitment to: a) natural language; b) so-called common-sense worlds, as described by Jerry Hobbs and Robert Moore (1986);[11] and c) the rise of artificial intelligence projects such as Doug Lenat's CYC, Generic Artificial Consciousness (GAC) and Common Sense.[12] It also provides a deeper reason for the Defense Advanced Research Projects Agency's (DARPA) very active role in Knowledge Query Markup Language (KQML), Knowledge Interchange Format (KIF), DARPA Agent Modeling Language (DAML) and their increasing role in Tim Berners Lee's quest for a semantic web.

Lest we be tempted to dismiss such a quest to replace human intelligence by machines as efforts of a marginal minority, it is important to recognize that analogous ideas are being developed in the realm of American industry. For instance, the authors of *Visionary Manufacturing Challenges for 2020* foresee new techniques evolving independently of language and culture, which is the opposite of the European approach:

> *A major task will be to create tools independent of language and culture that can be instantly used by anyone, regardless of location or national origin.*
> *Tools will have to be developed that allow for effective remote interaction. Collaboration technologies will require models of the dynamics of human interactions that can simulate behaviors, characteristics, and appearances to simulate physical presence.*[13]

By implication there are two fundamentally different visions of a semantic web. One aims at understanding the meanings of human history: a second seeks to use natural language and common sense to offer a single language for robots with no reference to cultural diversity and the complexities of history. This paper is concerned with ensuring the continuation of the first vision. It acknowledges that aspects of the second vision may be useful for applied science, technology and the military, but claims that this second vision is misguided if applied to the arts and culture.

3. Promises and Limitations of Globalization

Meanwhile, historically, there have been other, more subtle trends working against multilingualism. Ever since the scientific revolution in the Renaissance, there has been a gradual tendency towards international standards. This movement gained enormous ground in the nineteenth and twentieth centuries with the rise of many international organizations such as the International Standards Organization (ISO), International

Telecommunications Union (ITU), and the United Nations Educational Scientific and Cultural Organization (UNESCO). Underlying these bodies was a vision that one needed to reach agreement on terms in order to make progress. Local and regional agreement was the first step, national agreement was one step further and international agreement on a term or concept was the ultimate goal.

In the realms of science and technology international agreement is essential. Science is concerned with universally valid laws/rules. Hence we need globally accepted definitions of zinc, chemical formulae and the like if we are to have an international scientific community. This is also the case in medicine. Our definition of a heart needs to be the same if surgeons are to operate successfully around the world. This quest also relates to Tim Berners Lee's assumption that meaning is closely linked with logic and thus with things which can be proven. Hence his notion of a semantic web strives for information/ knowledge that is universally true and the same everywhere.

In the realms of the arts and culture, however, the situation is different for three fundamental reasons. First, the cultural sector has a historical dimension, which is central to its existence. In the case of science, the focus is on the laws/rules that apply now.[14] In culture, the arts and the humanities, the historical commentaries on great authors such as Homer and Shakespeare or on great artists such as Leonardo and Rembrandt are not just of passing interest. They are central to the field, for the depth of culture lies precisely in the cumulative effect of these historical commentaries over the ages. Indeed, these commentaries over time give cultural objects such as the text of Shakespeare's *Hamlet* their full importance. Hence, whereas science deals with laws, rules and formulae, which function as if they were a-temporal, cultural objects entail an essential temporal dimension. In science, a database of current formulae and definitions may be sufficient. In the realm of culture we need databases which include historical definitions (etymologies) and make visible the cumulative dimension of cultural objects.

Related to this is a second difference. The goal of science is to arrive at truths or at least working hypotheses, concerning which there is global acceptance. The greater the acceptance the more scientific a claim becomes. In the cultural sector, global agreement is extremely rare as in the case of UNESCO World Heritage sites (although even here there is disagreement). Indeed, the richness of the cultural sector lies precisely in the amount of disagreement, in the diversity of interpretations concerning the same object. Hence, whereas science needs databases to record those "facts" on which there is global agreement, culture requires databases to record all the disagreements concerning a given cultural object.

Hence the semantic web as it is emerging reflects admirably the needs of modern science and technology. But it does not yet answer the more complex needs of the cultural sector. Some might argue that this is not essential but merely a luxury. In a world where narrow identities of fundamentalist sects are threatening the very fabric of society, the need for identities with dimensions of tolerance may become our only hope for long-term survival as a civilization. Meanwhile, economists who wish to insist only on financial dimensions need reminding that culture is intimately connected with tourism, which is the most

important source of income in all the G7 countries and many other countries of the world. In addition to being fundamental to our sense of identity, it is thus also one of our most important sources of economic gain.

4. A New Synthesis of Local, Regional, National and Global

There is a third reason why culture is different from science and technology. Science is concerned only with the globally accepted laws/rules. Cultural objects/ products have local, regional and national variants. To take a prosaic example: beer has certain international standards, which are necessary to assure that the brew is safe and not poisonous. But ultimately what makes beer interesting is that German beer is different from Dutch or Danish beer. Even within a region and locally there are many variants. To take a more exalted example: paintings of the *Annunciation* are culturally rich precisely because there are so many national, regional and local variants. Hence a semantic web which aims to create databases with only a single definition of beer or of an *Annunciation* is not useful. In the case of cultural products/objects we need databases to indicate information/knowledge at the global, international, national, regional and local levels. And in an increasingly networked world we need ever more links between these levels.

Given the global nature of science, it is ultimately sufficient that there is only a single term for a given law, principle, rule or concept in a single language. Neither nuclear physics nor radio astronomy precludes multilingualism, but one could argue that multiple languages only risk adding further confusion to an already complex subject. By contrast, in the cultural sector local, regional and national variants are essential to the richness of cultural expression and depend fundamentally on different languages and dialects. Thus a semantic web, which includes cultural, spatial (local, regional, national, global), historical and interpretative dimensions, is one of the essential challenges facing us in the near future.

Since the rise of the nation state there has been a tendency to compartmentalize knowledge. Local knowledge was stored locally, regional knowledge at the provincial or state level and national knowledge in the capitals of countries. International knowledge was stored in a few global libraries such as the Vatican and the Herzog August Bibliothek and more recently in collections such as the British Library, the Bibliothèque Nationale de la France (BNF) and the Library of Congress.

The advent of new technologies and the Internet led in a first instance to a networking of the great international libraries and research institutions such as the Research Libraries Information Network (RLIN) and through projects such as the Gateway to European National Libraries (GABRIEL). Such networks provide access to tens of millions and potentially hundreds of millions of titles. Through the Gallica project (BNF, Paris) the full contents of such titles are also becoming available.

Meanwhile, our search engines often implicitly assume that everything on the web is equally valid. Alternatively they perpetuate nineteenth-century, positivist assumptions about terms: i.e. that, implicitly, when we search for a word a single definition is entailed.

The quest to achieve interoperability of content further strengthens this trend. There is an assumption that unless there is complete equivalence between the meanings of fields, there can be no interoperability. Paradoxically, however, if there is a complete equivalence in fields there is nothing gained in bridging meanings at different levels. Complete interoperability in this sense would lead to precisely the McWorld effect against which Barber warned.

Needed, therefore, is a more subtle approach. As users, we need more than just the internationally agreed upon usage of a term. We need access to national, regional and local versions, with an indication at each stage about the level of agreement that exists concerning a term in a given language or dialect. Hence, when we search for heart, the system needs to provide us with terminology and a definition which have been agreed upon internationally and which at the same time indicate national, regional and local variants. If the local interests us, there may be cases where a local term is: a) defined in a local dictionary or dialect phrasebook; b) where it is available in a recorded corpus and not yet formally defined; or c) where it is used locally and not yet even systematically recorded. Until we have a framework that allows such distinctions, we cannot achieve full syntactic and semantic interoperability. Hence a challenge lies in a new synthesis of knowledge at local, regional, national and international levels, complete with new methods for reflecting these levels within our search engines and devices for navigating through networked knowledge.

5. Beyond Eurocentrism

Most of our conceptions of art history and culture are distressingly Eurocentric. Janson's standard textbook on art history focuses almost exclusively on Europe, pays only lip service to the great cultures of India, China and Japan, and mentions only in passing the contributions of Africa, North and South America or Australia. Even an important figure such as Marshall McLuhan treated the history of printing only from Gutenberg's viewpoint in the 1440s and 1450s and discussed neither the Korean invention of moveable print around 805 AD nor Chinese developments in the Middle Ages.[15]

We have wonderful theories about the importance of the Greek alphabet and the origins of Western literacy, but we have very little on the paradox that the alphabet introduced a literacy divide: i.e. great advantages for the few who can read, great disadvantages for the many who cannot. We focus on Western literacy and have little on the history of literacy in the Indian, Chinese or Arab worlds. Even in the case of the West, we over emphasize the importance of literate cultures and underestimate the role of pre-literate societies. As McLuhan noted, in a world where printed books were our chief means of communication, this was probably not a coincidence.

The advent of networked computers introduces new possibilities for bridging the literacy divide because computers potentially deal with all five senses. While they began as glorified typewriters (using sight), they soon became the equivalents of record players and radios (sound) and are gradually extending to include force feedback (touch), smell (e.g.Digiscent) and even taste (e.g. Trisenx). According to the BBC, "advances in haptics

could allow blind people to feel objects, or allow visitors to a museum website to feel the shape and texture of an ancient object."[16]

A distinguishing feature of the new digital medium is that all of these sensory imputs potentially become interchangeable. In other words, once something spoken (sound, cf. software such as Via Voice) is digital, it can be transformed into handwriting or print (sight) or into any other sense such as Braille (touch). This means that written texts can be made available to the blind. It also means that illiterate persons can theoretically offer their knowledge in spoken form; it can be recorded digitally and then made available in written or print form. Conversely the knowledge of memory institutions, once it exists in digital form, can be transformed to oral (spoken) form, such that even an illiterate person can gain access to the collective memory of civilization.

In the past, the potentials of computers to bridge the literacy divide were hindered by economic barriers, which precluded a majority of the world from having access to technology and created a digital divide. This is changing. India is producing a Simple Computer (Simputer) without US parts, which costs under $200. The simputer is explicitly concerned with reaching illiterate persons.[17] In the United States there are now laptop computers, which cost $292.[18] John Gage (a chief Scientist at Sun) predicts that such computers will cost as little as $10 and sell for $25 within the next five years.

In the past five years Worldspace has been developing a new vision, which links satellites over Asia, Africa and South America to reach 4 billion persons in the developing world by radio. If this vision is expanded to link the satellites with a small computer that can also function as a radio, then the lack of infrastructure of the third world need not exclude it from these developments. In short, the economic barriers are disappearing and the only real barriers are the horizons of our own visions. If we expand these properly, then the wonders of the technological revolution can extend to include all persons and traditions rather than a small privileged minority.

6. Augmented Culture

In the 1990s there was great excitement about the potentials of virtual reality in creating virtual and imaginary museums and reconstructing archaeological sites. The past decade has seen the development of thousands of reconstructions of museums, cultural monuments, archaeological sites and, in some cases, entire cities. These now represent a whole new domain of study. Such reconstructions are being used to compare hypotheses concerning the original buildings. They are also being used to simulate economic processes such as the operation of textile mills in seventeenth-century Bologna, or to simulate social processes and aspects of everyday life in ancient Pompeii.

Meanwhile, the last five years have seen the rapid evolution of augmented or mixed reality, whereby one can superimpose virtual reality reconstructions onto images of the physical world. For instance, Archeoguide,[19] a project of the European Commission, is doing this for the ruins of the ancient Greek Temple of Hera (Olympia). Using a head-mounted display, a tourist visiting the ruin will be able to superimpose on the physical

landscape a reconstruction of the original temple. In the future, this principle can be extended to include alternative interpretations and reconstructions of the same temple. Ericcson has a slightly different approach. Instead of a head-mounted display, it is using special glasses which will project onto a physical scene both reconstructions and descriptive information of the old town of Stockholm. Such techniques promise to change the nature of tourism. Online versions of such technology could transform education and learning.

Implicit in the idea of augmented reality are new possibilities for augmented culture. Building on the ideas of Steve Feiner (Columbia University), IBM has shown how a small eyepiece can be used to project onto the night sky the Greco-Roman constellations of the stars, such that one can see precisely which stars in the night sky make up the Great Bear (*Ursus Maior*), Cassiopeia and other constellations. One could extend this same technique in order to project onto the same sky the constellations as seen in other cultures: Persia, India, China, the Inuit and the Aborigines. Augmented culture in this sense thus becomes a means of literally seeing the world through the eyes of different cultures.

This principle applies equally to cultural objects such as a sculpture of the Buddha. Here augmented culture can entail seeing the same statue through the eyes of Mahayana, Hinayana and Vajracana Buddhism, and learning to see the different symbolism attributed to the same object according to different schools. Augmented culture can also help to visualize historical developments. In the case of a Buddhist statue, it can show the interplay between Indian traditions, Hellenistic sculpture brought to Gandhara by Alexander the Great and the influence of Nepali, Tibetan, Chinese, Japanese and other traditions. In the case of temples and churches, it can trace their growth and changes over the centuries. For instance, in the case of a particular temple in Syracuse it can help a visitor to visualize how a Greek temple became a Christian church in the course of the centuries.

Augmented culture has obvious applications for tourism in that it can enrich the experience of visitors. This is all the more vital in an era of global tourism, where no person can be expected to have mastered all the religions, languages, literatures and cultural traditions around the world.

If augmented culture is made available online in a networked world, it could transform the realms of education and learning. Augmented culture offers a framework for the cumulative nature of cultural discourse, whereby the alternative and often conflicting interpretations become visible; whereby one can see the differences between American, English, French, German and Italian archaeologists and historians concerning the same monument or site in Rome, Athens or elsewhere. Augmented culture[20] introduces the possibility of a much-needed comparative study of cultures, which is essential if we are to bring to our children new dimensions of tolerance for the otherness with which an increasingly global economy confronts them.

7. Need for a Cultural Grid and a Network Centres of Excellence

From the beginnings of the Internet (1969) and throughout the 1980s there was a vision of networks of supercomputers in the sciences. In the mid-1990s, this expanded into a vision of a grid, whereby supercomputers were linked with regular desktops in a seamless, worldwide grid.[21] Initially it was assumed that this applied only to the sciences, because it was thought that the arts and cultural sector would not entail large amounts of data. The enormous rise of scanned images (ranging form 30 megabytes in America to three gigabytes per image in Japan) and reconstructions of monuments, sites and cities (ranging in size from ten megabytes to three terabytes) has introduced the need for a cultural grid. Without such a grid it will not be possible to have access to developments in the past decade, which in turn is necessary if we are to prepare students for the extraordinary developments that will occur in the next decades.

Much more than simple access is needed, however. This enormous new corpus of digital culture brings with it many new problems of method. A generation ago Marshall McLuhan drew attention to the ways in which the introduction of printing in the West imposed a static and linear form on knowledge organization. The introduction of digital media, entailing interchangeability between different production methods (e.g. voice, writing, print), different modalities and potentially all the senses, means that the organization of knowledge can now be dynamic. Aside from a few centers, which are exploring the potentials of hypertext and hypermedia, there is as yet no systematic study of precisely how we should produce, use, maintain and add to knowledge in dynamic form.

A decade ago there was much discussion concerning the need for interoperability such that a Macintosh Operating System and an IBM or a Windows Operating System could exchange data without problems. In the past years attention has turned increasingly to the need for interoperability of content. This includes a whole series of methodological problems: new methods in treating historical texts; access; reference using digital reference rooms; problems of conservation; criteria for reconstruction; standards for terminology and meta-data.

In addition to these problems of method, the new media are introducing a series of further challenges: how to identify criteria for quality in this emerging field; how to develop European multimedia education that will allow students to study at a series of universities to arrive at a new kind of European Masters and European Doctorate. We need new research examining the philosophical, epistemological, knowledge organizational, art theoretical, sociological, legal, political, ethical/religious, technological and economic consequences. Needed are new reflections, which can contribute to future policy development in this new domain. Needed also is a new sharing and dissemination of digital cultural content not just in Europe but worldwide.

These problems are much too complex to be solved by single scholars working in isolation. The past years have seen an enormous rise in networks linking memory

institutions (in museums, libraries, archives): e.g. the sites of the International Federation of Library Associations (IFLA), the International Council of Museums (ICOM), the International Council of Archives (ICA), the UNESCO Culture and E-Learning portal and specific efforts such as the European Network for Conservation/Restoration Education (ENCORE); the Northern European Historical Research Network (NEHRN)[22]; the Virtual Heritage Network[23], and the Visual Arts Network for the Exchange of Cultural Knowledge (VAN EYCK).[24] We need new broadband networks of centers of excellence which will link practitioners in such existing networks with researchers at universities, and research institutes. This fits into Philippe Busquin's vision of a European Research Area (ERA), which needs to be seen as a first step towards an international network of centers of excellence linking up with efforts such as the Japanese Digital Silk Roads Project within a global grid for culture.

8. Conclusions

At the outset, scenarios against multilingualism were examined: some naïve, some premeditated from certain factions of the American military. From an historical viewpoint an over-optimism concerning the potentials of international agreement with respect to knowledge and linguistics in particular was noted.

This paper explores possibilities introduced by new media in meeting these challenges. It is claimed that the international approach as it evolved in the nineteenth century is particularly useful in the fields of science and technology but does not apply in the same ways in the realms of the arts and culture. Science is about global agreement concerning laws/rules/principles which are assumed to be unchanging. By contrast, culture is about a cumulative and ever-changing set of values, expressed in different languages and dialects. We suggest that a new synthesis of local, regional, national and global knowledge is required to avoid the false dichotomies outlined by thinkers such as Barber and Ritzer. The new technologies introduce a new interchangeability between modes of expression (oral, written, printed), and among all the five senses (sight, hearing, touch, taste and smell). This introduces possibilities of overcoming the literacy divide introduced at the time of the alphabet.

At the same time the new media, which permit global networks, introduce many new challenges. We need models of culture that go beyond Eurocentrism. We need to use new methods of augmented reality which allow us to see literally differences in symbolism, style, meaning, and interpretation, such that we can understand approaches nationally, regionally and locally. The existing networks need to be complemented by broadband networks of centers of excellence which allow practitioners in memory institutions and theorists at universities and research institutes to address the myriad new problems of method introduced by digital culture made available through new media. Ultimately we need a new global, cultural grid. Science has discovered that the quest for standards must not undermine our bio-diversity. Such networked centers in a cultural grid can use the new technologies to ensure a corresponding linguistic and cultural diversity.

Notes

[1] Benjamin R. Barber, *Jihad vs. McWorld*, New York: Times Books, 1995.

[2] George Ritzer, *The McDonaldization of Society, New Century Edition: An Investigation into the Changing Character of Contemporary Social Lif*e, Thousand Oaks, Ca.: Pine Forge Press, 2000.

[3] See: http://www.glreach.com/globstats/index.php3

[4] Grant Fjermedal, *The Tomorrow Makers, A Brave New World of Living Brain Machines*, Redmond: Tempus Books, 1986, p. 188.

[5] Ibid., p. 141

[6] Ibid., p. 144. Asked what would make persons take this step the answer was fear caused by "small nuclear wars popping off here and there- like between India and Pakistan, or between Israel and the Arabs." In the post September 11 2001 world these claims of 1986 seem frighteningly prescient.

[7] Ibid., p. 121

[8] Ibid., p. 143.

[9] Ibid., p. 138.

10 Ibid., p. 139. For the views of Ray Kurzweil see his website KurzweilAI.net: http://www.kurzweilai.net/meme/frame.html?main=/articles/art0134.html. The physicist, Stephen Hawking's position is that humans need implants if they are to keep up. See: "Smart machines a peril, physicist warns humans," Deseretnews.com, Sunday 2 September, 2001.

See: http://deseretnews.com/dn/view/0,1249,300006902,00.html.

One cannot but wonder whether there are connections between this post-human scenario and a) the rumored Blue Beam project. Project Blue Beam (Excerpts of World Freedom Information Network, Evolve 2 Magazin)

See: http://www.wfin.com

See: http://members.aol.com/phmikas/infos/blue_.htm and b) NASA's recent attempts to create an interplanetary Internet.

[11] Jerry R. Hobbs, Robert C. Moore, *Formal Theories of the Commonsense World*, Norwood, NJ: Ablex Publishers, 1985 (Ablex Series in Artificial Intelligence, Vol 1).

[12] "Battle of the Brains", *Wired*, November 2001, p.

[13] *Visionary Manufacturing Challenges for 2020*, ed. Committee on Visionary Manufacturing Challenges, Board on Manufacturing and Engineering Design; Commission on Engineering and Technical Systems; National Research Council Washington: National Academy Press, 1998.

See: http://bob.nap.edu/readingroom/books/visionary/ch2.html#gc3

[14] To be sure there are historians of science who remind us that the history of the subject is useful in understanding how we got to where we are today, but this is seen more as a luxury than as an essential prerequisite for the advancement of science.

[15] For a standard treatment of the history of printing see Michaael Giesecke, *Der Buchdruck in der frühen Neuzeit. Eine historische Fallstudie über die Durchsetzung neuer Informations- und Kommunicationstechnologien*, Frankfurt: Suhrkamp, 1991.

[16]"Promise ofTouch Technologies," *BBC News*, 14 November 2001.

See:http://news.bbc.co.uk/hi/english/sci/tech/newsid_1646000/1646909.stm

[17] See: http://www.simputer.org/

[18] For a description of the Compaq LTE 5280 Laptop Computer
See: http://www.wekum2u.com/compaq/compaq.html.
[19] See: http://archeoguide.intranet.gr/project.htm
[20] These ideas are further developed in the author's *Augmented Knowledge and Culture*, Munich: Fink Verlag, 2003.
[21] Ian Foster, Carl Kesselman, eds., *The Grid: Blueprint for a New Computing Infrastructure*, San Francisco: Morgan Kaufmann Publishers, 1999.
[22] See: http://nehrn.hum.sdu.dk/
[23] Virtual Heritage Network,
See: www.virtualheritage.net
[24] Visual Arts Network for the Exchange of Cultural Knowledge (Van Eyck) State of affairs,
See: http://www.rkd.nl/prjcts/Eyck-e.htm

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