

Save the University.

About Technology and Higher Education

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I am not sure if it is necessary to save the University. I am not sure if it is worthwhile, or if it would be better to develop a new structure that supports the development of human knowledge at a higher level. Nor am I sure that a plausible alternative structure exists. Of course, in several institutions spotting the globe, there are thousands of faculty trying to adapt to these new times and incorporate change into their work. However, there are also thousands of professors that are unaware of important changes in the University. There are even academics who are aware of major shifts in their environment, and yet consciously choose to act as if everything is "business as usual". In every case, this incorporation has its way through the generalised use of the new tool for accessing knowledge: The computer.

This paper does not present the possibilities of computers as a new medium, but it deals with the urgency of a total and revolutionary change, a change that implements the use of computers as instruments for managing information and for communications.

The book

A professor posed the following question to her class of freshmen:

- What is more "human": a book or a computer?

These were the answers:

56 simply stated that a BOOK was more "human"

4 said that neither was "human"

1 answered that neither was human because neither had a life of feelings
 1 answered that neither was human, but the book was more "creative"
 1 thought that the book was more human, because it allowed
 more "freedom" to imagine and to think for oneself
 7 said that both were human, both having been created by a human being.

Only slightly more than a tenth of the students were aware of the essential similarity between books and computers: both are tools created by human beings for the management and storage of information. Yet many still reserve a special human respect and affection for the book. Are books considered more human because they are older? Because humans have utilised books for so many more years compared to computers? Or perhaps because we are more "accustomed" to them? We can derive as many rationales as we wish, including some as curious as "the book is more creative" or "it allows us more freedom", but in all cases we would be deceiving ourselves.

Books and computers are both information tools, which, though they differ from a communicative point of view, are equally products of human development. Both are equally our "children", engendered by us. Lions do not have books, and neither do plants. Even animals with a high intellectual or communicative capacity, such as dolphins, do not have books. For books are a uniquely human invention. As are computers.

Both books and computers, have been associated with major revolutions in our ways of knowing. The history of "the book", and that of written language in general, is a long one. People were reluctant to accept the written word at first; even men as clear-thinking as Socrates rejected it. Later, written text was raised above the spoken word: "o gegrafa, gegrafa" -what has been written is written. In present-day English, "to take something as read" means "to accept something to be true or satisfactory" (Longman, 1994). Today, it is taken for granted that contracts and legal decisions are only good when put down in writing, and that the signature is one's proof of identity. It only took a few hundred years before/ yet it was only a few hundred years ago that the written work was used for "society registers", Domesday, and so were many other records. That has led to the present time: a person exists if their name appears written on a significant piece of paper... regardless of whether he or she is actually alive.

Books have invaded our lives to such a degree that most countries now attempt to prove their economic and social development with a high literacy rate. It is also assumed that it is not possible to participate in society without knowing how to read and to write. Public figures often claim to be a good readers. Famous stars are asked on occasion, "What is your favourite book?" or "What book would you take to a desert island?". A mere 500 years ago that situation was dramatically different. Most of the people did not know how to read; books were a luxury. Before Gutenberg, ownership of a book was as rare as ownership of a stethoscope is today.

Thus, writing on paper has been with us for only a brief period of time. Pictures or engravings on stone have actually been used through more centuries, even though they are not very common today. And what about the printed book? Surprisingly, the use of printing press resulted in books of inferior quality. Aldo Girardi (1992) explains the interesting history of Gutenberg and his Bible. Some data: the Gutenberg edition was a reduced text with only 800.000 characters, while a standard Bible was comprised of 100.000.000 characters. Despite this, the price of Gutenberg's book was 5 times that of the complete handmade work, and 30 times that of a handmade edition of similar size (i.e. less than 1 million chars). The shift from handwritten technologies to the printing press also resulted in a loss of quality through the omission of small drawings, pictures, beautiful handwriting, etc. According to Girardi, the Gutenberg Bible was not a success. In fact, Gutenberg went to prison and his relatives lost their property. The printed books that followed were more successful but sacrificed durable paper for a cheaper (and poorer) material, thereby reducing the price. Rich and solid supports such as stone, skin, and papyrus are but a distant,

distant memory for humanity. Our lovely "human" book is a mere shadow of the nice old handmade books!

I would say that there isn't a special human attachment to books. Who has not fondled a book as one took it from the shelf in an old library? My childhood is linked to Sandokan, Julius Verne and so many other authors. But we are not speaking of feelings. There is a time and place for Physical Education, for Moral Education or for affect in education. What we are discussing right now is something completely different, that is, the supports necessary to managing information, the cornerstone of our scientific knowledge within the universities.

One must also admit that books contain a lot of information that is not available in other sources. However, there is information in other sources that one cannot find, nor will ever be found, in books.

My aim is to present clear reasons why we should cease blindly worshipping the book. We need to remember that what is important is not the book but the knowledge contained between its covers. What is of crucial relevance is not the book but the people behind it. I am not as worried about the students responding to the questionnaire as I am about their professors; because so many university academics base their knowledge only on books. They think that this is the only way of presenting information. I recall a Health Ministry that rejected an opinion regarding the Hanta virus because "it [the opinion] was not published". Forget the fact that it could take 12 months or more from the moment when an academic is confident in his/her research results until they are published: producing the text, submitting to a publication, revisions, acceptance, delay to be published, quarterly periodicals,... But "hey, no problem", the virus will be waiting!

And now it is time to discuss the computer. As with the book, we are not going to compare it with previous supports. It is a new support for a new need, generated for a growing and changing information database.

A growing and changing information.

During the past thousands of years, information was accumulated by humanity at a slow and imperceptible pace. There is evidence that in these ancient communities, the word of old people was respected as the definitive criterion. Such ideas still prevail to a certain extent: Longman dictionary still describes "elder" as "a person holding a respected official position". The phenomenon of note is that in those times the increase of information between two generations was so slow that the knowledge accumulated in an old person was all deemed necessary to solve the problems of the community: the wisdom was in the elder.

The accumulation of knowledge is not constant, but is rather irregular through history, with a Middle Age and a Renaissance Age. During the last few centuries, the volume of information has progressively increased in a curve that began at the Industrial Revolution. There are several indicators that show how different people have perceived the accelerated growth of available information, a growth so rapid that its management by men became problematic. One well known indication is the transition from the "Homo Universalis", engineer and painter, to the specialist engineer OR painter, to the high specialist, computer languages engineer or book designers.

But the indicator that I prefer is that articulated by Vannevar Bush, which he conceived in 1932-33, wrote in 1939 and finally published in 1945: "As We May Think" (Bush, 1945). If you have not familiar with

him, perhaps it could you help to know that, in some way, he is the "grandfather of hypertext" because of his Memex system (Nielsen, 1990). Memex stands for "memory extender". Vannevar Bush developed his Memex proposal in response to the explosion of scientific information that made it impossible, even for the specialist, to be well informed in his/her discipline.

Today, at the end of the century, the situation is worse.

Information is increasing so quickly that it is becoming very difficult to write a book and to publish it without it becoming outdated in the interim between submission and publication. Tomas Vicente Tosca published his "Compendia Mathematica" between 1707 and 1715. Regrettably, he had written it between 1680 and 1690, about 25 years before, immediately before the work of Newton. Therefore, this author declined to consider the "heliocentric" system as real, although he accepted that as a hypothesis there is no doubt that it is one of the best ".

Three centuries later, important changes in a given discipline can take shape in a much shorter period of time. Berge and Collins published a series of three books about teaching and telematics on-line in November 1994 (Berge and Collins, 1994). At the AERA conference in April 1995, they explained that the authors sent in a first version in September 1992, and a definitive one in July 1993. Thus, the research for the book was already completed, yet there was 10 months of delay for editing, plus 16 months more before the first edition arrived at any bookstore. In comparison, for each of the 10 tools available on the Internet in September'92, there were 25 in July'93 and 127 in November'94. From the time when the publisher received the text until when it was available on the street, a part of the contained information is multiplied by 5!.

Some estimations say that in a field such as Computer Engineering, the amount of information will be duplicated each year by the year 2000. There are two important consequences for Higher Education Institutions:

- . the need for a permanent change in designing and teaching and its contents.
- . the need for new ways to access and to organise the information.

People today need to continuously acquire new information, and that has translated into an explosion of continuous education -The European Union declared 1996 as the year of lifelong learning. But this is not the educational consequence that I would like to emphasise here. Rather, I would like to note the lesser importance given to the reproduction of information. "Knowing" means something more than reproducing names, facts and concepts. Day after day, the gap between what a human is able to memorise or store and the volume of information available to memorise or store grows greater and greater. A few years after finishing Higher Education many find that an important part of what we had studied has become obsolete. The presence of a rapidly changing body of information does not, however, completely discount the need to build up a solid personal base of knowledge. Sadly, some professors have been known to freeze when confronted by the reality of keeping up to date, and they continue supporting their teaching in the transmission of content, a technique that has become more or less obsolete.

The need to design and use new means for accessing information is what moved Bush to design his Memex, and what has moved us to speak of "hypertext". Of course, at some educational levels, a change is being made to adapt to this new way of organising information. However, it is common to hear that students are disoriented when they navigate through the Internet. Of course! Who has helped them to develop the skills for it?. As in so many other situations, students learn by trial and error, without a guide, without tutoring. It is also necessary to recognise that if a professor does not have a given skill, it is difficult for them to assist their students in learning it.

Higher Education needs to change. It is necessary to shift the importance from the acquisition of knowledge (as storage of facts and names) to the acquisition of skills. Computers and the World Wide Web are perfect tools for this purpose. and, of course, this is not a new idea (Grabowski and Curtis, 1991).

Words and Pictures

Most of the information that we have received during our life as students was contained in words, usually written words, usually printed words. For us it is normal to think of information in terms of books contained in libraries, places where the human knowledge is conserved. But things have not always been that way!

Words from old Greek verses tell us about a time when information was transmitted in a oral way, and these verses were a useful aid to remembering. Windows in the old cathedrals recall a time when the image was in some measure the learning support for the information distributed to most of the people. It was a time when men and women did not need to be literate.

For the past few centuries, humanity has channelled its need to store and distribute information by printing words in books. And now this is changing. In academia and the professions, the support of information is evolving into multimedia systems, which place a high value on text in some cases, or a similar weight on images in other cases. In the private and social sphere, information presented as a mix of text and images is much more evolved and more widely accepted. Privately, everybody is party to an audiovisual society mastered by the media, especially by television.

I do not want to discuss whether this is a positive or negative change, but only to state it: images are the primary source of most people's information. Several adults are now able to recognise certain sorts of animals far away from their habitat, or the outline of countries that they have never studied, or the face of personages that live in distant lands. In industrialised countries, watching TV is the third most time-consuming activity -the first two are working and sleeping (Ferrés, 1994, p. 14). We could continue including data about the importance of the image in our culture, but it seems obvious that the previous examples clarifies the message.

Several alarms have been raised regarding this state of affairs. Some of the more popular critiques are: it has produced a diminution in the capacity to concentrate, and at the same time, the information is increased but that the nature of this information is so superficial that it is more accurately phrased a "superficiality saturation". Passivity is growing as we face a loss of criticism and of reasoning capacity (Babin and Kouloumdjian, 1983). All these critiques are analysed by Babin, who shows us that we are now confronted with a new way of knowing.

Some of these new ways are related to the old theme of hemispheric specialisation, which has provided us with some interesting ideas to apply in education (VerLee, 1983). But we can find other more "apocalyptic" interpretations, such as suggestions from Jerry Mander to completely eliminate television (Mander, 1977).

I do not think that TV is "taboo" as Mander suggests. I think that our culture is changing and that the television as been the agent of change. We could apply the Frankenstein phenomenon as it is explained by Postman: men create a machine with a defined and concrete objective, but once it has been built, we find that our machine has its own ideas, that it is able to change our practices and our manner of thinking. Postman says that we do this finding ourselves sometimes horrified, usually anguished, and continually

surprised (Postman, 1991).

We can decide to value intellectual activities related with the image, as a new analogy, intuition, or global thinking... or decide to interpret the changes in a more negative perspective -superficiality, lack of reflection, dispersion, and a lack of structured knowledge. In both cases our work at the University needs to change. We can not continue transmitting the knowledge as we did 50 years ago, based solely in the printed word.

If we discuss the use of "image" in Higher Education, we are not only speaking about television or video. We are speaking about multimedia. Actually, we are speaking about computers that have changed from being information tools to communication tools (Hodges and Sasnett, 1993).

Computers in the University

There are many other significant changes today that are related to knowledge. Though it is not the only nor the most important change, the transitions associated with computers are pressing. And we can see how computers are offering answers to these new needs. It is now possible to analyse the introduction of computerized systems in our teaching not from the perspective of that it is a new educational resource judged more or less adequate by the instructor, but from the perspective of a tool absolutely necessary for our intellectual work. We cannot speak of using computers in our teaching as we can speak about slides. It is more essential, that is, it is similar to the way one would speak of using pens or books in teaching.

It is rare to find texts explaining how to use "books" in teaching, because books are tools so powerful and so widely used that it is difficult to include every use of printed materials (encyclopaedias, handbooks, essays, articles, readings, notes, ...). Also, we are speaking of a tool that we consider "ordinary and normal" for the learning processes. Is intellectual work possible without books? The answer is, generally speaking, "no". Well, today it is not possible, generally speaking, to do intellectual work without computers.

- "But I am a reputed researcher and I only use computers to write my articles"

Well then , you do not know what you are losing: data files and references on your previously read books, access to the incredible information on the World Wide Web, information that is being distributed through the lists in Internet, the capacity to communicate and work at a distance using electronic mail, the ability of recording and assisting the learning process of your students, the clear presentations from some CD-ROMs -not a lot of them, of course- ...

But what is more terrible is that while we live in the world of information that flows through the Internet, we think that we have all the information that is needed; unaware that what is contained in books may have long been overcome, enlarged, modified, or simply rejected. For an example: I have cited a book by Nielsen (1991) or perhaps it may have had been better to refer to Gaines (1996): it is shorter but provides more information. It is not in bookstores, but a student at a more isolated university can access it easily. It is more up to date, especially its updated references. It is, simply, a text on the Internet. And it is a text that takes us to several other places on the Internet, where some specific themes are elaborated.

Nielsen collected information from several books at the end of the eighties. It took months to write his work, and more time to locate a publisher. Later, the book stayed in a warehouse until it was distributed to a bookstore. When I visited the store, I found it and I bought it. That fact that it is a relevant book in spite of all this is only some kind of miracle.

It is necessary to note certain considerations. Today..... printed materials continue to be considered the criteria for scientific validity, e.g. they are used to evaluate the quality of research work, and to recognise the authors copyrights.... a large portion of the most relevant information is found only on paper, and not on the Internet, precisely because of the previous comment.

... some disciplines and research fields change very slowly and so the printed word provides adequate documentation.

... there are some key texts in the development of knowledge that are on paper and that will not change, although some of these texts come from the oral tradition, and so, the written version is not exactly the first one, nor necessarily the most used.

... we are not used to reading the screen of current computers and several people prefer to read the text in books.

We also need to recognise that most of the information on the Internet has been conceived, designed and structured by thinking in the old printed lineal texts. Nevertheless, at the present time, except in a few cases, professors and students at the university need to use computers "continuously" as their usual primary text tool.

What about the older professors? What about the academic that does not have access to and so cannot understand computers? We need to recognise those that preceded us, as well as how their experiences can help, but these are the exceptions to the rule. I have known older professors that began to use computers, first with fear, progressively with interest and later with enthusiasm... and efficiency!. Sometimes the problem is not really a lack of capacity but fear and ignorance of the unknown -- and often the lack of time.

What about young teachers "not oriented to computers"? Some persons think that computers are only for mathematicians. Of course, that is not true. Today computers are flexible and adaptable tools that can be used by people with different orientations in the context of multiple intelligence (Bartolome, 1995).

Not everyone will optimise the use of computers, just as not everyone did with the use of books or libraries. There have always been individual differences. Each person will use them in their own preferred way based on their abilities. But if most academics do not change, if universities as systems do not change, it is possible that this change was not necessarily utilised and the university will disappear as have many other former educational systems and institutions.

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