Architects in the Information Society: the role of New Technologies

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New Technologies (NTs) offer us tools with which to deal with the new challenges that a changing society or workplace presents. In particular, new design strategies and approaches are required by the emerging Information Society, and NTs offer effective solutions to the designers in the different stages of their professional life, and in different working situations.

In this paper some meaningful scenarios of the use of the NTs in Architecture and Urban Design are introduced; the scenarios have been selected in order to understand how the role of architects in the Information Society is changing, and what new opportunities NTs offer them.

It will be underlined how the telematic networks play an essential role in the activation of virtual studios that are able to compete in an increasingly global market; examples will be given of the use of the Web to support activities related to Urban Planning and Management; it will be shown how the Internet may be used to access strategic resources for education and training, and sustain lifelong learning.

The aforesaid considerations derive from a Web-Based Instruction system we have developed to support University students in the definition of projects that can concern either single buildings or whole parts of a city. The system can easily be adopted in the other scenarios introduced.

Keywords*: Architecture, Urban Planning , New Technologies, World Wide Web, Education*

Introduction

In the rapid development process of information technologies, we can identify two milestones in their diffusion through all professions. In the middle of the 1980s, the Personal Computer appears on the market. The personal computer is less expensive than microcomputers, and much easier to be used. As a consequence, the computer technology, which had supported the job of a small number of architecture professional studios, attracts more and more professionals that can afford the reduced costs of the technological equipment and the necessary training [Klosterman, 1999] [Sacchi, 1992].

During the following years, architects experience the benefits of Computer Aided Design (CAD), and a wide range of computer-based tools and techniques for the designer becomes available. CAD packages, cartographic data sets, specialised databases, expert systems and other software solutions, can support the main phases of the design process, thus proving that the technology can affect the way a project is

conceived. It is the beginning of a cultural revolution in Architecture, which will require the revision of the traditional “modes” and “places” of the project.

However, the moment that enacts a clear change in the way of doing and conceiving the Architecture is certainly connected to the New Information and Communication Technologies (NICT’s; shortly New Technologies: NTs).

They offer huge potentials to an architect and, at the same time, they issue interesting challenges to the profession and, to some extent, can affect its cultural horizons.

The potentials of NTs for architects are due in part to the steady growth in power, capacity, and speed - and decrease in cost- of microprocessors, optical memories and other microelectronic devices.

The increased memory capacity allows architects to store, retrieve and explore many design solutions, and to handle huge quantities of data and information related to the architecture; powerful microprocessors allow an effective use of advanced representation techniques to get really effective spatial simulations. Specifically, Virtual Reality, the new real paradigm for representation, enables the interaction with the designed (and not yet built) architecture. This kind of interaction is unique, and it allows designers and planners to work directly on the 3D virtual space [Maldonado, 1992].

A further benefit of using powerful computers is the opportunity to experiment innovative architectural forms; excellent examples are the Paul Getty Museum in Los Angeles, by Richard Meier [Meier, 1997]and the Kansai airport in Japan, by Renzo Piano [Piano, 1995]

Finally, low cost microprocessors can become part of a building, both to control the correct activity of the many technological infrastructures and systems which nowadays are located in a modern building and to collect data on the life of the building, thus providing an architect with dramatically useful information on the design, construction and maintenance of a building [Schmitt, 1998a].

However, improvement in microelectronic components is only one reason of the potentials of NTs for architects. Actually, the renewed interest in the role which computers can play in planning research and practice is mainly due to the incredible growth of the telematic networks. This growth has dramatically changed the idea of computers: they become the door to a real new knowledge and communication global system, the Cyberspace [Mitchell, 1995].

Telematic Networks and Architecture: new opportunities and new challenges in the Information Society

Telematic nets make the creation of “cultural integrated products” much easier than in the past; these products are generated by a number of “cooperating intelligences”, even if they are not in the same physical place. This is particularly meaningful in Architecture in general, which is intrinsically based on a synergetic approach by more operators.

Nowadays, this requirement is much more pressing, since the architectural project has become an extremely complex and articulated production procedure, with a greater and greater plurality of competencies working on it and interacting during its whole duration. In the past, the necessary strict relationships could be reached only by having all the operators in the same work place for long periods, or through a very complicated continuos check-assess-refine cycle for each provisional result of each operator. NTs can now provide new effective digital tools which support team work, thus encouraging the establishment of Virtual Design Studios (VDS’s), a real new job opportunity in Architecture. By using specific cooperative tools, members of these studios can work on the same project by sharing drawings, projects, reports, documents and, above all, ideas and expertise.

At the same time, telematic networks issue new and stimulating challenges to the Architecture. In fact, NTs have removed the spatial proximity constrain and, as a consequence, have changed the way people work and live inside and around the Architecture. The new Architecture therefore, must be developed

according to these modifications, both in terms of spatial configuration and functional structure: the architecture of the building is to be developed together with the architecture of the communication services, and the telecommunications infrastructure should be considered as element of its basic structure. In turn, this "intelligent architecture" is only effective in an intelligent urban context, so that similar considerations should be done for urban planning.

A Web-based system to support the use of the Net in Architecture

At the Italian National research Council, we have defined and implemented a Web based learning environment to support new didactic approaches to Architecture and Urban Planning and fulfil the need of a common knowledge base for design, which integrates a variety of data and information gathered from different disciplinary contexts.

The system is organised in two "work areas" respectively named "Analysis Area" and "Design Area".

The Analysis Area organises -in a hypertextual way- the "external" and "objective" information necessary for the design (data on the town and on particular areas, the context for a new building, building regulations, administrative laws, formal and bibliography references, and so on). Basically, the Analysis Area represents an information repository for on-line design modules activated on and managed through the system. Through the hypertext organisation of the Analysis Area, information can be organised at different levels of detail, thus allowing different categories of users to search and navigate through the information network; in such a way, planners would be able to find all the information they need for their activities in a single system; similarly, students would be encouraged to compare the different approaches by different disciplines to the same problem in a single study environment. System-known users can modify the information network by adding new Web pages and links; links can be to information nodes inside or outside the Analysis Area.

The Design Area provides an innovative cooperative design environment. It integrates most of the communication mechanisms available in the Net (e-mail, electronic discussion forums, video-conference system, chatting), in order to provide an effective cooperative work and learning environment. In addition, it includes tools to support the "control" of the project (virtual galleries, shared blackboard). Finally, it provides tools to carry out activities typical of the design laboratories. It should be noted that all these features are integrated with the information network in the Analysis Area.

The designed system can be adopted to create distributed learning experiences where the remote students share different cultural and study backgrounds, as well as effective cooperative work sessions between professionals. A detailed description of the system can be found in [Corrao, Fulantelli, 1998] and [Fulantelli, Corrao, 1999].

In the next sections, we report on the use of the system in some application scenarios. Some of the presented contexts are not strictly related to educational purposes, since the system can be easily adopted in different settings.

New Technologies for University Education and Lifelong Learning

One of the most important aspects of NTs concerns the way the networks modify and diversify teaching, studying and learning methodologies. Distance Education and Lifelong Learning – which are considered to be essential in an every changing society and central to the growth of every profession in the Information Society– have a special meaning for the Architecture.

From an educational point of view, it should be noted that the introduction of NTs at University graduate level is important in two ways: on one hand, NTs can support the teaching of disciplines, such as Architectural Design and Planning; on the other, it is necessary to encourage the use of NTs for planning

activities beginning from the University, in order to lead future architects towards the consciousness of the importance of technologies for their job.

The special meaning of Lifelong learning for architects is due to three important factors; firstly, many of the tools an architect uses in his/her job are based on technologies; secondly, "intelligent buildings" require continuos training on the quickly updating communication infrastructures to be included into the project of the building (and of a city); finally, as we have already said, networks are deeply modifying the way people live in the city and, therefore, the same idea of "city"; consequently, architects should be able to foresee these changes, which is only possible if they participate into the change directly.

Nowadays, telematic networks offer many effective resources and solutions for education and training; following, we report on the activities of a Virtual Class which get access to on-line educational and training modules through the system we have developed. The Virtual Class can include students of graduate courses in Architecture and Civil Engineering from universities world-wide, or can be made of professionals working in different parts of the world, thus increasing the role of cultural exchanges between people with different backgrounds. Teachers and trainers can be experts from the international setting. The system can be used to activate several modules at the same time, provided that the Analysis Area contains the related information.

Students and trainees gain access to the system through their Home Page, corresponding to a personalised access point to the Design Area; from this page, they can read the assignments for the course, have access to all the available communication and working tools and enter the Analysis Area. Students and trainees can explore the Analysis Area to gather information necessary for the assignment: this could consist, for example, in the production of design solutions for one of the areas described in the information network. Gathering of information can be extended beyond the limits of the Analysis Area: in fact, system users can connect to remote web sites explicitly linked from the Analysis Area pages or directly suggested by other users. Actually, links to external sites allow architects to be easily informed on other projects all around the World. In addition, documents related to the assignment can be exchanged through a specific section of the system.

Asynchronous communication tools allow students and trainees to cooperate on the given assignment; public discussion forums are provided to allow them to exchange information, comments and personal considerations.

Teachers and trainers can also meet course attendees in a chat room or through the video-conference system. A shared electronic drawing board can be used to perform revision tasks, in private or public sessions. Final versions of the projects developed by the attendees can be published in Virtual Galleries (a VR Gallery is provided for projects in VRML).

New Technologies for Urban Planning

During the last decade, a great deal of research activity and experimentation has focused on new methodologies aimed at the refurbishment of the contemporary city or of parts of it.

The widespread change in the productive activities, which is making the traditional organisation of the city obsolete, and the increasing attention to sustainable development, are invalidating the mono-functional conception of the different parts of the urban organism and are significantly reducing the separation between Urban Planning and Building Construction. As a consequence, a more intimate relationship between public and private sectors have developed as the possible driving force of the urban refurbishment processes which are aimed at improving the quality of life.

All this has produced a great increase in the number of interlocutors involved in the planning process and a notable complication of the procedures

necessary for its activation and management.

The rapidly increase in the involvement of the citizens in the identification of the needs for the improvement of the area where they live and in the assessment of the design solutions proposed by the planners can be effectively improved by NTs. To some extent, citizens will be able to verify the job of the planners and to affect further developments. Therefore, networks allow Society to participate effectively in the urban planning process. Traditionally, participation is limited to the final phase of a project, when it is presented at council and public meetings, conferences, and so on.

But this is not all. With the support of the system, the public authorities that control and assess the projects can carry out their duties more easily. For example, they can verify whether the projects conform to the rules and whether they are within the financial budget, without having to wait for the final versions of the projects, thus intervening, if necessary, while the work is still in progress.

Therefore, these potentialities, which have only been mentioned briefly, will enable citizens and public administrators to participate in the planning process; they will act as "project advisers" rather than as simple "controllers" or "customers".

The system we have developed can be easily adopted for the activation of design experiences that entail the effective collaboration of planners, citizens and public authorities. Through the publication of multimedia information in the Analysis Area, even a citizen with no specific technical background is enabled to understand the urban projects. In addition, the Virtual Gallery could be used to let citizens and administrators have access to the design solutions rendered with the most effective graphic visualisation systems.

Through VRML, for example, non expert citizens, who usually have difficulty imaging the real spaces when they are represented in the classical bi-dimensional forms (plans, prospectuses and sections), could virtually live the proposed future organisation of the areas considered by the project. In addition, they will be able to express their opinion through the communication tools integrated in the system. Synchronous video conferences integrated with asynchronous discussion forums can guarantee a more effective exchange of information and opinions between planners, administrators and citizens, thus overcoming the time and space constraints typical of traditional meetings.

Similarly, the system could be used to support public competitions aimed at the refurbishment of a city or of parts of it. Through the system, in fact, it will be easy to encourage the submission of projects by young architects world-wide, that might work - according to the Virtual Design Studios paradigm- with local architects; in this case, local architects would be the expert of the site for the project, and might find in their foreign colleagues (and in their cultural backgrounds) new design stimuli. Such a kind of concourse might stimulate competition, thus arising the level of the submitted projects.

New Technologies for Urban Management

The need for continuous and updated exchanges of information between the Public Administration and the different contributors that can lead to more effective urban management and to more careful control of it, can be met with the use of the NTs. The availability of several Territorial Informative Systems (TIS) has already highlighted the advantages of such a use of the NTs, even though there are difficulties directly connected to the activation of these systems.

The need to coordinate the numerous institutions involved (local city transport companies, the gas board, the electricity board, water board, town council offices, housing offices, registry office, local health services and the University) and the long time needed to set up a TIS (based on cartographic and alphanumeric DateBases) require huge investments in human and economic resources and involve a review of the tools and the methodologies which are traditionally adopted for urban management.

However, a number of successful experiences involving the "intelligent urban management", especially connected with the traffic management and the control of environmental pollution levels, allow us to envisage an increase in this kind of investment [Malosti, 1997].

The system we have developed has the potential to manage and control a city, since the information base (the Analysis Area) may be integrated with TIS and GIS systems available on the Net. The possibility for system known users to create links to other systems will allow them to extend the Analysis Area, and to refine the research activity according to their specific demands.

Structural and associative links are extremely useful to organise the data produced by different institutions into a coherent information set. Remote access to the system guarantees easy mechanisms for updating data in the different sections of the system, thus providing planners with the correct parameters during the whole design phase, and avoiding a project becomes obsolete before it is completed.

Conclusions

Finally, we introduce some ideas which are not explicitly referred to a specific technological solution applied to a well defined context in Architecture; rather, these final considerations concern the future of the relationships between Architecture and New Technologies.

As told before, NTs are changing the idea of the city as an aggregation place; according to many authors, cities are extending towards the Cyberspace; actually, Cyberspace is already a social space, where people can learn, work, make business, meet other people, and so on. Civic networks are an impressive example of this phenomena.

Therefore, it is extremely important to reflect on the potential role of Architecture in this new space, that is changing the meaning of geographic boundary, physical limit, and topological area.

Firstly, there is the risk that this progressive and continuous reorganisation of activities in the virtual architectural and virtual urban spaces isolate the man. It is therefore mandatory for the architects to create, inside the urban setting, new elements of social aggregation. In many European cities, a similar need concerns industrial areas which are now in disuse; architects are challenged to bring people back to these areas. (It should be noted that most of the industrial areas to be recovered went in disuse because of new production systems enabled by the NTs).

However, the debate on the role of architects in the cities of tomorrow is mainly related to deeper transformations: according to Schmitt, it is the beginning of the Information Architecture: "In the future, architectonic activities will be not limited to the design of physical buildings, but move towards virtual constructions"[Schmitt, 1998b].

As a matter of fact, the role of Architecture will be modified: "Nowadays, the work of an architect is limited to the design phase. In the future, it will cover all the aspects, from the project to the maintenance of the virtual structures. Architects with virtual design knowledge and skills will be able to design as well as to program a virtual building."

In authors' opinion, the Cyberspace architect will be not only related to the present architect, rather it will require a mix of architectural and technological competencies and skills. In fact, "The classical and important properties of Architecture - *firmitas, utilitas* and *venustas* – gain a new meaning in the information era, and will be directly related to the information architecture. *Firmitas* will refer to data bases and to data security aspects in the virtual structures, but also it will refer to the validity of new ideas. *Utilitas* will be related to the performances of the virtual structures as experimentation and work places. *Venustas* will indicate the elegance of the information structures and of their presentation, according to the grade of satisfaction associated with the use of the interface." [Schmitt, 1998b]. We absolutely agree with Schmitt on the fact that architects, trained according to the new paradigm, will be able to improve the information

territory, by transforming it from an abstract space (with many nodes connected by data highways) into a real cultural and architectonic space.

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