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Design and Operation of Spaces for Communities that Learn

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1. Introduction

Knowledge workers

Both students and educators can be considered as knowledge workers[i]. Obviously the students learn, but so also do the academic and departmental staff, and as a result the entire university or educational centre acquires knowledge. If educators are unable to keep up-to-date then students do not learn, and if an organisation does not learn then its teachers will not have an environment that will enable them to keep up-to-date.

Although the majority of us are convinced of the benefits of technology as a tool for training, we also know from experience that many of our academic colleagues do not share this vision. However, even though it might appear paradoxical to say so, it seems reasonable to conclude that this lack of vision is - at least in part - due to a learning problem.

How do knowledge workers learn?

From the perspective of knowledge workers, designing and organising teaching so as to be more efficient undoubtedly requires an intensive use of the information and communications technologies (ICTs).

Given a satisfactory study environment, we know that students learn in proportion to their effort and this effort is more efficient insofar as we are capable of improving the student learning environment. As fundamental elements for the development of learning environments we can point to the following:

- A systematic and rigorous approach to the learning process.
- An open structure so that students can gain access to the many resources and contacts provided or facilitated by the Internet.
- A dynamic design that will motivate and stimulate the student.

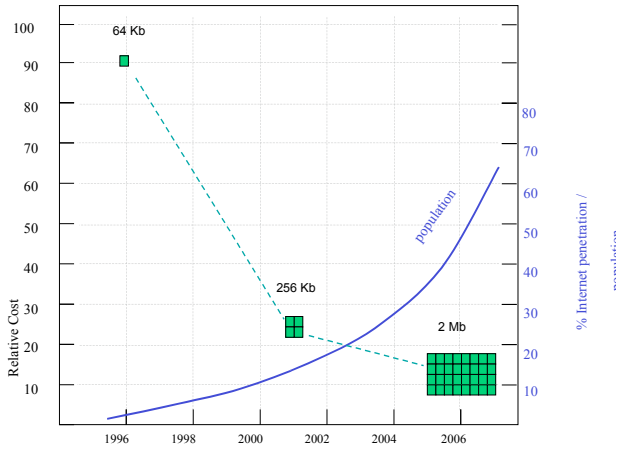
In addition to providing study plans suitable for each speciality the learning environment has to teach how to learn as well as unlearn, how to search for information, work with scientific rigour and co-operate with colleagues[ii]. This approach, as we know, has a cost for the student but especially for the educator, who undoubtedly must make a proportionally greater effort[iii].

The new Internet space

The Internet should be understood as an enormous virtual space constructed on the basis of two fundamental functions or services (the '0' and the '1' of the Internet):

- Access to multimedia information.
- Multimedia communication between individuals and groups.

The integration of audiovisual communication with mobile telecommunications and personal computers will give rise to very complete, powerful and ubiquitous personal 'offices'[iv]. This kind of equipment, as used in any work centre, will also be used in universities.



Relationship between Internet costs, services and penetration[v]

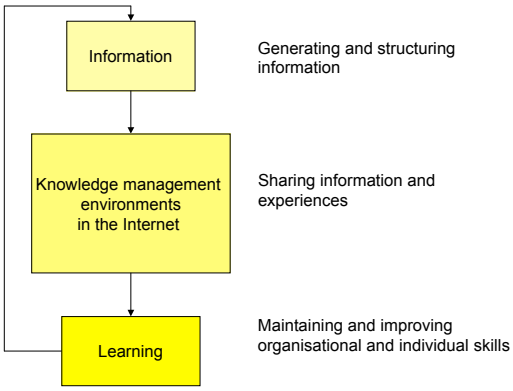
To date, the universities that operate distance training courses have played a primordial role in defining models for remote training. Even if these continue playing what is evidently a central role, it seems reasonable to suppose that this will be shared with traditional universities once these begin to systematically implement information and communications technologies.

New models of spaces for training, on which many universities are quietly and patiently working, will go from strength to strength, given that the Internet in combination with conventional training represents the future for all those universities capable of carrying through the transformations required.

In this article we endeavour to make our contribution by presenting a model based on hybrid learning spaces that combine multimedia content and communications.

Design and operation

Nobody doubts for a moment that the information technologies will have a key role to play in training, by facilitating access to content and intensifying interactions between all those within the learning process who share information. However, there is much to be done and the task is no easy one.



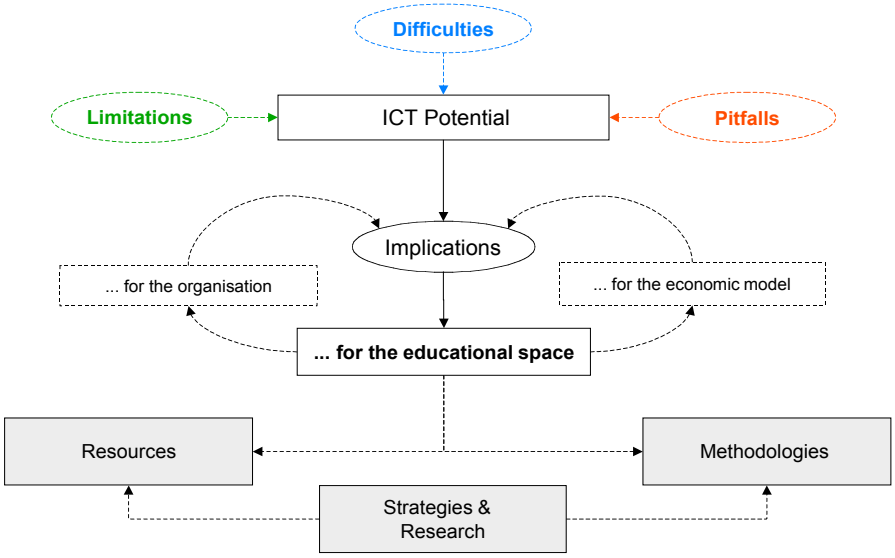
Information, knowledge and learning

In the first place, design and operation go hand-in-hand. They cannot be envisaged as separate simply because one feeds the other. In this respect we need to design and develop strategies for the following:

- Generating and structuring information: multimedia content.
- Sharing information and experiences: training activities.
- Maintaining and improving organisational and individual skills: developing user loyalty to continuous training.

Design, engineering and the social sciences[vi], all of which affect these new spaces, follow certain rules that combine many disciplines such as graphic and audiovisual communications, programming, editorial content, management of communities, user psychology and pedagogical aspects. Moreover, the rules that govern the design, development and operation of virtual spaces in the Internet are not stable, but change and evolve constantly. Technological advances are continuous and result in new network resources, hardware and software that make new applications possible.

2. Potential and implications of the ICTs



The above diagram illustrates the schematic reasoning behind this article. Within the educational framework the ICTs bring with them a series of implications. The central idea focuses on the important changes in the educational space that have consequences for the overall organisation and for the economic model of training.

The development of a new educational space requires both resources and methodologies which are, in turn, based on working in an environment according to pre-determined work strategies and in which the consequences of these strategies are researched.

Before describing our model of ICT potential, we should recall – even if schematically – the limitations, difficulties and pitfalls to be faced.

Limitations

The ICTs, in themselves, provide little or nothing; it is the users and their work, rather, which equips them with value. The ICTs are no magic wand, but what magic they have is that they constitute an inexhaustible source of work for all those who base their professional activity on one or another of the many forms of working with the ICTs – as is known from experience by those who have devoted their energies to developing multimedia content.

Difficulties

Defining strategies for the implementation of technologies is one of the greatest difficulties to be faced by any organisation, including the universities. The decision as to when to introduce a specific technological resource is critical. A premature decision may be both relatively more costly and less efficient, whereas a delayed decision might result in a loss of competitivity and opportunities.

Moreover, the maintenance of technological solutions is in itself a complex matter, due to the continual changes to and improvements in equipment and software tools.

Pitfalls

Undoubtedly one of the most evident dangers deriving from the diffusion of the ICTs – at least in the short-term - is the potential imbalance in the redistribution of wealth. That said, the technology in never before, of the problems of humanity.

Implications

The implications are based on the consideration that the ICTs give rise to a new space for education, just as they do for commerce, leisure or information.

Multimedia communications itself is a good thing and it is precisely thanks to the ICTs that the world of today is aware, as and the great interactive arena that is the Internet will enable improvements to the way in which people communicate to learn, to work and above all, to live. These great educational, work and leisure spaces that are being configured by the Internet can be understood as new 'urbanisations', combining and at the same time projecting, even if only in part, organisations, the economy and even life from the real plane of existence[vii].

3. The new educational space[viii]

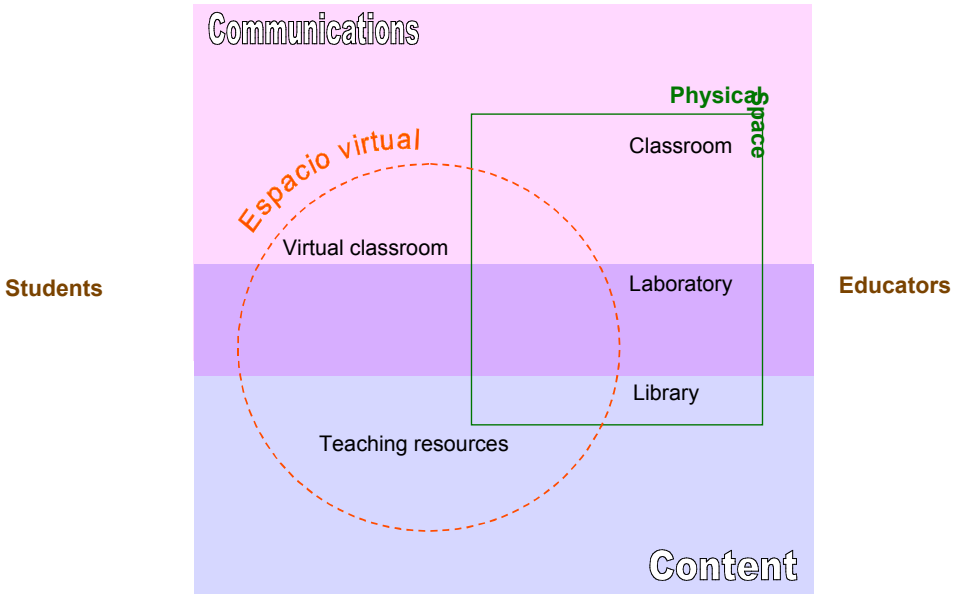
Our endeavour is to model the new educational space that has arisen from the development of the Internet. Of particular use in arriving at the formulation of the model has been

experimentation using this model as back-up material in a UPC teacher training programme for the development of distance course content[ix]. The model is defended as having been produced on the basis of experiment as well as for its usefulness as a training tool for university teaching or other staff needing to undertake the development of spaces and content for ITC-based training.

Agents

As the basic agents in the model we distinguish between subjects, spaces and mixed communication-content processes.

- The subjects of the training process are the student and teacher.
- Training takes place in a space consisting of two coexisting planes – the physical space and the virtual space[x] - both equally real and each having their own specific rules of functioning.
- The processes that enable development of the training activities combine, in different degrees, student-teacher communications and different kinds of content.



Activities

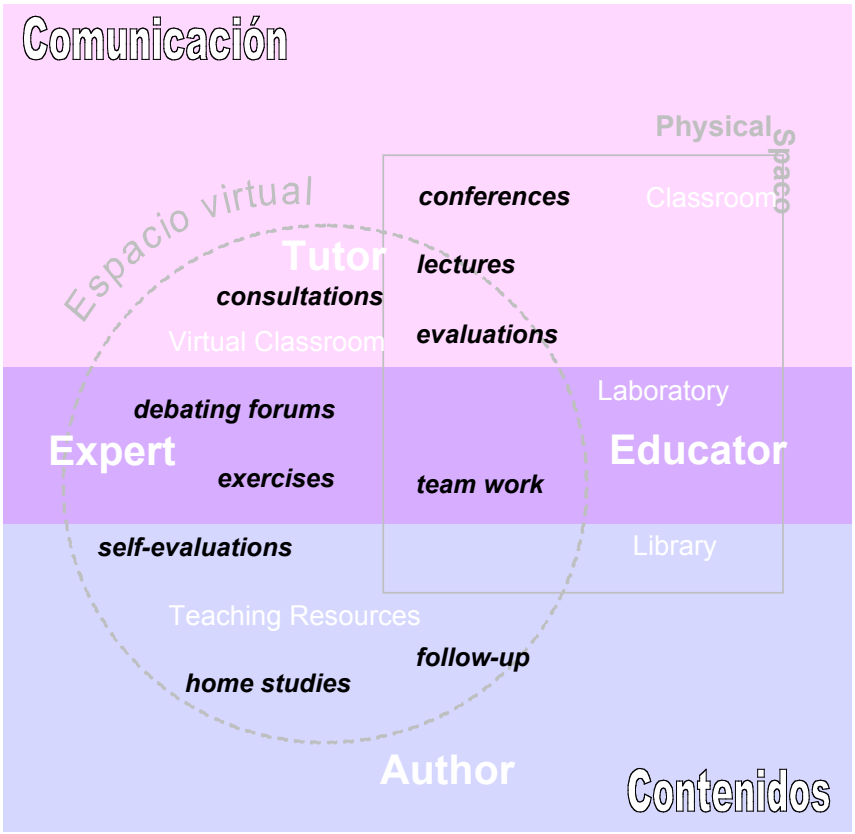
In the framework of this new educational space, the organisation of training activities takes into account both the physical space and the virtual space (or network). The training activities, which onsist of communication processes that apply content using many strategies, are modelled bearing in mind the following:

- Each communication situation between educator and student occurs in a virtual space, in a physical space or in both simultaneously.
- The communication is synchronous or asynchronous
- A specific content intervenes in each process.

The educational function

A combination of physical and virtual spaces enables the different educational functions of the teacher to be established with ease. A division of labour is thus introduced, with the teacher playing roles as follows:

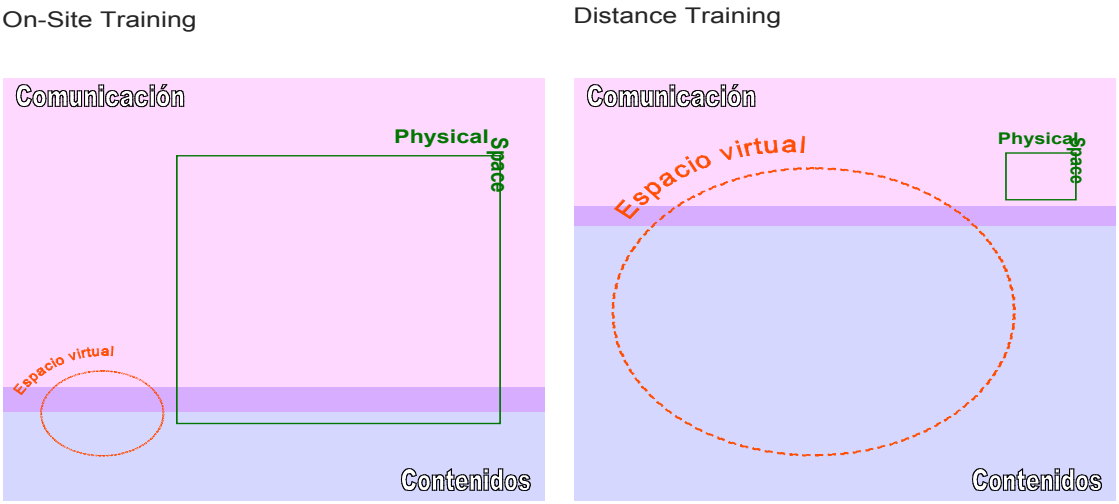
- As a tutor when providing personalised support to the student.
- As an author when preparing content or integrating resources.
- As an expert when consulted for specific knowledge during the learning process.



Training models based on a hybrid educational space

A study of architecture reveals that the formation of spaces is conditioned by many factors and the concepts of home, village, city and even car are continuously adapted to the changing needs of society. The new concept of an educational space, described here as a combination of virtual and physical spaces, enables us to imagine what the universities of the future will be like. Nonetheless, the creation of virtual classrooms and campuses is the easy part; the difficulty will be filling them with activities that 'cause knowledge'.

Our next image illustrates the validity of the model for explaining both distance and on-site training.



4. Conclusions

The gradual transition towards a new educational space will have implications for both the organisational and economic modelling of universities.

Cultural change brought about by the knowledge society

The development of the information or communications society is inevitable. Apart from the generational implications of this development[xi], the changes involved are centred on the core activities of the universities themselves, i.e. the generation, storage and transmission of knowledge, all of which have come to represent the central axis of businesses and organisations immersed in the development of a global market.

So, does this mean that we compete with all the organisations in our environment? Most certainly yes, and in far more difficult conditions than previously. Furthermore, the application of technological innovation implies entering into cycles of activity that occur at a pace that might result too fast for us.

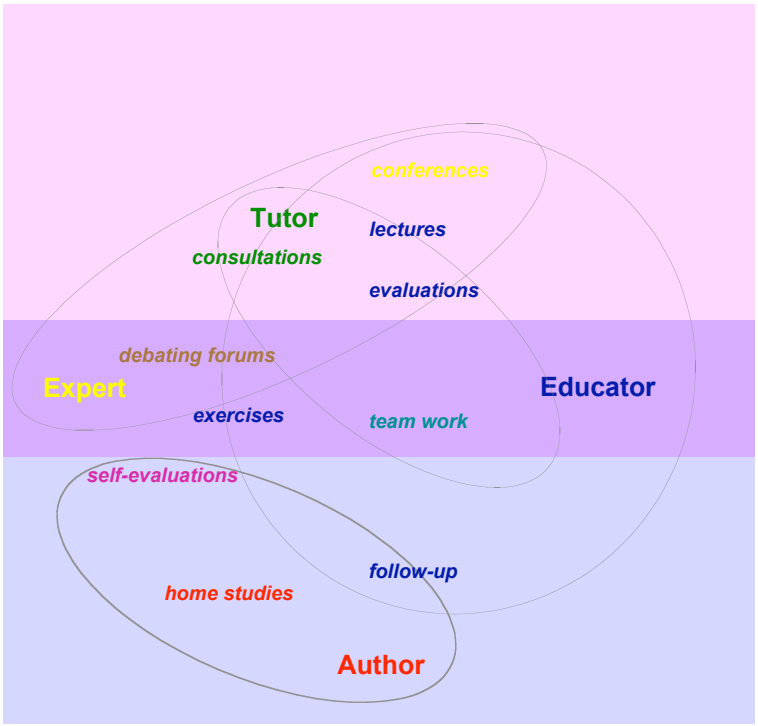
Division of labour in the educational space

The division of labour that marked the industrial era never became a reality in the educational field, which has fundamentally continued to apply an artesanal approach that can be summed up as 'the teacher does everything[xii].

The first organisational implication deriving from a hybrid model of educational space is the division of labour. Rather than merely give class, a teacher becomes a professional educator whose principal mission consists of co-ordinating and following up on a process for both transforming information and contacts into knowledge and for facilitating learning. The teacher's function, which currently consists of a presentation of content, will gradually be displaced so as to include roles as consultant, expert, advisor or animator. With improvements in self-learning materials and technological enhancement of teacher performance in the teacher-

student communication process, it seems reasonable to assume that teacher efforts will be aimed more at content improvement, personalised attention to students and the development of motivational activities.

The following figure may be useful from the perspective of evaluating division-of-labour alternatives for educators.



Educators in their role as co-ordinator interact with other others participating in the process, as follows:

Roles	Shared	Supervised
Educator-Tutor	Follow-up and support to team work	Follow-up to consultations
Educator-Author	Preparation of self- evaluations	Follow-up to the production of home-study materials
Educator-Expert	Preparation and animation of debating forums	Organization and follow-up to conferences and visits

Neither educators nor students are ready to deal with sudden changes and so this process, which will require a great deal of effort, will be a gradual one.

Participation

One of the keys to a new organisation of education - one imposed fundamentally by the human element - is participation, and participation in decision-making is fundamental to the decisions being taken on board by the learning community.

The universities capable of adapting to this new environment will be able to move directly from the proto-artesanal stage just described to the approaching post-industrial stage based on knowledge management.

Education as a business

Economic agents tend to show an interest in education when it begins to suggest business. However, it can be claimed that rejection by the academic community is almost certainly guaranteed if large businesses, publishers and communication groups demonstrate a sudden and renewed interest in education. We academics do not perceive education as a business; nor, as knowledge workers, do we like to feel we are part of a moneymaking machine.

The innocent discourse between defenders and detractors of the ICTs in teaching has now shifted towards a possibly more important debate - between managers and administrators on the one hand, and educators and academics on the other. The former see the ICTs' potential for reducing costs and exercising more control over the former. We have already argued that the ICTs change the artesanal nature of teaching; however, this does not necessarily mean a reduction in costs, since there are many other collateral costs involved in improving educational quality.

That said, it will not be possible to apply classical economic models, given that these will not take account of the fact that since each academic is a link in a knowledge network, the knowledge society leads inexorably to a certain degree of self-management.

A new cost structure

Administrators should not assume that academia can be organised in the same way as a kitchenware factory. And neither should academics reject on principle any economic analysis of their activities.

The introduction of ICTs changes the cost structure, due fundamentally to the fact that an on-going investment effort is required. In traditional on-site training most of the operational costs are those associated with the classes given by academics, whereas for distance education the most important costs are those deriving from a depreciation of the technological infrastructure occurring at relatively short time intervals. In training that involves both on-site and distance elements, both kinds of costs must be taken into consideration, perhaps with a somewhat more complicated breakdown that reflects the division of labour.

Research

The Internet, as we have seen, enables information management spaces - and, by extension, knowledge and learning management spaces - to be developed by communities composed of individuals. Apart from the use of virtual spaces as a tool, the design and development of these spaces and the techniques for exploiting them constitute a new knowledge and research environment that the universities will have to make available to their students and teachers.

Research constitutes the component which closes the circle of systems development that enables hybrid learning spaces to be developed.

The future scenario

In the world of information technologies, evolution is gradual. We are only just beginning to define the complex convergence and complementarity phenomena that are taking place.

Nonetheless, these phenomena continue to be difficult to predict because the limits to the traditional frontiers of human activity are shifting without warning. In university training, however, the frontiers are –as we all know – enormously rigid. The current university model treats knowledge as coming in 'lots', as in the estate agent's meaning of the word. The complementarity and convergence that are being generated – not only in technology, but also in the services and, by extension, in society - do not have a parallel in university education. For

continuous training, however, entirely open as it is to individual initiative and not confined exclusively to the universities, this is fortunately not the case.

5. References

Alpiste, Francesc (2002). *Modelo para el desarrollo y explotación de productos y servicios multimedia en los proyectos de formación a distancia.* Doctoral thesis, UPC, Barcelona.

Bates, Tony (2001). *Cómo Gestionar el Cambio Tecnológico.* Barcelona: Gedisa,.

Brown, John S. and Duguid, Paul (2000). *Social Life of Information*, Boston: Harvard Business School P.

Drucker, Peter (2000). *El management del siglo XXI*. Edhasa.

Gilder, George (2000).*Telecosm*, The Free Press.

Kurzweil , Ray (1999). *The Age of Spiritual Machines*, New York: Texere.

Monguet, Josep et al. (1999).*Gestión y Organización de la Producción.* Barcelona: Edicions UPC.

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[i] For the professional of the 21st century, and in particular for the educator, the Internet is an essential tool for a knowledge worker development, according to Peter Drucker. For Drucker, the new workers in the information society are, unlike workers in the industrial era, accumulators of know-how, knowledge and experience. Thus, the means of production pass, at least in part, from the organisations to the workers. These new workers, whose raw material is information, need above all to be autonomous and capable of managing themselves. The question to be posed is not so much 'How do I do this?' but 'What do I have to do?' In this framework, having knowledge does not guarantee results but will certainly make them more likely.
For organisations locked within a closed cycle of learning, innovating and improving quality, the efficient management of information and communication processes is fundamental. The virtual spaces in the Internet not only facilitate this management but in fact make it feasible.

[ii] Co-operative work techniques and methods require our particular attention, particularly in organisations where we do not work in isolation but in teams, interacting with others and needing to understand their contributions so as to fit them with ours.

[iii] The new technologies provide new opportunities and options for educators. To the greater frequency in updating content can be added the efforts required for the development of content and a greater interaction with students - all thanks to the Internet.

[iv] The communications scenario has changed –in the words of Gilder– from the 'Bell pyramid to the Tower of Babel'. Due to cost barriers, the Internet and the services it provided were previously the preserve of the larger organisations. Since the mid-1990s, however, they have become an almost universal resource, not only available to smaller businesses and organisations but also to individuals. Costs and services are evolving in inverse proportion, with the former decreasing and the latter improving at an exponential rate.
The number of mobile telephones now surpasses the numbers of computers and, very soon, telecomputers (teleputers) will outdo our present computers in terms of power. According to Gilder, bandwidth is increasing at three times the rate of computer power. Computer power, which itself doubles every 18 months, according to Moore, has to be multiplied by bandwidth, which doubles every six months. What this means is that Internet traffic will increase significantly in the coming years. Windows will no longer be adequate and we will soon require many ports to be able to efficiently navigate virtual space.

[v] Based on data supplied by http://www.telefonica.es/ and http://www.aimc.es (Estudio General de Medios).

[vi] An architectural metaphor enables us to comprehend a culture of space; engineering reminds us that these spaces are dynamic and must be organised in such a way as to make them operational; and finally, psychology provides tools that help us understand the behaviour of individuals in virtual space.

[vii] The development of the Internet is taking place in the framework of a process described as a convergence of technologies and services. Technological convergence assumes that all the telecommunications networks tend to converge towards a single network, given that they are all channelled towards the same kind of digital information. Likewise, the architecture of personal computers will form the basis for all the communications devices, in particular, telephones, videos and televisions. The convergence of services assumes that certain activities, previously isolated due to the technical infrastructure used, can no longer be easily differentiated given that they share the same space and methods of communications. The frontiers of the activities of some organisations, but particularly those providing services, are being redrawn and a new kind of multi-disciplinary organisation is being devised.

[viii] "Modelo para el desarrollo y explotación de productos y servicios multimedia en los proyectos de formación a distancia". Doctoral thesis by Francesc Alpiste Penalba, UPC 2002.

[ix] The UPC teacher training programme (http://www-ice.upc) is designed to train teachers to develop content in a variety of multimedia formats.

[x] Of all the possible designations, 'virtual space' was selected as being the most generic term.

[xi] The generation of the1980s is the first to have availed of electronic leisure from infancy.

[xii] This artesanal approach is applied even in training situations that involve the use of the ICTs. Bates introduced the concept of the 'Lone Ranger' who, with just one assistant ('Tonto'), is capable of dealing with the entire chain of activities (including sale) involved in training at a distance or ICT-supported training. In continuous training - in Spain usually funded by the user - it is normal for the teachers to market their own courses.