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ICT Influence on Spatial Planning, Building and the Built Environment

Abstract

The building sector is entering a new era. Developments in ICT have an impact throughout the entire life cycle of a building and the built environment. Through changes in daily life it will influence; the spatial planning, the urban structure of the future, our cities and the living environment. It shows already its influence in our way of living, our habits. The gap between creative design, which is done by means of advanced modelling software and the building technical aspect of designs, is getting bigger. ICT and Internet technology provide a closer link between the participants in the building process, their activities, knowledge, and information. Collaboration and communication within ICT techniques will be the future of the building. This paper provides a vision on the influences of the future ICT developments in spatial planning, architecture in general and focuses on the influences of the building sector in the above-mentioned fields.

Resumen

El sector de la construccion esta entrando en una nueva era. El desarrollo de la tecnología de la informació y comunicación tiene un impacto en el ciclo vital de un edificio y su entorno construido. Influira en el planeamiento espacial, estructura urbana del futuro, nuestras ciudades y nuestro entorno vital a traves de los cambios en nuestra vida diaria, la cultura. De ahi que los edificios, el entorno construido y el diseno arquitectonico en si mismo evolucionaran. La TIC ha comenzado a mostrar su influencia en nuestro modo de vivir, nuestras costumbres y a largo plazo en nuestra cultura, como en el caso de la Red. Tambien provoca cambios en la manera de trabajar, comunicar, construir, y en el aspecto creativo del diseno en el sector de la construccion. Aumenta la distancia entre el diseno creativo, modelado mediante software complejo con complejas formas arquitectonicas, y su materializacion. Los tecnicos de la construccion deben ser conscientes del hecho de que esta distancia crece rapidamente como resultado del avance del modelado mediante software. La TIC y la tecnologia de la internet proporcionan una conexion mas cercana entre los participantes del proceso constructivo, sus actividades, conocimiento e informacion. Collaboracion y comunicacion con la TIC seran el futuro de la practica de la construccion con respecto a la mejora en eficiencia y calidad en este sector. Este texto da una vision en la influencia del futuro desarrollo de la TIC en el planeamiento espacial, aquitectura en general y se centra en las repercusiones en el sector de la construccion de los campos anteriormente mencionados.

Introduction

During the ages, every technical invention and development has resulted in advantages and disadvantages, which have influenced the well-being and prosperity of mankind.

These developments had fundamental influence on the behaviour of man and therefore on society. This influence can be seen in every level of daily life such as living conditions, housing and recreation and change our habits and finally the cultural changes. The infrastructure development is one of the many examples. The medieval cities were small and fortified with city-walls and the narrow streets were designed for coaches. These cities became larger and larger due to the inventions of motor vehicles and trains. They are being the concentration-points of employment with many new activities and jobs such as factories, universities, commercial companies and cultural centres.

The technological inventions had also an impact on the way of gathering knowledge collected and distributed it. The invention of the book print made enormous contribution for distribution of knowledge. Later the telephone, telegraph, radio and other communication technologies arrived within the last 200 years.

The integration on digital technology and the computers resulted in the developments of communication technology and the introduction of the term ICT (Information and Communication Technology).

The developments in ICT and especially the Internet are bringing us into a new era. The communication, information and knowledge exchange is proceeding at an extremely fast pace. Integration of these technologies, by various information streams and other media has brought enormous possibilities for the user.

Via the laptop or Palmtop, we can send e-mails from everywhere all over the world; we can make telephone calls, listen to the radio, watch television in our own language, make video-conferences, tele-banking, read newspapers, get advertisements and gain access to any possible information on what is happening elsewhere in the world and do distance learning, etc, etc…

By means of GPS (Global Positioning System), we can reach anyone anywhere at any time. So, the 21st century man has become space-less and timeless, but not infinite!

ICT and its effects on Spatial Planning

It is very difficult to say simply how the ICT influence will be on spatial & urban planning, because the topic is almost new, very complex and there is no empirical research on the subject. But, it is clear enough to say that the influence is not direct but indirect via the *social & economic trends*. These trends will cause changes in the *behaviour* of the individual people in society, economy and as a result in the culture. Therefore the human being will have new requirements concerning his daily life activities such as living, recreation, work, his home environment, mobility (transport), and new requirements concerning infrastructure in its normal context as well as information infrastructure. As a consequence of these changes we will get influence on the spatial planning of our living environment. In fact this will happen in a circular movement and it is a 4 dimensional process. Everything influences each other, and connected to each other in time and space.

ICT influences on building design

Till now, the use of ICT in the building process is as a *tool,* as an instrument for achieving a specific result and slightly being a new *medium* besides the existing media. Especially the widespread use of the Internet and the developments of the Web have pushed the computer into the role of a medium.

We are now at a stage in which ICT allows us to develop new techniques and methodologies where the computer can be used as a *partner* by means of knowledge integration, decision support, and artificial intelligence. Decision support systems allow the computer to support the user through knowledge provided by experts or by the user. The computer can also be a partner when we teach it things it can reason with. It can even be a valuable and reliable friend when we let it solve problems that are not clearly defined, fuzzy, or uncertain. It can also assist us in generating shapes by processing information that influences the shape, supported by self-learning techniques. Here, artificial intelligence techniques such as fuzzy logic, genetic algorithm and neural networks play an important role.

figure 1

ICT and handling complexity

The buildings are getting more complex, not only in their shape and function, but also in their infrastructure: their techniques and their communications. Therefore the design process is also becoming complex in the sense that many, often conflicting, interests and criteria are involved, and that many different types of expertise are required to find an optimal solution. These requirements concern aspects like usability, economics, quality of the shape and space, social aspects of architectural design, technical norms or laws, and technical and mechanical aspects of the design.
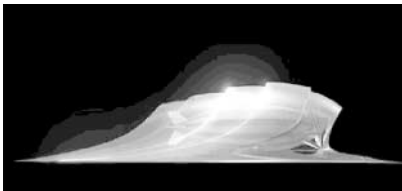
Building design is a multi-actor, multi-discipline, and multi-interest process. The process of decision-making is often intuitive and based on experience. In this respect, the ICT tools and their integration form an essential component in the knowledge integration process of the various disciplines. The management of the Information, Communication and the Collaboration between the partners in this process has to be done in an efficient way. Collaborative engineering techniques can be a good start to reach this goal.

figure 2

ICT & impact on creative design

Architecture deals with *alpha*, *beta,* and *gamma* sciences. This requires the designer to have the skills to integrate the various disciplines of knowledge, involving besides the artistic form expression of the building also building physics, applied mechanics, building materials and techniques.

As a result of developments in advanced modelling software, and its use for architectural design, the gap between the architect and the building technician or product architect is getting bigger. The developments in the field of building technology and building materials have not followed these advances in modelling software, so that they can no longer fulfil all the requirements and demands of the new architectural shapes. The Guggenheim Museum in Bilbao-Spain, designed by Frank Gehry, is a prime example. We are already educating our students with these advanced software techniques. ICT may play an important role in narrowing this gap.

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ICT in architectural education

The possibilities which ICT offer, will have an impact on the way how, where, when and what we learn. We see growing possibilities on the Internet for Virtual Universities. The traditional universities are also placing their teaching material on the web. The student of the future will be a mobile student who will be able to work at any time and from any place, at any age and this requires another approach. Therefore the distance-learning possibilities will gain an important role in the future of the academics, for who are involved in the education.

Figure 1,2: Design of an airship hangar by the student Remco Wilcke

The architect of the future must be able to use the computer not only as a tool and medium but also as a partner and be able to integrate the ICT tools for his/her specific needs in the design process for Knowledge Integration, Advanced modelling techniques, and as a support environment during the design process.

The influences of ICT in architectural practice is that the modern architecture in all over the world has the same characteristics. The architecture gets a more MONDIAL character. The side effect of this is the loose of cultural identity of the local architecture. Therefore the faculties that teaches architecture education should be aware of this fact and ensure that cultural values do not disappear.

Conclusions

The ongoing developments in the field of ICT have an important impact on the spatial planning, architecture and building sector. The requirements and needs of the society are changing and this can be seen in our daily life such as living, recreating, transport etc. This in turn results in changes to spatial Planning.

The influence of ICT can already be seen in architectural design. Designers can allow ideas and intuitions to take physical shape in ways that have not been possible before. At the same time, technical developments in the building industry are lagging behind and alternative, innovative solutions have yet to be adopted. As a result of creative software tools, the gap between the designing architect and the building technician is getting bigger. The architecture is becoming more MONDIAL and the local and the cultural architectural aspects need to be paid attention.

Collaborative engineering will pervade the building design process. Ongoing developments of Internet technology require other way of design management and communication (data and partners communication) in the building process.