

The future of Architectural Design Practice within ICT developments

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Design in general is analyzed and the use of ICT tools in architectural design practice in the design process explained. The place of the designer in the history and the future of the designer within the ongoing development of the ICT overviewed. The influence of the new technologies on the design and its process therefore the impact on ICT use in the practice clarified. The future perspectives of an architect as a profession and the place of the architect in the whole design process speculated. Architect as designer, as a product and process architect mentioned. Finally the influence of these changes on the architectural education reflected.

Introduction

Architecture, as a profession deals with two main categories of studies: *Alpha* and *Beta*. The integration of these both studies makes the architecture extra-ordinary, unique. The beta-mind as a scientist brings the objective outside world of the facts of logic with the rational mind culture. The alpha-mind brings as a culture the subjective outside world of the beauty and moral, with the artistic intuitive soul. The combination of these both minds makes the person complete and this completion can be seen in the architect. That is why the architect as a professional unique, comparing with other professionals. [Br98]

Architecture is a discipline, which is the mixture of exact sciences and the art. Architect has to combine these both elementary aspects in the design besides the social aspects. The study of architecture as an independent study occurs after the Middle Ages. In the Middle Ages the form of an architectural object was never considered isolated from the technical aspects of the design. The designers of the buildings at that time were not architects but the real craftsmen. They had to have practical experience to become a building master, which took years. If we think of the French cathedrals for example, these buildings were built in hundreds of years. There was no one designer who gave the form to these buildings, these buildings developed themselves within the time itself by various technicians and artists. Later the design introduced as an apart discipline by the French and the architecture became a new study.

The industrial revolution and the technological developments had remarkable influences in how people built and designed. Architecture as a mixture of creative design and building techniques, besides the social aspects has to coop always with these developments. This means that the architect has to have skills to integrate the various disciplines of knowledge which involves in this whole process of design such as dimensioning of the construction, building physics, applied mechanics, calculation of structures, building materials and techniques besides the

artistic form expression of the building. The most famous architects, like Santiago Calatrava are the ones who has the ability to combine these various disciplines in their design as architect and building engineer at the same time.

In our architectural practice, the old craftsmanship, which mentioned above has been complemented with a new craftsmanship, in which the knowledge used in the architectural design process is coupled with the machine. So the computers came up to stage in architect's world and in the last decade architects had to deal with the developments of the Information and Communication Technology (ICT) as well. On the other hand there is an enormous increasing demand on the well-educated building engineers and architect's on informatics in the whole world. Recently, published report of the Dutch Council for Science and Technology approves this statement also. [AWT98]

The designers role with respect to the ICT technology

The first introduction to computers in architectural design, comparing to other engineering disciplines, came much later. The CAD software developments were mainly done for other engineering disciplines such as mechanical engineering, aerospace engineering. Later the architects also have seen the necessity of these tools and they took it over to use them only for drawing purposes. Later the various CAD software developed. First as 2D and then the 3D software came to the market. Seen these historical developments of the use of information technology in architectural practice, (which is not so long ago) we see that the computers were put into the practice as a tool to these following purposes till now:

- 1- Information processing tool
- 2- Communication tool
- 3- Interactive Visualisation tool

They are mainly used into processes such as animation, simulation and the whole spectrum of visualisation interactively. In our days they are not any more only a visualisation, communication and information processing tool, they are used for more purposes. They are becoming a new medium besides the other existing media within the architectural design process [SDC98]. Especially the widening of Internet opened the horizon that computers became more and more a medium.

All these 3 category of computer use has the purpose of improving quality and efficiency of the building design and the design process.

In the very near future, computers are going to be even more than a medium. They are going to be partner, which offer support in the whole design and building process. [Schm97][McCu96][SCVS98]. From this starting point we can add to those purposes referred above two more as 4th, 5th and 6th category of tools that the computers can be seen as a partner when they are put as:

- 4- Knowledge Integration tool
- 5- Decision Support tool
- 6- Design tool

The use of computers in the design process as a communication, information processing, visualisation tool have the purpose of improving efficiency and upgrading the quality of the design and the building process.

We are now in the stage that ICT technology allows us to develop new techniques and the methods and use of computers as partners in the whole design process, namely from initiative till the demolition by means of knowledge integration, Decision Support and finally the design tool.

During the last years the developments on Internet technology such as HTML and VRML and hardware independent JAVA programming languages will have enormous impact on the building practice. Even now, the architectural offices use the Internet completely to communicate with the partners from the other side of the world. They discuss their design on the white board and they do teleconferencing with the partners. The distances are not long anymore, the world is getting smaller and smaller. This opens the gates to the architects to become a mondial architect. That implies new way of managing, operating, designing, building and constructing and even causes cultural influences and exchange. The architecture will be more and more mondial than the local. We see already many examples of it such as the highest skyscraper of the world in Kualalumpur in Malaysia, which is designed by the Cesar Pelli Associates in USA. In this design we see the strong influence of the local culture by the use of Islamic geometric pattern in the design.

When we look at the latest development in the architectural practice we see that the professional field of architects are going into changes as a result. We can state that the architects in the practice are working in these 3 main categories:

Design architect as creative designer :has as main field of operation the process-steps of concept, decisive design and (a part of the) construction design

Process architect: has a main field of the process of initiative, planning, decisive design, realization and the management of the built surroundings.

Product architect: has a main field of the component information, construction design and realization.

1. Design architect:

No matter which technological development there is, the creative design, which the designing architect produces never changes in quality. Up to the economical, social and cultural circumstances and the time period which designer lives, show differences. The architecture changes also according to the requirements of the societies.

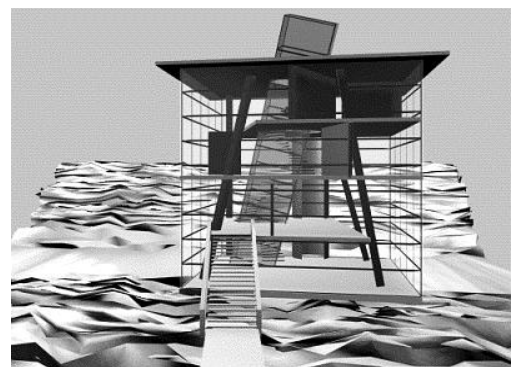
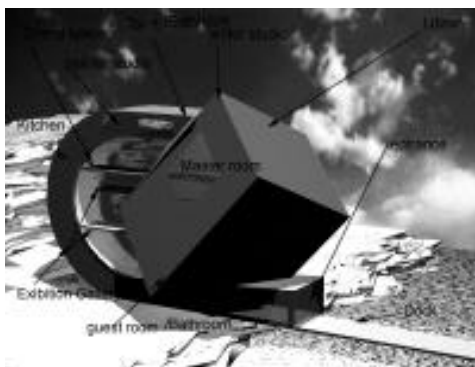
As Panton Cowen says, «it is the ability to create beauty is God's greatest gift to man». It is the whole spectrum of skills, education, and also the God's gift to that designer which makes him/her different than the others. Think of the famous designers as Le Corbusier, Frank Lloyd Wright, Calatrava etc. The technological development surely influence their design, but the technology such as ICT technology can never convert the ability of this creative designer to a computer model. As it was mentioned earlier the architectural design is a mixture of arts and the exact sciences. When we deal with the exact sciences in the design such as building technical aspects, we can convert this expert knowledge to a computer model. If we are concern with the creative part of the design, it is impossible to make a unanimous system or a computer model, which is valid to each designer. The designer can only do the form finding and adding the spatial values in a design. In this respect we can also distinguish architects design from the other design disciplines.

In architectural design, especially in the initial (conceptual) phase of the design there are hardly general, unanimous rules applicable to each design process. The starting point is always different, although there are certain questions that every designer will have to face. Irrespective of whether it is a bridge, part of a machine or a building, every design will start with a series of requirements and after that a concept is developed. Following this phase the various design processes will divert. A part of a machine will mainly be designed with a view to its functional and financial requirements.

A bridge or a toaster, however, should also have other qualities. In this case different added values will be expected, in particular for those regarding quality of form.

From design of architect, people will expect additional value, namely the perception of space. Not only a new building should look attractive, but people should also feel at home inside the building and in its immediate surroundings. In this respect there is a fundamental distinction between architectural design and the designs in most other disciplines. Qualities are not visible, it only exists in man's conscience. In this respect, the role of the ICT tools as a communication, information processing, visualization, animation and simulation is very important, to make the qualities visible.

Fig.1. Form finding during the conceptual stage of the creative design process

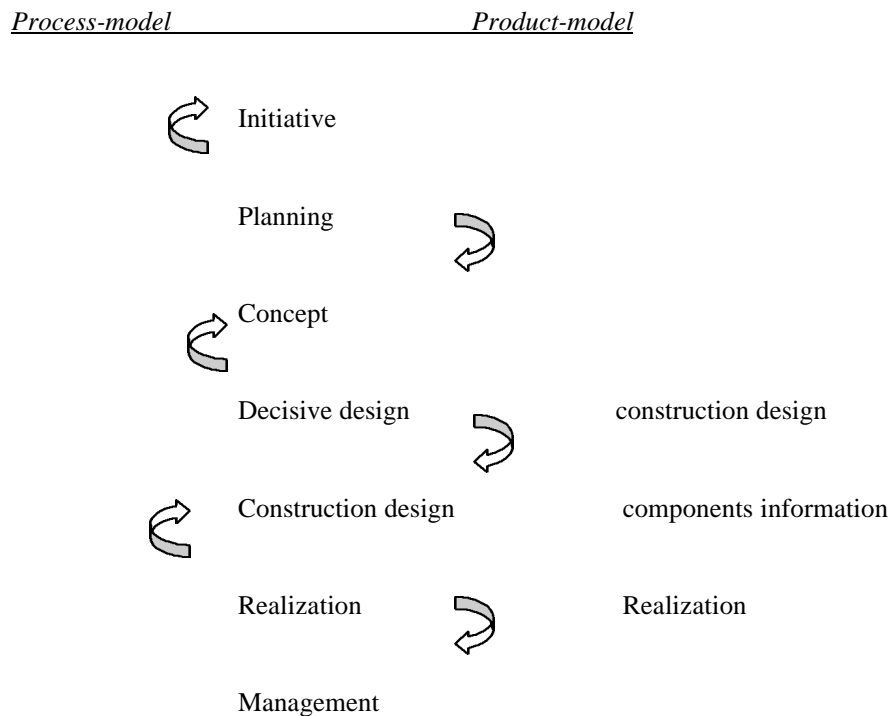


Other aspects such as taking decisions or the integration of the various disciplines of knowledge in one design which plays also an important role in the whole process must be also developed in the near future to reach the better quality, even if it is not visible.

2. Process architect:

The working field of architect as a process architect has the steps of initiative, planning, designs realization and management of the built surroundings.

A survey of the design-process renders us a scheme such as the one below.



Herein two ways of thought can be recognized:

The process model: initiative, planning, concept, decisive design, construction design and realization.

The product model: component information, construction design and realization.

The architect's has a new working field as process engineer. The role of an architect is going to be more and more someone who has overview in the various disciplines of a design process and the management of this process. The ICT technology should be put in for the ordering of information up to the questioner and the information provided by the various partners from different disciplines, which occurs in the design process.

The management of the life cycle of the building can be subdivided in to three main levels.

Market search and Inception

Design and construction

Usage and demolition

ICT should provide upstream and downstream information exchange during these main levels, which is necessary for the future trend of the building management. There is a need for tool integration for the integral building management. Therefore, the Architectural education would be adapted to these new requirements.

3. Architect as a product engineer:

The open markets, international competition and the new technologies force traditional architecture to change. This change now and in the future will not effect architect as a top creative designer, however still there is a need for improving the role of architect as a product engineer for the future. There is a growing interest for increasing the quality of product and process for design and construction projects. Building construction becomes more industrialized by mechanization and the influence of Information and Communication Technology (ICT) and the robots on the site and by extensive prefabrication of building components.

The building itself nowadays becoming more and more is assembling of building components on the site. Especially, from the sustainability point of view besides the efficiency, there is more attention being paid for the development of building components and the assembling and disassembling techniques. Therefore, the architect as product-designer achieves new dimensions in the practice.

In the industrialization of the building sector, such as automotive and aerospace industry, first level of integration of CAD/CAM have been already finished and now they go ahead with second level of integration for intelligent manufacturing of the products. In order to achieve and to adopt these improvements, the architectural process should be reengineered. Although, we can say that architecture has its own difficulties to deal with, for instance buildings are one of a kind or multi fragmented industry, each building itself is a unique object but still there is a requirement for further development.

Therefore, we should be able to model products (buildings) to increase the competitiveness and to apply new Information and Communication Technologies. Day by day, different industries get closer and closer. New standards such as ISO10303 STEP provide information and data exchange in building, automotive, aerospace, shipbuilding sector. As a result architects role as a product engineer getting more and more important. Architectural education would be adapted to these new approaches.

Future perspectives of an Architect as a designer in the profession

The developments on the field of ICT show that the practice of architect's facing with rapid changes. The education at the universities should adapt themselves up to these ongoing developments. The way of teaching design and the tools, which are being used for the design, are now different. The machine is now replaced the craftsmanship.

The building itself is also changed and they became complex. Not only in their *volume* but in their technical infrastructure, communication and the higher requirements for such a building. Above this, the *time* issue is getting more and more important, valuable in our society!. The *time is money* in our information society!. Therefore the buildings have to be built in a higher tempo and in a very short time comparing the past.

As a result of all these items the role of an architect in the whole building process is moving. It is not always going to the right direction perhaps in spite of the profession. The architect's specialist is going to be in danger. The top-designers, famous architects will always remain, but there are only few of them. The other average will more and more work in the field of building management, as a process architect or the product developer at the construction site as a product architect. Building is more and more going to be the assembling of components. Ready-made building components are being assembled at the construction site. We should also take in mind that the robots would be the workers at the building site in the future. At the moment there are for example construction firms in Japan, which constructs the whole high rise building only by means of robots without any human being at the site.

This all implies another way of thinking, designing, managing and operating from an architect. That is why there must be enough attention paid for the architectural education by preparing the new generation of architects for the 21st century.

Conclusions

We can conclude that the architectural practice and the role of architect in the whole building process are changing rapidly. The role of the architect as a designing architect will remain always. The top-designers will have always the same design-task but for the average category of architects, there is a danger that their role will be potentially left to the computers or the people from other disciplines. In this respect the architects has to take care of their profession and try not to loose their own specialists knowledge and place in the building process.

That is why the architecture education must be aware of these developments, changes and orient itself to prevent against this risk that the profession as an architect disappears. Finally we can state that;

The ongoing developments in the field of ICT has an important impact in the design and the building process

The role of an architect is changing, the professional field of the architect can be categorized in 3 main categories: *designing architect*, *process architect* and the *product architect*. Therefore the ICT education at the architecture faculties should prepare themselves up to the changes in the practice.

The architects must protect themselves for the risk that the profession disappears up to these changes.

The architectural education has to adapt itself up to these developments and changes.

In the future, the ICT developments for architecture and building sector will be in the field of knowledge integration and the decision support environment and finally the support in the whole design process from initiative till the demolition.

The most important added value of the ICT developments is that, by means of this technology the various branches of the scientific disciplines comes closer than ever before and working on the integration of their disciplines.

In the future the architects must be able to make their own *computer model* to built up their *specific knowledge* on computer model to use them for their own *support* as a *partner* in their design process.

Keywords

ICT (Information and Communication technology), Architectural Design, Process engineering, Product engineering, Architectural education

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