# VIRTUAL LIBRARIES:

# THEIR POTENTIAL FOR

# LESS DEVELOPED COUNTRIES

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by

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## ABSTRACT

Virtual libraries are the new vision of libraries of the future.
They are still taking shape in computer and electronic
laboratories, but there are some applications that provide an
insight of what is coming in the next years. The development of
virtual libraries will take place when libraries transform
themselves into three dimensional electronic information centers.
It will be possible when data storage, data representation and
image processing technologies mature to cope with the great amounts
of data graphically represented required by virtual information
systems.  In this paper, the upcoming of virtual information
systems is discussed, defining the general concepts related to the
topic and assessing the potential benefits for less developed
countries.

# 1. THE CONCEPT OF VIRTUAL REALITY

Virtual reality (VR) is based on alternate reality, a man made illusion or replication of what happen or may happen in the real world. Therefore, alternate reality is not new. Movies and electronic machine games are two versions of the way that we see artificial reality. Books are another example of older technologies where humans create or narrate fictional reality. The difference between these means of alternate reality and virtual reality applications are that a book, for instance, is seen or read as an observer from outside while virtual reality allows the person to see things from inside the virtual information system (See table 1).

Immersion is the most important element of virtual reality and lets the user to see things from inside. Navigation is another characteristic that allows the user to move and therefore explore the cyberspace. The user can travel, walk, rotate, run and live through the virtual reality application. Another characteristic of virtual reality systems is that the inside observer can reach out and knock in the virtual world and get a response. He can manipulate, transform, erase and create new scenes or characters at his own will. In other words, VR systems are fully interactive and livable. Traditional media like books, journals or newspapers stimulate just one sense, that is vision. However virtual reality systems stimulates vision as well as hearing and touch. The user dips into this artificial world watching, listening and touching physical objects. In VR worlds anything can have a three dimensional (3-D) shape such as a thought, a concept or even a sound. In a summary, VR allows the user to create an electronically manipulated reality (See table 1).

Table 1

| THE VIRTUAL REALITY CONCEPT |
| --- |
| - A 3-D information system |
| - VR gives the feeling of living a "real experience" |
| - Feel an alternate reality from inside, not observed through a window. |
| - Basic elements: immersion, navigation and manipulation |
| - Immersion is the most important element of VR: it allows to see things from inside |
| - Navigation allows user to move and explore the cyberspace |
| - Manipulation is the ability to reach out and knock on a virtual world and get a response - Stimulates vision, hearing and touch senses |

Table 2

| VR COMPONENTS |
| --- |
| - Requires image processing of high resolution and speed<br>- Monitoring systems to orient position of the person<br>- Expensive hardware components and software<br>- It is more than simple images: knowledge has to be<br>  represented<br>- Computers require capacity to process gigabytes of data<br>- Require graphical user interfaces: data gloves, head mounted<br>  displays, joysticks, steering wheels, body harnesses, etc.<br>- There are some applications in use |

The term virtual reality (VR) was coined by Ivan Sutherland in 1965 [9] to denote a technology that allows the user to step through the computer screen into a 3-D artificial world. The progress during the first years was slow but it evolved faster in the last two decades. However, virtual reality is a technology that is still in the process of maturing. VR systems, beyond some simple entertainment applications, require up-to-date technology such as image processing of high resolution and speed, expensive hardware and software, great computer capacity to process gigabytes of data, and interface gadgets like data gloves, head mounted displays, joysticks, steering wheels and body harnesses (See table 2).

Table 3

| VR TECHNICAL NEEDS [5] |
| --- |
| - VR information systems are not mature yet, they require to:<br><br>* Improve quality of micro LCD screens<br>* Reduce costs and limited availability of CRT<br>* Eliminate delay between user's movements and systems<br>  response<br>* Operate systems in real time<br>* Improve VR interface comfort<br>* Master ability to convey the virtual world<br>* Generate images for complex scenes |

There are some technological developments that have to take place before virtual reality becomes a reliable technology. Liquid crystal display (LCD) screens need to be improved, the limited availability of micro cathodic ray tubes (CRT) have also to be overcome as well as its cost (See table 3). Delay between user's movements and systems response needs to be solved. Systems need to be operated in real time, and virtual reality developers have to master the ability to convey the virtual world, as well as to be able to generate images for complex scenes. These limitations will certainly be overcome in the short run because the entertainment industry is highly interested in virtual reality, since it will

revolutionize the way that we spent our free time.

## 2. VIRTUAL REALITY AND LIBRARIES

Virtual reality is basically a fully interactive graphical information system, as such it has received attention in library literature [1,2,3]. The term virtual applied to libraries appears in the literature with different semantic connotations [4,10,11]. The most popular meaning is for those library services based on electronic information services transmitted via macro networks, such as Internet. According to Rooks [11] the virtual library relies on electronic information systems, which uses "the most advanced high speed computing and telecommunication capabilities to the delivery and access of information resources." Some like Reynel [10] regards virtual libraries as those that may have fully digitized collections and electronic systems connected to other libraries of similar development, so that the user can access information from any library as if it were at the reach of his computer terminal. However, VR scientist regard as virtual reality only those information products where the user can immerse himself within the virtual world [5,7,9].

Normal media, like books, online databases and electronic video games, are seen or read from "outside" as an observer, but not within the product. In this sense, virtual libraries do not exist yet, since virtual information centers are not present. There are products for entertainment, education and scientific use. However, a center with a collection of such products or a complete virtual library does not exist (See table 4). The future virtual library is likely to be a place with a fictional location where the user can penetrate, swim and walk through myriad of 3-D images with stimuli for most human senses. A library of this type may or may not resemblance a past, present or future passage of life, history or a natural phenomenon where the observer can interact with such fictional world.

Table 4

| THE SO CALLED VIRTUAL LIBRARY |
| --- |
| - VR Term applied wrongly to networked electronic information systems |
| - Access to Internet information is regarded as virtual, despite being real |
| - These libraries can be regarded as electronic |
| - Connection between two or more electronic libraries does not upgrade libraries to VR |
| - Use of optical media or digitalized documents falls within electronic libraries |

The term virtual library is also used by some authors as synonym of digital library, but the second concept applies for those information resources that have been scanned using optical character recognition technologies. In other words, digital information is based on images of text, unlike electronic information that is originally generated as text. The first type uses more computer memory than text based data, but it cannot be regarded as a virtual reality product. Digital or electronic products fail to provide immersion to the user, a basic function, as stated, required by VR information systems. The term electronic library should be used to denote the new services provided by networked libraries, as it is used by Olsen [8] when he describes the Mann Library at Cornell University which aims to be fully electronic, or by Senkevitch [12] description of Texas rural libraries' access to Internet information sources.

## 3. POTENTIAL LIBRARY BENEFITS OF VR SYSTEMS

Virtual reality may potentially bring astonishing benefits to library users since information is presented in 3-D graphics. The basics skills of writing and reading will become probably secondary to use this new visual world. Books or virtual information systems will come alive with pictures, sound and smells of real life.

**Libraries versus television**. Virtual reality systems will empower traditional libraries, making possible for libraries to challenge television entertainment. It is said, that reading habits take more time to develop in children at present time due to the easiness of turning and watching television. VR information systems offer libraries the possibility of providing tools with full multimedia interacting power, besides the traditional printed and electronic services. The emerging information society will have a VR product that will meet the needs of audiovisual oriented users. Traditional television, except by interactive television, is a one way communication system, where the user is not able to interact. Even interactive television will still be based on watching in the short run, while VR lets the user to live within the information system and be part of it (See table 6)

**Ideal information world**. If virtual libraries resemblance traditional libraries the user will be able to open the main door of a library and navigate through shelves full of book spines, where he will choose the title and with the movement of a joystick, or even an eye movement may open a monograph. In this ideal information world, the user, since he or she may not be called reader anymore, will walk through a fictional life and jump from one scene to another and even navigate from one library to another. For example, novels will come alive playing the scores of music and set the characters in dancing action, if the topic is a musical, allowing the user to be part of the virtual living plot,

interacting or transforming himself into the book's main character
(See table 5).

Table 5

| BENEFITS FOR FUTURE CYBERSPACE LIBRARY USERS |
|---|
| - Book plots will come alive<br>- Information is represented graphically<br>- The user may navigate through shelves<br>- Open the book and interact with the system, feeling<br>  images, sound and smells of virtual reality |

**New concept of library may arise**.   VS systems, however, are
unlikely to take the form of a book or other printed media.   They
will be high technology gadgets, perhaps transformed versions of
present head mounted displays and data gloves.   Soon some real-like
virtual scenarios may enter the market.   The upcoming of new
technologies will permit VR scientists to develop cabins or movie
theaters with the capability of providing virtual reality, where
libraries could become alive such space does in planetariums (See
table 6).

This type of libraries are still to come.   Whatever the form
virtual libraries take, they will transform the concept of
information.   It will mean a copy of the real world or the VR
expert view of a concept, story o phenomenon with such grotesque
effects of futurist movies, cartoons or electronic games.

Table 6

| LIBRARIES AND VIRTUAL REALITY |
|---|
| - Virtual reality systems may challenge TV channels audience<br>- Information will not be based on writing or print<br>- The illiterate will be benefitted if able to access it<br>- Improves cognoscitive process<br>- Provides a sensorial immersion<br>- VR is a communication device to foster intuition<br>- VR implies a new sensorial integrated information product |

## 4. LDCs' PARADIGM

Virtual reality is a new technology that will affect developing
countries as other new information technologies have.   The rapid
development of information technology is a major challenge because
it grows faster than their economies.   The advent of computers took

years to arrive in LDC's libraries. It was until the mass production of personal computers when libraries acquired computer machines. VR is just the latest paradigm for libraries from developing economies. The technological gap may become now greater than ever before.

There is the feeling in LDCs that no matter how much a librarian tries to modernize information services, he will always face a time lag in using technology with regards to those from the developed nations. Computers were the ultimate and definite goal to reach information modernity for most libraries in the South during the 80's. However, as soon as computers were at the reach for above the average library, networks become a must. Local area networks (LANs) are a reality in some libraries, but now wider area networks are the new standard. Plans are for creating open network systems and inter-connectivity via Internet is at a great pace in the industrialized world, that it seems unreachable for several LDCs.

Virtual reality might not be a concern in the short run in LDCs, because libraries, mainly from middle income countries, are working on electronic library applications, such is the creation of gophers. However, it seems that they are, again, late in the world of Internet; the World Wide Web (WWW) is the new norm, since it requires even better telecommunications, solid networks and excellent workstations to handle greater graphical data. The higher income Latin American countries like Brazil, Mexico, Chile, Venezuela and Argentina have some library gophers, but fewer libraries have created Web home pages.

Mbambo's paper describes the networking limitations of Sub-Saharan african countries whose networks rely on switch packet technology to access remote Internet nodes. This means that library institutions are left out of any Internet application because it becomes expensive, even just logging outside information resources.

The WWW is not even accessible to most libraries now in LDCs since it demands workstations with good technological capabilities. Personal computers (PC) stations require 8 megabytes of RAM memory and they have to have a high definition monitor with fast microprocessors. PCs with these characteristics are in the top range price. LDC libraries that regard themselves to have "good computing equipment" can aim to develop and use gophers, which need less trendy equipment.

The Gopher interface is more suitable at the moment, but the latest and more exciting Internet sources are available on Web browsers. This a major challenge to LDCs because some information sources on Internet are increasingly becoming the only place where to find them, such as logging to commercial online databases, bookdealers and to the cyber gossip of the networked world.

These recent electronic service developments place new challenges to developing countries but offer opportunities as well (See table 7). The opportunities are basically greater flexibility and convenience for libraries users, since networks are integrating information systems into a single global network open to anyone who can access it.

Despite the overwhelming economic demands of electronic services, libraries from LDCs ought to pay attention to VR information systems, because it is a technology that may enable them to overcome some social problems.

Table 7

| STRATEGIC INFORMATION CHANGES |
|---|
| - The information cycle is becoming a single process<br>- Authors are able to publish and communicate with their audience in a single step by themselves.<br>- Most printed sources are now produced in electronic media: books, indexes, journals, newspapers and memoranda<br>- Virtual reality is new product of the electronic information revolution |

LDCs are characterized by illiteracy problems, and people who have access to schools often end up becoming functional illiterates since reading materials are not available. Training of the unemployed is another burden because most teaching materials are in traditional printed media. Virtual reality offers a potential benefit to this population due to its graphic portray of the message. VR systems can be used to train illiterate people without need of writing and reading skills. VR products can overcome also language barriers, since language is not strictly required to replicated reality.

Testing and research of some scientific and industrial application will become cheaper. VR systems replicate real world problems, reducing the use of "real" materials. This will help LDCs to pursuit research endeavors with less economic investment (See table 8). However, there may be another world economic crisis or economic re-adjustment similar the one produced in the last decades due to the reduction in size of most industrial goods, as well as the substitution of raw materials by synthetic products i.e. steel by plastic. This industrial changes brought economic problems to LDCs because their economy relies heavily in raw materials.

Table 8

| POTENTIAL ADVANTAGES TO LDCs |
|---|

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- Information will become more accessible worldwide
- Virtual information systems are friendlier
- VR facilitate the creation of one-stop-shopping
  information centers
- Less barriers to assimilate information, even education
- Overcomes language barriers of present information sources
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VR products will make easier transborder flows of information, but traditional problems faced in information transfer by developing country users will still persist. VR applications transmit a virtual reality related to industrialized countries. Few VR systems may be created having in mind LDC countries' needs or creating a virtual world that takes into account local culture and values (See table 9). Benefits and negative impact of VR systems in LDCs are several, some unimaginable yet, that it would take a long list to describe them.

Table 9

| VR DISADVANTAGES TO LDCs |
| --- |
| - Requires greater and more sophisticated information technology<br>- Divert scarce resources to monitor VR developments<br>- VR demands more scientific skills to organize and generate information systems<br>- Information may be more centralized by a few organizations from the developed world<br>- Impact in world industrial production may reduce imports of raw materials from LDCs |

## 5. CONCLUSIONS

Virtual reality is a technology that will soon affect educational methods, training, information handling and the entertainment industry of the world. Virtual reality offers a great potential for easier and more attractive transmission of information because it is based on interactive graphics and images.

It overpasses present multimedia products, since virtual reality not only provides great images, but it gives the feeling to the user of being in the application. The user feels the system from inside, something that is called immersion, plus the power of navigating and manipulation of the virtual world. Libraries with such characteristics do not exist yet.

The features of virtual reality systems will certainly affect the way that information is transferred from the author to the user.

LDCs will benefit from this technology, if they can afford it. Virtual reality systems may become the best tools for training, laboratory experimentation, and for almost any kind of information transmission without the limitation of language and printed media. A user from an LDC country will still require background knowledge to be able to grasp the virtual reality system content and the ability to manipulate such environment. The main barrier to the use of VR is the high cost that it has at the present time, but once its cost is reduced, it will be potential tool to speed out social development of countries from the South.

A problem that less development countries may also face is that highly developed countries will speed out the generation of knowledge consequently scientific and technological progress. This probable acceleration of knowledge in industrialized countries might be overcome by LDCs if they begin exploring and monitoring VR systems development. Otherwise the gap between the information-rich and the information-poor will widen. The major challenge for LDCs is explore the use and effect of virtual reality in their own societies. Libraries need to monitor the role that virtual information systems may play in the way they transmit and diffuse knowledge.

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# REALIDAD O FUTURO VIRTUAL:

# REDES Y BIBLIOTECAS

# ELECTRONICAS

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por

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## RESUMEN

Las bibliotecas virtuales o más bien llamadas bibliotecas electrónicas empiezan a ser una realidad con las super redes de compúto como Internet. El usuario accesa, revisa y recupera información desde su terminal de bancos de información ubicados en diferentes lugares y latitudes del planeta, como si dichos datos se encontraran al alcance físico de su mano. La realidad virtual o la sensación "casi real" del entorno informativo ofrece grandes ventajas de acceso a los usuarios de la información. La aplicación de multimedia, sistemas de cómputo más capaces y las carreteras cibernéticas de las redes ofrecen a las bibliotecas mayores posibilidades de llegar al usuario donde quiera que éste se encuentre. Los avances en la información virtual son un gran reto para los países de economía emergente, quienes deben planear el crecimiento de su infraestructura telemática, tomando en cuenta el éste nuevo desarrollo, que emerge en naciones industrializadas.

# NOTES FOR THE VIRTUAL LIBRARY WORKSHOP

- The workshop will be informative and conducted as a panel

- It is a hot topic
      The theme of this conference
            Several papers
      Continental Airline magazine
            Language courses
            Ciberdegrees
      Time magazine: VR
      Newsweek - electronic services

- Difference between VR, electronic services, networks

- Just in time VS just in case

- Information on demand

- Library as a building

- Focus of these papers

- I have some demos, similar to
      Electronic video games
      Futuristics movies

- We will probably have some extra time

- Will speak in English

- Show overhead transparencies


1. QUESTIONS FOR THE AUDIENCE.

- **BENEFITS**. Write down three potential benefits of VR information systems in libraries of your country.

- **WHAT TO DO**. Three actions that an LDC can do to benefit from this information development.

- **CHALLENGES**. List three of the main problems that countries of your library face to fully use virtual library/networks information systems.