ITs Applications in the Culture Domain: Context, Vision and Models[*]

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1. Introduction

In many acceptances (researchers', political men's, entrepreneurs') Global Information Society (GIS) is characterised by an important cultural dimension. This cultural dimension is the new element which makes the distinction between the information society and the industrial society, and is meant to serve the citizen (by spiritually "enriching" him) and the enterprise (by simultaneously enabling its entering competition and co-operation within a globalised economy) as well as human communities in various countries and regions (of which interdependence at various levels gets larger).

One main component of Romania's strategy on joining the European Union , and broadly speaking, the civilised world, is given by the "Multilinguage" Program. The European Union and the most developed countries are themselves with no fatigue and quickly making out for the Global Information Society. A push-up is given by technological advances , by large public awareness, and not last, by the Government's actions for moulding and matching progress.

In this context, the paper shows the author's taking pains in the last two years for understanding the insinuation of IT in cultures and the technological and economic repercussions of such a process. Ideas expressed before (Filip, 1995) are now refined. The paper is organized as follows. The next chapter is a review of the evolutions witnessed internationally, which we try to align to, and of some local ways of action, accordingly. There follows a description of the directions taken in libraries' digitisation which might be beyond the current perception as to computer's part in such cultural premises. Chapter to come takes a general perspective (which, we think, is a good one for several types of institutions treasuring cultural goods) of the target, grounds and influences of the transition to global and virtual computer based cultural systems, and refers some pilot projects.

Some final remarks on the necessity and urgency for a systematic and realistic approach to the computerisation of the national cultural patrimony inventory, conclude a paper which intends to be rather informative than normative.

2. The Context

2.1 The International Context

Setting up Global Information Society is a heavily bearing process , derived, in its turn, from the world's economic and social transformations (Filip, 1996). Goods and services production could be characterised by globalisation, demassification and dematerialisation (knowledge based ideas of economies). High penetration of the data transmission and distribution systems brought about significant

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political and social changes. Some (Pinto-Balsamao, 1995) speak of the erosion of the main categories of hierarchically structured human organisations (state, church, trade unions) and blame the "Internet- isation"of mankind, thereby people and organisations keep always in touch, no matter time, place or social group, for it.

Computer networks are by now so complete systems that the threat of somebody's control over them (be it a group of persons, an organisation or a state) is practically null. Though, an altogether spontaneous and anarchical evolution of computer networks (more exactly in their coverage and exploitation) does not best serve mankind either. So, initiatives and steps have been taken in humans' behalf as to globally promote Information Technologies and Communications (IT & C) advances.

In this paper's view, Projects No. 3, No.4 and No.5 out of the 11 Projects package selected by the Brussels '95 G7 Conference, are crucial. They address "intercultural training and education, "digital libraries", "electronic museums and art galleries".

If associated with Romania's concern for a fast and beneficial integration into the civilised world, the three above-mentioned projects stand not only for a pragmatic solution (well-defined prerequisites, objectives and their approach, as well as the pace they are subject to), but also for the " conditions" to meet if a smooth and consistent integration is ever made for. We will further make a comparative analysis of the main characteristics of the three projects.

2.1.1 Intercultural Education and Training in A Global Information Society (Project No.3)

Prerequisites of this project are to be mainly found in the economic life: a) qualified education and training for all citizens is mandatory for economic and social development, and b) global information society ("global village") together with global market asks for large co-operation plus better knowledge of each other,and, eventually, for an ad hoc interacting of people living everywhere and belonging to any society or

community. One handicap in people profitably interacting with one another could be their weak proficiency of foreign languages and poor specific information about different societies and states, which, it is assumed (and desired) , will long preserve their particularities.

The objective of this project is therefore to help people master a foreign language and comprehend the cultural and societal aspects defining another state or nation, by interactive learning based on global computer networks.

Practically, this project covers, as the other projects do, the years 1995-1997, and consists of two distinguished but interacting sub-projects. The "Intercultural Education " sub-project addresses students of large scope subject-matters (trade, politics, tourism) and concerns language and civilisation problems.

The "Intercultural Training" sub-project mainly addresses the people working in business organisations (especially SMEs which cope with serious difficulties in getting integrated into globalised economies), and consists, beside language knowledge, of specific aspects (dictionary, acronyms, legislation, etc.) of a branch.

Embarking upon the project means first of all to standardise modalities and format the exchanged information. It will be stored on (homepage server like) interconnected computers with a view at generating virtual and modular " electronic manuals", together with interactive services for remote supply, exchange and updating of information.

2.1.2 Digital Libraries (Project No.4)

The setting of the project is the following: a) libraries are for the time being the main repositories of the (cultural, technical, etc.) knowledge which mankind has acquired for years, and b) multilingualism and various national identities specific to libraries' treasure have been and will always be an undeniable reality.

Under such circumstances, the objective of the project is to allow that large unified virtual collections are gathered , starting from a geographical distribution of the libraries' physical

contents, and to enable free remote access through multimedia (text, graphics, voice, still images, video), with the conservation of rare collections and perisable collections guaranteed.

The approach to the project and the means to do it include: a) digitisation of resources (bibliographical records and contents) b) internetworking of catalogues and larger and more rational public access to libraries' services. It is intended that the project first covers national libraries (sorting out information on each separate country). This will be open even to countries not belonging to G7.

The project impact will be many-sided: a) promotion (through knowledge and valuation) of the national cultural treasure which libraries have a hold of, b) problem-solving as to authentication and protection of intellectual property, and c) new suppliers for the "information industry" (for instance by producing "electronic publications" on CD and on " network servers"). Thus, new jobs are expected.

2.1.3 Multimedia Extended Access To World Cultural Heritage in Museums and Art Galleries (Project No.5)

One expects that Information Society (based on knowledge and free data exchange) "will be more humane than that intensively based on capital" (Bavec , 1995). In this respect, culture will be of more effect in human progress, say by large and free access (irrespective of geographical place, time and available material resources) to cultural goods, at once with the preservation of cultural identity and diversity and with the protection of the cultural wealth of each country.

The objectives of Project No.5 are to virtually create quasi- global collections via networks and to access them via multimedia. Public interest in collections will thus be stirred to a higher degree, and museums will exploit their treasure for preserving and enriching it. They turn to be genuine "documentation centres" for culture promotion.

Embarking upon this project means, as with libraries, to digitise collections via multimedia, to gradually generate huge multimedia databases,

out of which segu... ...ill be ...ndo.ed through www.acce...le... in networks. All this will be achieved by generally agreed access and exchange standards.

The predicted impact of the project reads as follows: to diversify and extend the market of multimedia cultural products and services, to invent occupations and ensure employment, and to obtain additional funding for the (always running short of funds) public museums.

2.2 National Scenes

The crossroads intervened last Summer ('95 Summer) when the objective of an intensively information-cultural society was set out as a key (largely grasped and spoken of) element in the process of Romania's joining the European Union. Such an objective , of which attainment is feverishly wished for by the Romanian society, is being consistent with the international movements, and , even more, admitted, at least publicly, by almost all the parties and leading factors of Romania, which is quite a remarkable deed, and proves the awareness of this chance. The opportunity should not be missed on account of poor understanding, slow action or inertia.

The Multilinguage" Programme covering the Romanian language, literature and history, two foreign languages, programming languages and arts' language, is the (guessed or even determined) effect of the world evolution , and to the same extent, of some previous or present opinions of individuals, groups or institutions in Romania on experimenting and acting. It would make bulky and boring if we cited here main ideas, plans, facts and achievements, an operation which , even within the limits of the author's knowledge, will have lapsi, some of them unforgivable. However, some other time it would be worthy to mention them. This pàper does not do this because of its technical and prospective orientation.

3. Information Technologies and Libraries of the Future

3.1 Computer in Library

On giving the definition of the "library of the year 2000" , Saltzer (1992) puts forward some characteristics. The fund of physical objects (books, manuscripts, staves, maps, etc.) should at once be "selective" (not everything written is published , and not everything published is collected in libraries), "persistent" (meant to be preserved/archived for years on end), and "shared" with a public segment (nonrestrictive or entering various categories of which admission depends on the library profile). Librarians, in their turn, should not only collect, maintain and manage the library fund, but also guide readers , which delimitates them from collectors.

With public libraries, "logical collections" (including information on objects and some catalogs, indexes, etc.) are actually larger than the "physical collections" of objects. This became a reality due to the library's shared organisation, to economic grounds and to limited storing capacity. Recent upsurge of the communications has made this reality even more obvious.

Lately, libraries have become more specialised. Some of them are preoccupied with gathering physical objects, while some others focus on getting collections of data about objects and on providing information and services (Saltzer, 1992).

Looking on the use of computer in libraries in the last decades reveals, according to Saltzer (1992), three directions. First there is the "automation" of the traditional functions (procurement, catalogs' editing, loans and exchange management). Second, there is the "identification" of relevant documents ranging from simple searching based on the classical information retrieval methods (for instance, by mentioning all the works of author X which the library holds) to AI based searching, not very successful so far (for instance, finding all the works which refer an idea introduced by work Y). Third, there is storing a contents and "navigating" from the text to the references quoted.

3.2 A Vision

Some years ago, in 1992, Saltzer's outlook on the "library of the year 2000" was clearly and simply expressed.

Anyone may , if connected via a PC or a workstation to a network, browse any of the books, magazines, manuscripts, staves, technical reports which are stored on-line, staying at home.

On reading the document through, a window on the screen may render the text of the quoted reference, with the library represented as a huge hypertext system.

The objective pursued is not to replace books, but to enable their browsing before loan, their safeguarding and their parallel accessing (several readers accessing the same inventory item) or multiple access (one reader accessing several libraries).

The solution of the 1992 technical problems (upgrading the terminals' screen resolution, getting the transmission speed in the network as high as millions of characters per second, developing hypertext like databases, "client-server" architectures, and larger capacity external magnetic memory), which could have kept such a view far from reality, has partly been found.

With respect to a previous assertion on the library specialisation, we could refine and extend the above point of view. So, we can imagine libraries which are "merely electronic" not just "computerised", specialising in and aiming at library services for a well-defined geographical area (given the necessity for cutting down the data transmission costs), able of collecting data about physical objects and the "digitised thesaurus".

The "electronic" libraries can offer, on charge, on-line documentation services at their location or, remote documentation services, following orders placed in advance (on account of solving the access concurrency problems and the problems related with the data bulk to be stored on-line). In the latter case, the resemblance to the modern VOD (video on demand) systems is not out of the blue, but based on the technological developments in the bandwidth networks and the "client-server" like architectures. Such developments are enabled by the new working conditions, say "teleworking"

(Britton, 1994) with respect to "access", and by the new ways of producing , quickly and cheaply, electronic journals and proceedings. They allow for a "quasi real-time" dissemination of (scientific) information as it is produced. Such a view will get refined in Chapter 3 of this article , within a more general context.

3.3 Examples

There are several projects which address the use of computer in libraries and archives. The most representative and spectacular one of all these projects seems to be the European ESPRIT VENIVA (VENice Virtual Archive) (de Michelis, 1996). It aims at letting Venetian archives , located as they are in different parts of Europe: Venice (90 km of bookshelves), Vienna, Corfu and Crete representing one virtual collection of manuscripts, books, drawings and maps, be accessed. Methods from IT (geographically distributed databases, hypermedia interfaces, hypertext databases, information retrieval systems) and www Internet services, through "exporting" x-Mosaic subproducts, are used.

To conclude this chapter and to make the endeavours to computerising a library and to transposing its repository in a digital form, better understood, please note some figures. At present, a book of about 400 pages, with only text, and monochrome printed, will take about 3oMbytes after scanning and data congestion. To put it differently, about 20 such books may be "deposited" on a CD-ROM (650 Mb), and about 30 books on a (currently used) PC disk of 1 GB. Cost reference is also attractive: at the now prices, an electronic copying of a book on a CD-ROM will cost about 40 cents, the storage space will be extremely small, search and access will be simpler and safer. The time needed for getting an electronic copy of a book, even though infinitely smaller than that taken by printing a book (of course under modern conditions), seems to become a lot (of years) when electronic copies of entire collections and libraries are wished for, supposing that fast Photo CD like technologies are involved (which cost tens of thousands of dollars). Let us take an example: along 25 years

the Research Institute for Informatics library got 30,000 entries of the literature in the field. If an electronic version will be intended , we will need more than 1000 magnetic disks or 1500 CD. This time the costs and time of an electronic transposing will be acceptable. But if we refer the Library of the Romanian Academy and plan to digitise out of its 10 mil items (books, newspapers, manuscripts, medals), only 1.6 mil books, the need for about 80,000 CD or 50,000 PC disks for storing the information estimated to 50 Terrabytes (10^{11}), will easily be realised. Everyone can see that this is a difficult and long lasting activity. As it is, such a task should be assumed and fulfilled. We should always remember that Library of Congress in Washington has 90 mil entries making up 2.7 PB (10^{14}).

4. Towards Global and Virtual Cultural Systems

Most of the elements discussed in relation with libraries' digitisation (prerequisites, type of approach, problem- solving) can be invoked when discussing about the national wealth institutions (museums, historical monuments and sites). We will further insist on the possibility of going from the present way of exploitation of the physical objects cultural patrimony and of the information (including reference information) about the objects possessed by the cultural institutions (CI) (Figure 1) to the way of exploitation made possible by technological developments (Figure 2). The two Figures are suggestive enough to let us analyse now some other problems of which occurrence deserves analysis . We speak about the apparent intrusion of technology and of business interests. in the realm of noble and generous activities of the cultural institutions.

4.1 Why? (or what the real library/ museum is not apt for)

In order to touch/ access real objects , the visitor/reader should be "some place" at hours and on days when the entrance is permitted, which at least with the casual visitor/reader is restrictive.
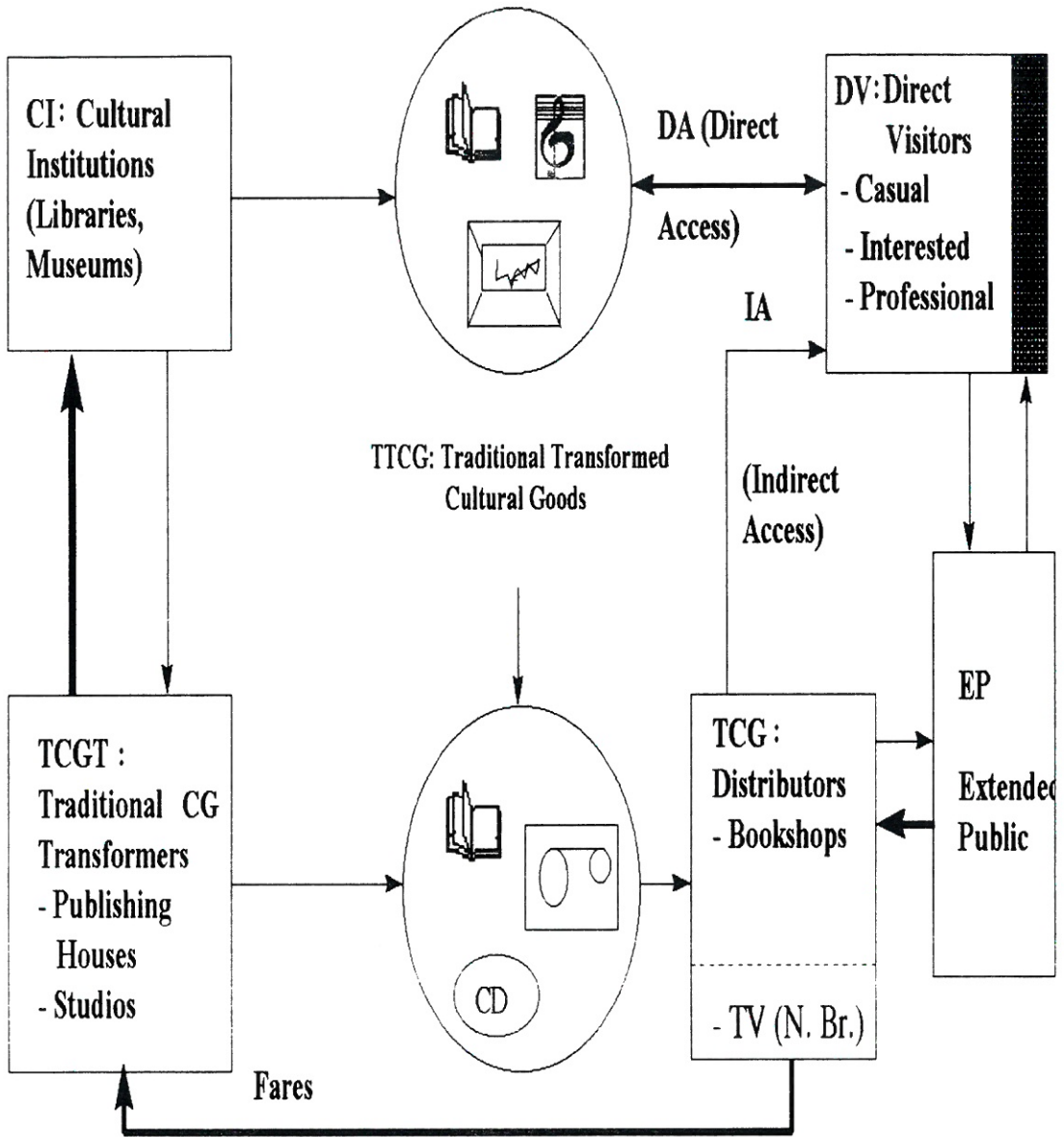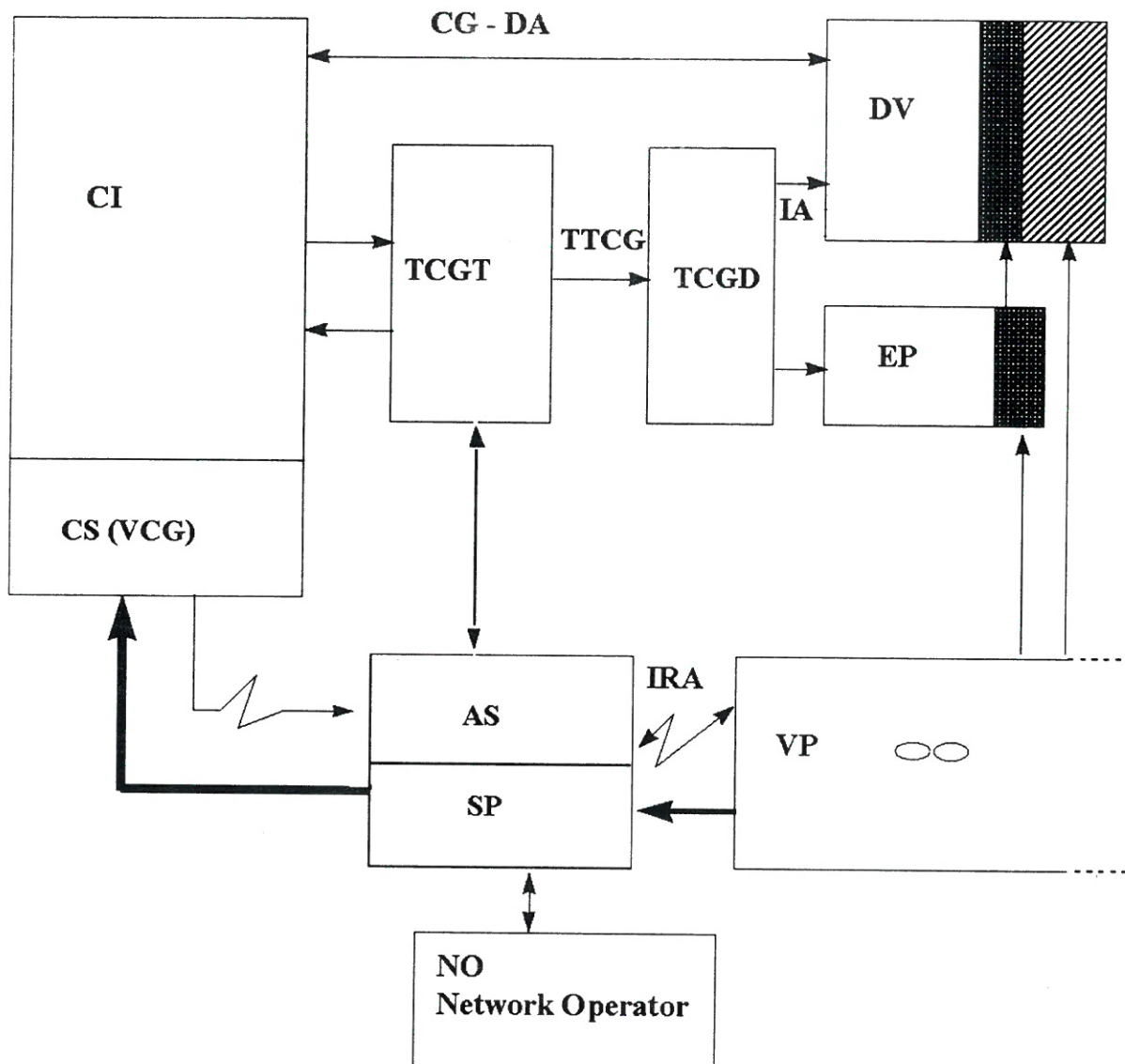
CG - Cultural Goods

Figure 1. Current State

Figure 2. A Vision

Legend:

VCG : Virtual Cultural Goods;
IRA : Interactive Remote Access (incl. WWW, APPV, VOD);
CS : Content Server;
AS : Application Server, SP : Service Provider ;
VP : Virtual Public

Table I   A Comparison of Media

	Direct Access	Audience	Content / Capacity	Access Cost
Printings	Yes	Medium	Static / Low	Variable
Film (Microfilm)	Yes (No)	Low (Limited)	Unmodified / Medium	Medium
Video	No	Medium	Unmodifiable / Medium	Medium
CD (DA, ROM, I) Photo CD	No	Medium	Unmodifiable / Large	Medium –
WWW	No	Very Large	Dynamic, Updatable / Infinite	Low
VOD/ITV	No	Large	Static Quasi-interactive / Large	Low +

Besides, on various grounds, cultural institutions will not exhibit everything. A man in our days, under time pressure, will hardly spot the object he is interested in, if not personally assisted/guided. Researchers will in turn be embarassed in their studies when the objects (or parts of them) will be in various rooms, on different floors, in various buildings, institutions, towns or even countries, or sometimes long distances will separate them.

Being still far from man's "teleporting" as presented in SF pictures, we could for the time being think of the object visual teleporting which is possible via electronic access from home or from office. Unrestricted access, at any time, to cultural wealth by non-professionals, by old people, people living a secluded life or by disabled or needy people will be as large and at hand illusioning as it will be a way of democratisation, integration and non-discrimination. It is expected that remote access should not keep people away from cultural institutions. On the contrary, it should stir their interest in going to visit such cultural institutions. No doubt, previous and present means (albums, slides, videocassettes , CD) storing traditional (transformed) cultural goods (TTCG), have succeeded in attracting a segment of the extended public (EP) to visit cultural institutions. One can also assume that a segment of the virtual public (VP), which is practically numberless, thanks to the networks' penetration, will be willing to be among the direct visitors (direct public-DV). Remote access is well-distinguished from traditional means (printings, cassettes, CD). Unlike traditional means, which are somehow "frozen" for a while, i.e. any modifications ask for a new edition, the network "servers" information is dynamic and likely to be updated and continuously enriched. One will not deny the importance of the traditional means. They are physical objects themselves, making up collections and signifying that the collecter was there where such objects and some events could be or happen. Various media are compared in Table I.

4.2 What Virtual Attendance Cannot Offer

First, one cannot touch an object. Second, the object will not be seen in its natural environment (reading room or museum hall, landscape). If the clouds position when above a monument or the light tinges in a museum hall, depending on the hour of the day and the season of the year, or even the street noise from under the library's windows might be technically rendered, the old books' scent , the feeling of having an object under your own eyes and of being not alone (being there with other, directly touchable visitors) in admiring the same object, will for sure remain non-transferable or non-stirrable by computers and networks.

4.3 Some Pilot Projects

Here is the "Milennium Time Machine" project. A most ambitious project aiming at on-line definition of the collections in British museums. The project benefits from 44 mil pounds sterling from the UK national lottery (MDA, 1996).

The ARCADIA (Arts and Crafts Multimedia Encyclopaedia) project is to create modular pedagogical collections of multimedia documents. Every module will make a monograph on a certain domain (say craftsmanship, decorative arts, small jewels) telling about materials, technologies, bibliographies and host museums (Funaro, 1996).

The famous Alinari photo collection , dating as back as 1852, with its more than 1.5 mil items, has been electronically digitised and restored for getting it on CD-ROM and on-line loading it in the network via Internet, ITAPAC and ISDN (De Polo, 1996).

The European IMPACT (Information Market Policy ACTions) 2 initiative, covering 22 projects for the use of multimedia in schools, consists in some cultural achievements: folklore on multimedia , Flamish art, a multimedia dictionary of modern and contemporary art, Gothic cathedrals, a visit to the 19th century London, etc. (Hoffos, 1996).

We could go so on end, because of the new elements getting added day- by- day. But we prefer, instead, to refer a project on the development of a general-purpose technology supporting sophisticated applications and complex services. The GLASS (GLobally Accessible Service S) system, collaboratively

developed by GMD-FOKUS, IBM, DIGITAL, Grundig, Multimedia Services , is based on the MHEG (ISO/IEC JTC1/SC29/WG12 "Multimedia and Hypermedia Information Coding Expert Group") standard. GLASS as part of an action which targets the development of high performant and more general systems, serves informative and educational (cultural) purposes, transactions (teleshopping) and communications, etc.

For other European projects on R & D, see bibliography.

4.4 Preliminary Conclusions

"Digitised" (or electronic) libraries and museums are only possible through the collaboration of many specialists: a) librarians and museum custodians ("contents providers") who possess , advise on and provide cultural information and the access to cultural goods (CG); b) informaticians who digitise the cultural wealth and possibly, provide access services to the digitised cultural wealth ("service providers"), network operators and cultural goods' distributors. All those potentially engaged in developing computer based cultural systems should be highly motivated.

Specialists working in cultural institutions are highly open to such a project. They realise that new technologies are useful not only for better understanding and protecting the cultural wealth but also for attracting more direct visitors and more donations for enriching and restoring collections. New technologies can also help in the authentication of the cultural goods. One can achieve the "virtual reconstruction" of the monuments in graphical and textual descriptions (Iwainsky, 1995). Although outside the scope of this article and little known, electronic art works obtained through "virtual reality" techniques (there already exist specific software tools), are worth-mentioning.

It is likely that an important market segment starts operate, namely , the cultural products (transformed values) market. It promises employment and new occupations. The interaction with (and mutual encouragement in)

other professions looks very promising (see Figure 3). The Europe of the year 2000 will see how a "content industry" emerges and integrates IT and Communications with audiovideo, with electronic mass media, etc. (Bangemann, 1995). But we must remind of the fact that if prototypes of computerised (or electronic) cultural institutions are relatively easy- to- develop, one or two years will be enough, full systems' development takes more than this. Information Technology does exist and will never stop develop. There will come in, sooner or later, the multimedia global networks , with dual storage operation, the multimedia global communications (Popescu-Zeletin, 1996) which will do away with the "bottlenecks" now rather frequent with electronic/optical interfaces, with communication technologies, with personal computers'and workstations' design (they were meant as stand-alone equipments, not connected to a network), with the integration of data transmission, with the continuous media realm, and with the incompatibility of the now wide spread operating systems (e.g. DOS or UNIX), with real-time operation. These solvings to come will not make the cultural goods exploitation systems tributary to them. On the contrary, they will render the turning into account of the cultural patrimony more efficient and will enable different work. It is the huge cultural treasures which mankind created and accumulated that makes the development of such complete systems take so long (about 10 years).

4.5 A Mathematical Model

Figure 1 suggests a synergy between the activities of cultural institutions (CI) and the commercial business of traditional transformers of cultural values (TTCG). Let consider a basic model of a pair composed of one CI and one TTCG and the following state variables: x_1 - the accumulated number of direct visitors (DV), at the end of the month, x_2 - the number of people who buy transformed cultural products (TCG), x_3 - the income of the CI, and x_4 - the profit of the TTCG. Let also consider a control variable u_1 of production cost of TCG editions and u_2 – the external contributions. For simplification the
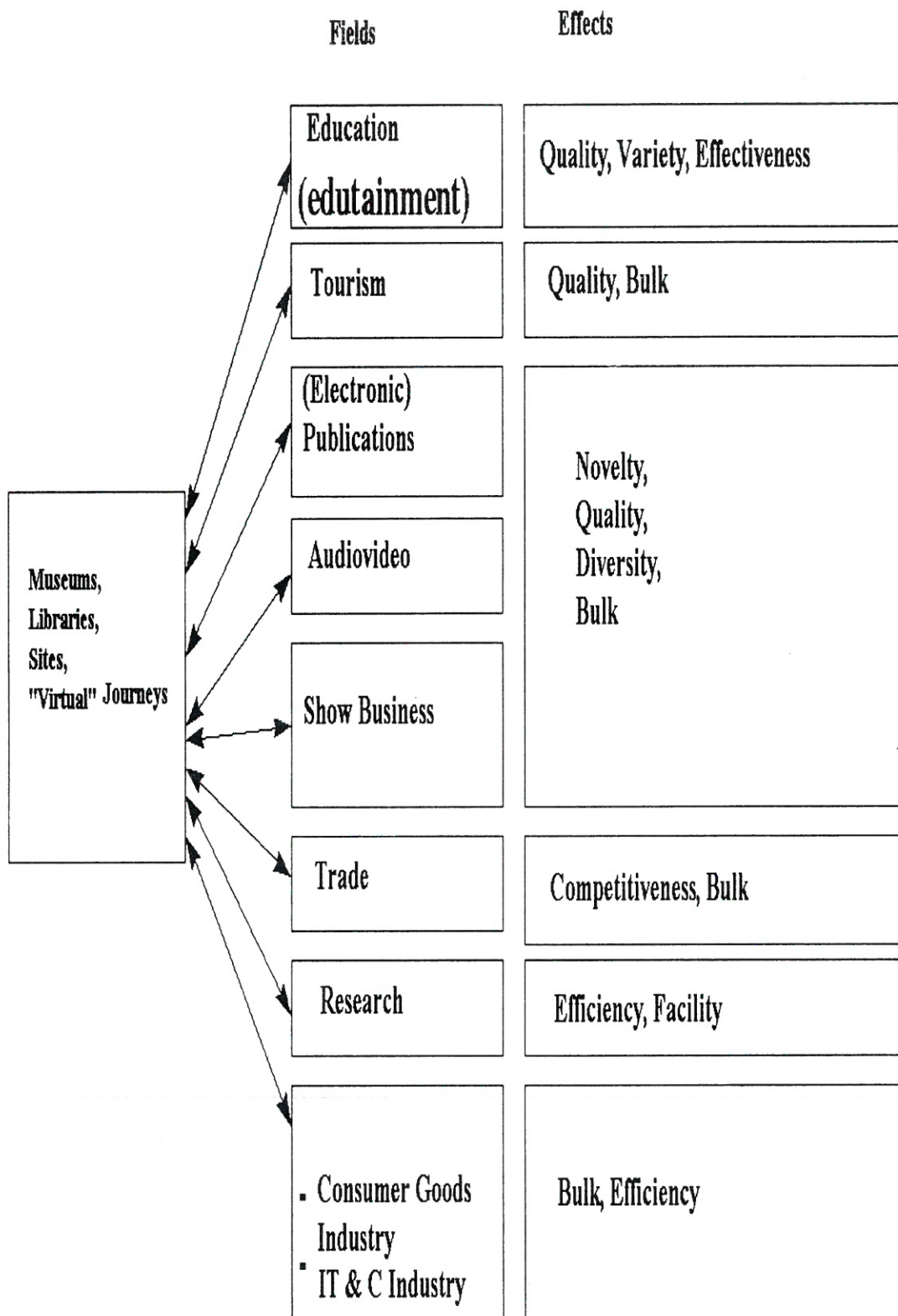
Fields   Effects

Education (edutainment)	Quality, Variety, Effectiveness
Tourism	Quality, Bulk
(Electronic) Publications	
Audiovideo	Novelty, Quality, Diversity, Bulk
Show Business	
Trade	Competitiveness, Bulk
Research	Efficiency, Facility
• Consumer Goods Industry • IT & C Industry	Bulk, Efficiency

Museums, Libraries, Sites, "Virtual" Journeys

Figure 3. Interactions

distributors of TCG are included in the TTCG which is assumed to produce only one TCG.

A very simplified discrete time, time delay, dynamic model can be set to represent the system dynamics.

$$x_1(k+1)=x_1(k)+ \sum_{\tau=1}^{\theta_{11}} a_{11}^\tau(k)x_1(k-\tau)+$$

$$+\sum_{0}^{\theta_{12}} a_{12}(k)x_2(k-\tau)+\sum_{\tau=1}^{\theta_{13}} a_{13}^\tau(k)x_3(k-\tau)+w_1(k) \quad (1)$$

$$x_2(k+1)=x_2(k)+ \sum_{\tau=0}^{\theta_{21}} a_{21}^\tau(k)x_1(k-\tau)+$$

$$+\sum_{\tau=1}^{\omega_{21}} b_{21}^\tau(k)u_1(k-\tau)+w_2(k) \quad (2)$$

$$x_3(k+1)=x_3(k)+a_{31}(k)x_1(k)+b_{31}u_1(k)+u_2(k) \quad (3)$$

$$x_4(k+1)=x_4(k)+a_{42}(k)x_2(k)-u_1(k) \quad (4)$$

where a_{11} indicates the ratio of previous visitors repeating their visit, a_{12} represents the proportion of TCG buyers stimulated (inhibited) to visit the real CI, a_{13} shows how the CI income contributes to improving CI services (possibly by organising special events, improving displaying conditions, restoration or new acquisitions), a_{12} indicates the proportion of visitors resolute in buying TCG as souvenirs, a_{31} represents the entrance fee, a_{42} is the price of the (single) TCG, b_{21} represents the influence of new editions of the TCG, b_{31} is the proportion (currently very low) of CI rights paid by the TTCG, w_1 and w_2 show the influence of other factors , say season.

Of course this model is not the only possible representation and the process of parameter calculation requires long time and serious efforts. However one can expect some relationships such as

$$a_{21}^0>>a_{22}^\tau(\tau\geq1)$$

$$b_{21}^1 >> b_{21}^2 > b_{21}^3 \dots$$

$$u_2(k) > > a_{31} x_1(k)$$

Such a model could serve to evaluate via simulation various decision alternatives such as: association between a CI and a TTCG, the opportunity to produce a new edition of the TCG, the fair value of CI rights, the need for external contribution or the feasibility of new acquisitions or organisation of special cultural events.

In the particular context of this paper it is worth-studying two additional problems namely 1)the consideration of new media of TCG (for example CD) and 2)the effect of the revolutionary new ways of enabling access to cultural goods of an ever larger virtual audience via networks (see Figure 2).

In the first case the scalar u_1 must be replaced by a vector and the models (1) through (4) must be modified accordingly.

In the second case two new state variables must be introduced namely x_5 (the number of virtual visitors using the computer networks) and x_6 the profits of network operators and service providers (SP). A new decision variable u_3 (investment in building and extending the content servers) is needed too. Two new equations are to be introduced in the model.

$$x_5(k+1)=x_5(k)+ \sum_{\tau=1}^{\theta_{51}} a_{51}^\tau(k)x_1(t-\tau)+$$

$$+\sum_{0}^{\theta_{52}} a_{52}^\tau(k)x_2(k-\tau)+\sum_{\tau=0}^{\theta_{55}} a_{55}^\tau(k)x_5(k-\tau)+ \quad (5)$$

$$+\sum_{\tau=0}^{\omega_{53}} b_{53}^\tau(k)u_3(k-\tau)$$

$$x_5(k+1)=x_5(k)+a_{65}(k)x_5(k)-u_3(k) \quad (6)$$

In addition, Equations (1) through (4) should be completed by new terms.

$$Eq(1)\leftarrow Eq(1)+ \sum_{\tau=1}^{\theta_{15}} a_{15}^\tau(k)x_5(k-\tau)$$

$$Eq(2)\leftarrow Eq(2)+ \sum_{\tau=1} a_{25}^\tau(k)x_5(k-\tau)$$

$$Eq(3)\leftarrow Eq(3)+a_{35}(k)x_5(k)$$

$$Eq(4) \leftarrow Eq(4) + \sum_{\tau=1}^{\theta_{45}} a_{45}^{\tau}(k)x(k-\tau)$$

Even if coefficients may lack a precise estimation, one can expect better synergetic effect. The guess of this author is that an increase is to be noticed in the evolution of x_1 and x_3 (due to the fact that $a_{35} > 0$) and a non-decreasing evolution (possibly increasing) sequence of future values of x_2 and x_4.

The modelling approach proposed is in a very early stage. Efforts will be made to refine, validate and experiment such models with a view at supporting "What of ...?" analyses.

5. Conclusion

Last June many GO and NGO, cultural institutions and IT institutions as well as "media organisations" signed a Memorandum of Understanding on the European co-operation in the field. Its co-operation objectives are quoted below:

- "international standardisation on core Sets of interoperation protocols, Formats, Search and Retrieve functions, Access Interfaces, and terminal protocols and interfaces: in conjunction with the relevant committees of the International Council of Museums (ICOM) and the Digital Audio-Visual Council (DAVIC);

- identification of audiences of open multi-media access to the cultural heritage and stimulation of public interest and awareness with governments, parliaments and industry;

- ownership and protection of Intellectual Property Rights, including mechanisms to control access to proprietary information, and billing systems and principles;

- digitisation of collections and associated information, with a particular focus on the choice of collections and formats for priority digitisation and the best way to reach a critical mass of information to attract public and commercial interests;

- the Integration of Multi-Media systems developments in Museums with those for libraries, archives and other cultural information providers."

One and first explanation of the interest of governments, research and business units, etc. in the computerisation of cultural institutions, is the very special cultural and humanised size of the information society.

A second one, even more suggestive, is the awareness of the fact that one must take (given the IT level) this excellent economic chance, which will provide employment and will yield profit. Enthusiasts (like De Michelis, 1996) state that " for Europe, the cultural patrimony is a strategical resource similar to oil in the Arab countries", and that a " new gold rush" is foreseeable for the end of this century.

As the (once started) exploitation (via computerisation) of the cultural heritage seems to be self-fundable, we do believe that the wave of (transformed) cultural goods will reach us before long. A small scale industry for the foreign-made CD-ROM reproduction will for sure get on and occupy many SMEs, attempting at keeping pace with the series reproduction of video-and audiocassettes. This one advantage, among others, on stepping in the Information Society, should be wisely considered by the Romanian society as a whole.

The pursued objective is quite clear and unanimously accepted: knowledge, exploitation and conservation of cultural wealth. Thus the country will be able to join the civilised countries' group. Citizens' cultural level will be higher and the country will admittedly contribute to the European cultural heritage. Besides, it is obvious that a new (dynamic and largely influential) sector of cultural goods and services as well as close contacts (through co-operation) of the specialists in human sciences with those in engineering sciences, will be possible.

Strategy should be proactive and bring about a consistent and practical vision. The vision truthfulness will consist in involving and encouraging cultural institutions ("content provider"), IT units(research units, software houses, network operators and, possibly CTV operators), publishing houses, strategic partners and European organisations, schools and universities. One condition of success will be the conformity to the standards adopted by the G7 and EU member states for their projects.

Provided that a consistent vision should exist, all the objectives defined in the research programmes of the Ministry for Research and Technology (Horizon 2000 Programme) and of the Ministry for Culture and the Ministry for Education, would harmonise. The Romanian Academy will, thanks to its long cultural tradition and vocation, play a major role in this process.

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