*ITU* A|Z
*VOL: 3, NO: 1/2, 37-52, 2006-1/2*

# Transformations created by ICKT on the architectural design and its education

**Ahu SÖKMENOĞLU, Gülen ÇAĞDAŞ**
*Istanbul Technical University Faculty of Architecture, Istanbul, Turkey*

*Received: April 2007* *Final Acceptance: June 2007*

**Abstract:**
Information, communication and knowledge technologies (ICKT), creates serious economic, social and cultural transformations in the contexts of human, human life and space. Architectural design and its education is one of the fields seriously influenced by the ICKT. In the case of architectural design and its education, the influences of ICKT are not only in relation to the technological side of it but the subject is far more complex as it has a social, cultural and economical aspects. Architectural design and production processes, its tools, concepts, theories, methods and forms are highly affected by ICKT and the transformations have begun. Digital technologies are challenging theories and practices of traditional architectural design both from educational and practical perspectives. Standing at the threshold; one should consider the technologies beyond themselves with all the transformations that they cause. This process of questioning ICKT and architectural design relationship should only be started at the architectural educational platform where experimental, theoretical and practical sides are always present. Questioning the boundaries of the discipline, re-conceptionalizing it and re-defining its role in the future are the subjects to be discussed in educational platforms. Architectural discipline should update itself to protect its own realm of being, its cultural validity and its meaning. Furthermore, a new more creative and complex way of teaching architectural design could be find in this mutual relationship of ICKT and architecture.

***Keywords:*** *Architectural Design Education, Digital Architectural Design and Production, Information, Communication and KnowledgeTechnologies (ICKT).*

**Framework of discussion**

ICKT creates serious economic, social and cultural transformations in the contexts of human, human life and space and architecture is one of the most influenced fields. The aim of the paper is to discuss the transforming effects of the ICKT on the architectural design and its education. Most of the technological innovations come on market without being researched thoroughly. ICKT, also became commercially available before being discussed and understood academically (Bricken, 1995). Similarly effects of ICKT on architecture has not been sufficiently researched and understood yet. Whereas ICKT has enormous potentials and it affects architectural

discipline seriously. These potentials and effects will be discussed below. Most common use of ICKT in relation to the architecture is mostly still not going further on examining the real potentials of it. Certainly there are lots of creative studies about the subject but the researchers of these studies are still a small group of people. Surveys about this issue are indicating that most of the design teachers still see these technologies and tools as a "facilitative assistant". However this intersection of ICKT and architecture deserves to have its own area of research as ICKT clearly became more then a tool for facilitating design representations. ICKT and architecture relationship could be very briefly summarized as following: first steps towards computer aided architectural design were taken in 1970's after the publication of 'Computer Aided Architectural Design' book by W. Mitchell. Then in 1980's virtual reality technology was introduced, ten years later in 1990's computer aided architectural design concept was acknowledged in architectural design studios. Finally 2000 is the year of 'Generation Y', a generation born with the computer. Computers are diffused in design studios and assuming several roles. During this time we first knew the computer as a tool, and then it also became a partner and a medium, now it is more and more perceived as extension of the body and space. This brief history indicates that the technological developments occurred in a very short time. Therefore, one can conclude that current situation is a period of transition: it is easy to foresee that computers will become more and more ubiquitous and indispensable in the future.

Since ICKT has been a part of the architectural design and production processes, its tools, concepts, methods and forms experienced serious transformations. Cartesian design space is not an obligatory now, Non-Euclidian architectural forms are easy to design and to built. A concept of non-standard architecture is emerged: architecture is no more looking for standardization but searching ways of personalization. As design and production processes are integrated and becoming a part of a single digital system, it is foreseen that architectural industry will resemble in automobile and aircraft industries. All these major developments seriously transform the identity of the architect as a professional, conventional architectural design and production processes. New emergent tools, concepts, theories, methods and forms and values of architecture have to be taken into account while teaching architectural design. In the academical realm, there is an ambiguity caused by apprehension, lack of interest or an excessive admiration towards the relationship of ICKT and architecture. Therefore it won't be an exaggeration to describe the situation as a "nameless chaos". A. Erdem and B. Pak (2005) define this process of transition as the rise of a paradigm shift of an information society. As we are standing at the threshold; to consider the technologies beyond themselves with all the transformations that they cause, should start at the academical realm. Future architects should be trained with such an awareness of these major transformations. As mentioned before, ICKT deserves its own area of research in the architecture design field, this togetherness can't happen by importing ICKT from other disciplines. In the first part of the paper, for revealing this idea, some major subjects of research will be proposed: **Representation, Design Process and Communication**. These subjects should be researched thoroughly in the "information era" to better understand the "information architecture". Based on the first part's outcomes, in the second part some conclusive matters will be put forward which are the main entries while integrating ICKT and architectural design education for constituting a new creative educational model of architectural design.

## 1. Information architecture: representation, design process and communication

### 1.1. Representation

#### 1.1.a. Architecture as an image loosing its meaning

In the contemporary world, stability is less important than the velocity and happening is more important than lasting. Material was constituted from energy and mass but today information is the third dimension defining the material; the image worth more than the thing which it defines. (L'image vaut plus que la chose dont elle est image, Virilio, 1998.) In fact, this situation affects seriously the field of architecture standing on a cultural platform. Could architecture become an image, could architecture completely de-materialized? According to Piotrowski (1998) architectural places are very rich representation places and contain much more symbols than every other cultural objects. Buildings transform everything related to real life into symbols. Buildings and the city are the symbols of the cultural identity. Globalization causes all the cultural identity to become blurred and homogeneous and this is a serious threat for architecture. To become the passive receivers of the coded information cause the meaning replacement by information. Globalization made possible for architecture to collaborate internationally and this is only possible if the buildings are reduced into the information. Every sign in a computer screen has a meaning but all the signs are insufficient while representing a living environment. Digitally supported global architectural services are proceeded by working with signs and images. According to Piotrowski (1998) this can be seen safe at the first impression but it isn't, in fact what is done is to reduce reality into visual effects. What is criticized here is not international collaboration but it is the meeting of cheap labor, imported technology and commercial knowledge. This effort creates a global-vernacular architectural style having no identity and there is a continuous shifting of meanings caused by global visual images. Piotrowski (1998) claims that animation is a series of images for explaining a place but they constituted a simulacrum while transmitting for supporting an international collaboration. Living in a world where there are less and less meaning but much more information (Baudrilliard, 1995) are visual images sufficient to establish a dialogue, or they just can't go further on than creating fashion icons? Similarly, in the contemporary architectural magazines; written media create fashion icons from the architectural images. To be homogenous and sameness is supported by global media. The transformation of architecture into the images is in fact a clear example of how the capitalism uses the information technologies in its service. This way, architecture's boundaries are getting narrow instead of getting wider. Architecture is boxing itself in so called 'Magazine architecture'. We see copies and copies of the same image of fashionable buildings designed by star architects, no matter the content or context are: Is there an universal design fitting everywhere? Architecture is charged with complicity: being in service of production-consumption operation. (Foster, 2002) Below in figure 1, there are two of Frank Gehry's buildings from Spain and USA which are almost indistinguishable although they are different functionally and culturally.

Guggenheim Museum, Bilbao-Spain

Walt Disney Concert Hall, LA-USA

***Figure 1:*** *Frank Gehry Architects: Guggenheim Museum in Bilbao and Walt Disney Concert Hall in L.A. ( http://www.eikongraphia.com/)*

**1.1.b. Real experiences replaced by simulations**

Representation is made for describing the original one therefore it is a coding and reduction process. By definition while representing something some details are not taken into consideration. As told by H. and F. Yürekli (2004) simulations could not represent the architecture "built" in the mental space because no matter the nature of the representations, they are always making architecture loose its value. Therefore an architect could not trust just one representative method while designing his/her "architecture" in his/her mental space. All the design representation techniques are needed in order to reach the mental level and experiment new ways. Computer simulations could not be unique methods of designing and there will probably never be only one tool or method dominating all the others.

Furthermore Ritchie (1995) claims that since real experiences are less important than it has ever been, and that there is a very serious danger for students of architecture. Students loose their scale and material sensations in front of a computer screen. The contribution of sensorial memory; vision, touch, smell and auditory senses into the architectural design and education process is not deniable.

Computer, by its nature uses a very abstract language for operating which is very unfamiliar for us. Computers are digital tools and humans are analog beings. What is productive and considerable is this synergy of digital and analog which is dilemmatic by its nature. One can, at least for now, never replace analog way of feeling with digital way of operating, that means never collide real and virtual. Both sides of the new "information era" should be experienced together.

**1.1.c. Representation of representation and blurring of the essential**

The three dimensional representation techniques used in architecture could sometimes eliminate the real power of the architectural representations; which is conceptualizing. The necessary distance between the represented one and the representation is disappeared in such a case. While an architectural object is represented with a computer model, the model itself becomes more than a representation; it becomes an independent object itself. While trying to obtain a photo-realistic view in 3D computer renders, students bypass the necessary time for a design idea to get mature. A realistic 3D computer render taken in the designing process is not a translation of the mental design. This way of using computer might damage

the real idea when it is too soon for the design to be finalized. This can result in breaking the connection from the original one to loose the essence.

More, computer representations filter the personal traces and could obstruct personalization, which is extremely important for an architecture student. Every student should find his/her own way of designing and expressing his/her ideas.

Finally, architectural design projects of students (designed for a conventional function and envisaged to be built in physical space) are represented more and more only with 3D computer graphics. This way the own language of architectural design is more and more getting lost. Written or spoken words and computer graphics illustrating how the idea looks like are seen sufficient for students to transmit the design idea. Unfortunately, if not the computer is used very masterly it still looks like it is almost impossible to read and understand an architectural idea as a whole without using the conventional language of architecture: plan layouts, sections, elevations, physical models, sketches. In such cases, instead of the object itself, the ability of persuading becomes more important. (Uluoğlu, 2002) This means the produced architectural object becomes more and more a narrative oriented architecture. Zenger (2005) claims that digital modeling techniques are standing in the forefront of architecture and architecture should save itself from this camouflage. Criticizing of the architectural products by the visualization performance instead of its content, is an obscurity that is created by the digital representation techniques in the educational platform. The representation can hide the creativity and blur the essential.

**1.1.d. The reduction of architectural knowledge into computational measure of values**

In the case-based and knowledge-based architectural design applications, the aim is to constitute design templates by dissolving an architectural language produced anonymously or by a specific architect for a specific context and program. The dissolving process is done in order to constitute digital inputs that can be manipulated in computer. The vocabulary of the design is constituted, grammar rules are defined, and together they are served to constitute a brand new design template in a computerized environment. The new design template is accepted as a design pattern sustaining influences of the specific architectural language which was analyzed and then dissolved. The coded data, the taste of the architect and the design pattern issues are important. Architecture is nor like music; based on a commonly accepted notation, neither like painting; based on totally subjective measure of values. Architecture is referring both on formal and subjective notations. (McCullough, 1996) Therefore, it can't be reduced into formal computational measure of values. In computer aided architectural design literature, architectural design problem is described as an ill-structured problem as it has a subjective side. Therefore it has not a unique and particular answer. The design methodology, tools, approach of the architect mature by subjective experiences, formed according to the design context, and constituted by an architectural accumulation and interpretation ability, therefore it can't be standardized, categorized and limited by the generally accepted objectives. Computer can still not give the taste of architect, it can be just influenced by his/her way of designing. Architectural design produced in knowledge-based and case-based architectural design processes can not be accepted as genuine, can only be used as design patterns. The coded data should be differentiated form the knowledge.

There is always a need for a human designer in order to have qualified architectural designs formed from knowledge-based and case-based architectural design studies. These studies can be seen as a tool for understanding and dissolving the extremely complex architectural design processes and considered as basis for artificial intelligence researches. The view of D. De Kerckhove (2001) could be guiding; symbols embedded in computers are making the architectural design masters role much more valuable.

From an educational perspective, case-based and knowledge-based architectural design applications can be use in the architectural design studios for special purposes such as dissolving an architectural language of a given design environment. This could be helpful for giving the students a profound view of architectural algorithms and at the same time helping them to understand the architectural design problem as a whole; collection of the architectural data, the methodology, the environmental inputs, the functional inputs, the inputs originating from the context. Such studies may help students to improve their architectural intuition. It is important for students to learn the pre-existing architectural design knowledge for being able to criticize it while searching for innovative solutions. Case-based and knowledge-based architectural design applications are especially useful while analyzing historical and vernacular architectural styles. Below there are two different examples of a generative approaches developed with an educational purpose. In figure 2, there is an example of architectural form production belonging to an existing architectural language and the form alternatives based on fractal dimensions are shown. Alternative forms based on fractal dimensions generated for a special settlement in Istanbul named Chora (Kariye).

In figure 3 a creative example is an object generator program which was produced in the scope of Generative Systems in Architecture course in 2000, Architectural Design Computing Master's Program. The program operates through a 3D modeling software interface and designed as a sketching tool for utopian architectural design projects.

### 1.2. Design Process; transformation of the design process by representation methods and time-movement parameters as a design variable

Time concept was a static input of architectural design until the emergent computer technologies, but with the emergent computer technologies it became a design variable seriously effecting design process. The usage of information diagrams in architectural design brought time parametre into the design environment. Time-based diagrams of information illustrating how design inputs transform in a given time interval are directly associated with design; the building is designed according to this dynamic inputs. More, there are buildings which are programmable which means that they behave according to a given logic and change in time. Below in figure 4 there is an example of a building of Kas Oosterhuis; Unibody Saltwater Pavilion is the first true "body" building to display real-time behavior. The body is generated in the weightless digital realm and is embedded in an artificial island on Earth. The pavilion captures raw data from a weather station on a buoy in the sea and transcribes the data into an emotional factor. The black body of the Salt Water Pavilion feeds on data. Inside the black body, the lights are continuously changing in real-time; visitors feel themselves immersed in the dynamic light and sound massage. (http://www.architectureweek.com/)

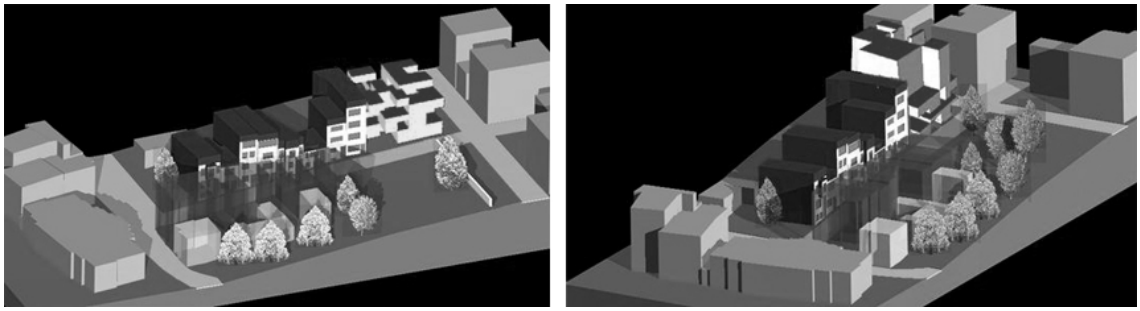

***Figure 2:*** *Alternative forms based on fractal dimensions generated for Chora (Kariye) (Gözübüyük, Çağdaş, Ediz 2006)*

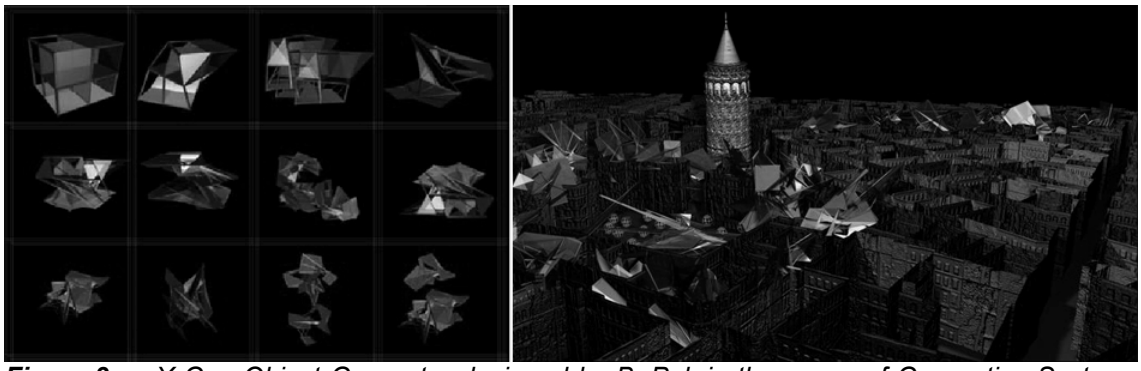

***Figure 3:*** *X-Gen Object Generator designed by B. Pak in the scope of Generative Systems in Architecture course in 2000. (Çağdaş, final submission of the Generative Systems in Architecture course' 2000)*

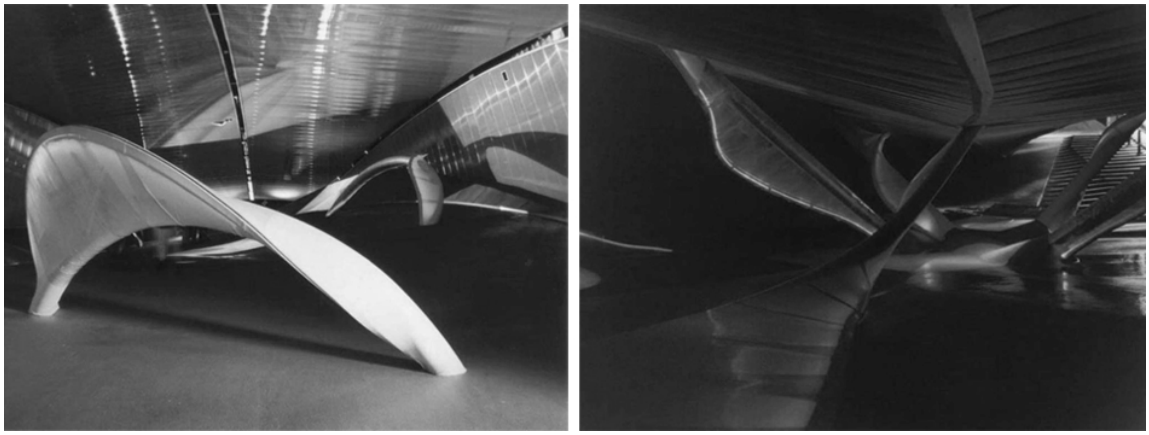

***Figure 4:*** *Interiour of the Unibody Salt Water Pavilion designed by Oosterhuis (www.e-architekt.cz/)*

Design process is also transforming by representation methods brought by computer technologies. Because more than representing conventionally, some design software have the capacity of analyzing, simulation, interpretation, visualization, classification and communication. In integrated systems (CAD, CAM, Rapid Prototyping) the basic idea of representation which is reducing in to simple terms is totally lost, the intangible design object appearing on the computer screen became the one to one copy of the tangible object. Therefore the intangible object is as real as the tangible design object. According to Callicott and Ehlert (2005) this way, representation is now an inseparable part of the design process in other

words the drawings made for production are done away with, the representation became transparent and started to affect architectural production as well as the architectural design. Designing and visualizing processes became one single process; what is produced and seen on the computer screen is directly the physical design object itself. Below in figure 5, there is an example of such an integrated design process where "the manipulation of the material becomes a means by which response is generated, modified an ultimately understood as a part of the design process."

***Figure 5:*** *Prototype House, Blankenburg, 2004. (Callicott and Ehlert , 2005)*

All these new experiences such as time-related, dynamic, non-linear and responsive systems make the design process registerable therefore enable the developing design product to be followed in the process by real-time feedbacks. This way, more then seeing series of static images of the design, we can explore its dynamic development. Virilio (1998) states that the space and its personal experience is a dynamic process however this dynamism is never felt in the conventional representation techniques such as plan layout, section and elevation drawings and he adds that the non-existence of the time and movement parameters in architectural design is due to this absence. Virtualization of the architectural models was in presence before the emergence of the computer aided architectural design process. (Virilio, 1998) The contribution of the computer is that it provides to constitute the mental virtual models of the architects in the computer screens and therefore make these models easy to manipulate. This kind of representation tool has the power of changing the process more than only changing the representation method.

**1.3. Communication; to broaden the existing vocabulary with the new words and concepts as well as re-defining the existing ones**

The inevitable collaboration of ICKT and architecture need a common vocabulary as well as they transform each other's concepts. ICKT takes architecture as a metaphor and borrows lots of architectural concepts. On the other hand architects believe that the existing architectural concepts should be a part of the cyberspace design and architects should participate in cyberspace design. Cyberspace vocabulary is constituted by the real world's architectural concepts such as world, space, place, bridge, door, window, threshold, trace, and domain and so on. It is obligatory to study these concepts transformed by cyberspace and at the same time to re-define the existing architectural concepts which extends into the cyberspace. As the intersection domain of architecture become larger, architectural buildings started to be transformed by their virtual extensions such as museums, schools, libraries, conference rooms, shopping malls and so on. So the conventional building typologies begin to dissolve. Their conceptualizing process, their programs and their contexts should be re-

defined. Cyberspace do not only borrow real life and transform it in its virtual context, it creates brand new forms of life. It is a domain of an uncontrolled community which creates its own culture and language. The contributions of cyberspace into the architecture should be studied in the educational platforms. Today, one of the problems between the instructor and the student of architecture is the lack of communication caused by the overlapped vocabulary of ICKT and architecture. The richness of a language grow out of the vocabulary, therefore architectural language should therefore update its vocabulary in order to protect its power. Otherwise the lack of communication in the architectural education platform could be lasting. Below in figure 6, there is an example of a virtual museum; an experimental digital design studio project. (Erdem, Pak, 2005) They mention that experimenting with design of virtual environments of dynamic information exchange might trigger creativity. This kind of experimental design projects could be the best way to question the overlapping domains of architecture and cyberspace.

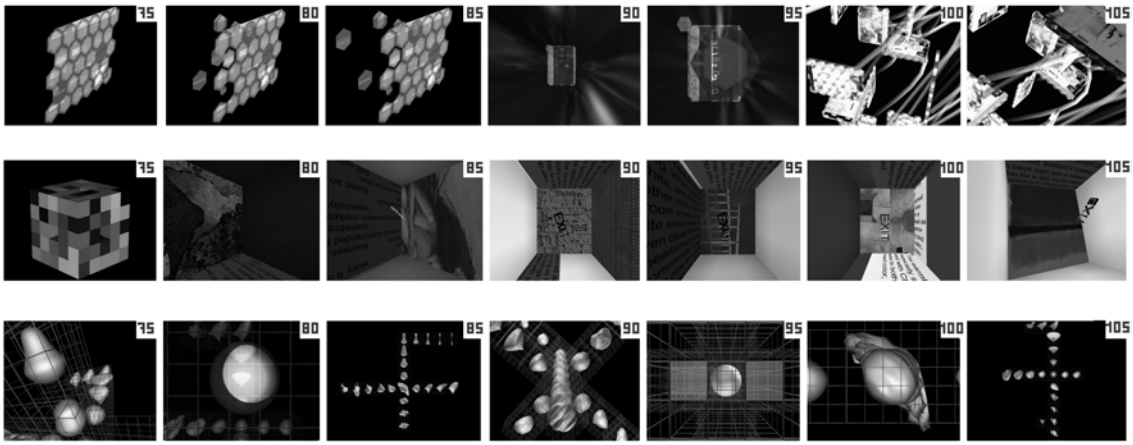


***Figure 6:*** *Virtual museum projects produced in the digital the design studio implemented at ITU Faculty of Architecture by A. Erdem and B. Pak . (Erdem, Pak, 2005)*

**2. Integrating ICKT and architectural design education**

"What to consider while integrating ICKT with architecture and forming a new architectural educational model?" should be the main question to ask ourselves. It is extremely important for architecture how to take the ICKT into its realm and how to manipulate it. Piotrowski (1998) determines that digital technologies should enter into the architectural realm as a part of the cultural and political transformations, not as a technical and commercial solution. The basis of this view is that the prevention of the architecture to be dominated by digital technologies is the most important thing. The four below mentioned issues are the major points to consider while integrating ICKT with architectural education.

- Architecture: A cultural memory collector and a symbolic representation place;
- How architecture could welcome technology?;
- Architecture: A question of disciplinarity.

### 2.1. Architecture: A cultural memory collector and a symbolic representation place

Piotrowski (1998) states that architecture should be considered as a representation space rather than a collection of carefully solved rational problems. The representation space should be defined as a physical space created to establish a relationship with the mental space which is defined as personal and cultural thoughts. In modern model of architectural education, architecture is defined as a combination of sub-disciplines; art and engineering and engineering side is always magnified. However, buildings are cultural memory collectors serving as thoughts transmitters during generations. From this point of view they are similar to the art, history and traditions. Symbolic side of architecture is always forbidden next to its functional usage. Computer is a digitalized environment and it is at least for now, questionable if and how cultural knowledge and accumulations could be digitalized. Therefore computer as a design partner and medium, always bring a risk of making the designer underestimating the cultural character of architecture and urban space.

### 2.2. How architecture could welcome technology?

Technological determinism is not an appropriate way to deal with technology. Vesely (1995) states that creativity is not always a characteristic of technology. Technology dominates by the acceptance that the knowledge is the power but today the difference between the knowledge and the information started to blur and it becomes more and more difficult to differentiate them. More, technology and even science could not be approved unconditionally as they do not remain static and unchangeable. Every scientific revolution results in a paradigm shift in Kuhn's terminology. A paradigm shift is simply the (often radical) change of worldview; a change from one paradigm to another. Therefore, there could never be one certain way for architecture to follow. The subject to be discussed must be how architectural platforms will manipulate technology in service of architectural design instead of how to adapt architecture to technological changes. Dominance of technology over architecture is what should not happen. The mentioned claim is absolutely not to turn back on technology otherwise architecture will certainly loose its value, currency and validity. The key word is to be aware of every aspect of this relationship by carefully and broadly studying the interaction between technology and architecture. The aim should be how to manipulate, orient, transform and manage technology in the name of architecture, to welcome technology with a suspicious looking.

Above all, instead of borrowing it from other industries, we should start to produce the technology itself as Tschumi (1995) states. As the future is undeterminable and the technology is instable, instead of teaching only the existing technology, innovative ideas of new systems and technologies could be seed in architectural design studios. In terms of benefiting from technology in an innovative way, an architect should be master of the technological knowledge. To take part in the technology producer side is the key to maintain the role of the architect. The technology producer role should be the new sub-role of the architect in the future. Zenger (1995) claims that in the future those who capture the computer instead of serving it will be able to practice architecture.

### 2.3. Architecture: A question of disciplinarity

There are various concepts of disciplinarity indicating the contemporary tendencies of interaction between various disciplines. These are;

interdisciplinarity, multidisciplinarity, transdisciplinarity and crossdisciplinarity and non-disciplinarity. (http://en.wikipedia.org/) Interdisciplinarity is usually when specialists from several fields of work are coming together and work collaboratively for a common goal. Multidisciplinarity approach uses only one discipline's methodology but examines the subject from different perspectives of other disciplines. In case of transdisciplinarity, conventional academic disciplines boundaries are transcended and blurred. It's usually when a single discipline is not sufficient to understand and solve the problem. It is a discovery of finding dynamism of several levels of reality at once. Cross disciplinarity is also crossing one discipline's boundaries and trying to explain it with another foreign discipline's ontology; seeking for one discipline inside another one. Non-disciplinarity is the approach of consciously negating of remaining within the subject matter and methodology of a defined discipline. These concepts of interaction between various disciplines are very important for architectural practice, education and discourse. Architecture always being positioned next to engineering or next to art, but never belonged totally to one of these knowledge areas is always facing difficulties concerning its ontology. Today with the intervention of ICKT in to the architectural discipline, it is even more complicated then it has ever been. There are major changes undergoing on architecture; its field of interest, the nature of the design object, the professional identity of the architect are transforming. All these above mentioned disciplinary approaches are worth to examine for better understanding contemporary architectural knowledge. Below there are some considerations about the disciplinarity concerning architectural knowledge.

Zenger (1995) suggests two concepts while examining the interdisciplinary being of architecture; Major and Intermediate fields. He claims that the major fields are not alone sufficient to practice architecture, the intermediate fields are also very important. Architect who can not settle for traditional architectural knowledge and its instruments search for other instruments and infrastructures and this attitude makes it more productive. Şentürer (2005) determines that the inter-disciplinary being of architecture is what makes architecture stronger. Today architects have various roles such as designer architect, office architect, building site architect, sales responsible architect. Beyond these upper-identities of the architect he/she also has some sub-identities such as intellectual thinker, designer, communication responsible, engineer, social scientist, manager. These sub-identities give the role of movie maker, photographer, fashion designer, publicist...and so on to the architect. She claims that this is the productive side of the architecture and should be protected.

Beside the above mentioned multi-character of the architect, with the intervention of ICKT, as contemporary expansions of architecture enlarge, the boundaries of the discipline are dissolving. There are briefly three kinds of architectural expansion formed in relation to the intersection of ICKT and architecture; physical architectures, virtual architectures and hybrid architectures. With the adaptation of ICKT in every part of the human life, physical architecture is undergoing major changes; there is an emergent de-materialization concept which affects building programs; buildings scenarios are transformed due to their virtual extensions. More, as mentioned before; CAD and CAM technologies integrated with Rapid Prototyping technology associate designing and production processes. The design-analyze-evaluate and modifying stages become part of a single process and this development cause more and more time and cost effective production. Architecture

becomes more and more a robotic industry, so the identity of the design process actors and their equipments are different than it used to be. Virtual architectures are concerning architecture of virtual environments of digital networks of information, communication and knowledge; Michael Benedikt speculates that cyberspace will require "*constant planning and organization*", that it will need "*structure*", that it will have to be designed by "*cyber architects*" who are "*schooled in computer science and programming (the equivalent of construction), in graphics, and in abstract design*." (Al-Faleh, 2000)

Hybrid architectures are the ones where physical architecture and digital networks of information and communication intersect and constituted new space and time scenarios never experienced before.

Based on above introduced expansions of architectural field, it is unquestionable that today, the interaction with the other disciplines and how to manage this interaction, is crucial for maintaining the currency and validity of the architectural discipline. Computer related disciplines and the representational disciplines in relation to ICKT should be integrated in architectural design education; such as computer programming, knowledge engineering, graphical design, media, web design, geometrical modeling and animation. Discussing profoundly the disciplinarity issue could be a starting point for educating, while establishing a new architectural education model. Below in figure 7, there is an example indicating how an architect could be performing in the contemporary world where disciplinarity issue became so open-ended. Rafael-Lozano Hemmer defining his work as 'relational architecture' transforms public spaces with interactive installations for establishing a way of communication between people and built-space.

***Figure 7:*** *Relational Architecture by R. Hemmer* (http://www.lozano-hemmer.com/)

There are also similar studies in the educational platforms. Figure below is an example from Architectural Design Computing Master's Program of ITU prepared in the scope of an international workshop: Reflective, organized between ITU and Stuttgart University. In Reflective workshop a java-based programming language, Processing was introduced for animating urban surfaces. The goal was to the re-activation of urban spaces via digital media, questioning the digital media's potential in the name of architecture and urbanism.

***Figure 8:*** *Reflective Workshop organized in march 2007, collaboration between ITU and Stuttgart University, project by Lâle Başarır, Çağın Özbaki , Beste Üstündağ (Çağdaş, 2007)*

**3. Conclusion**

ICKT are seriously effecting economic, social and cultural environments of the contemporary world and transforming the existing world organization. Architecture which can not be thought separately from these environments is one of the disciplines that is deeply transforming by ICKT in terms of designing, organizing, producing, educating, criticizing and conceptualizing. The ontology of architecture and architectural design is transforming radically. One should be aware of these ontological transformations in architecture and establish a new model of education for the information and communication era. Interpreting the capability of the digital technologies as a tool, medium, partner and an extension, in a creative way is the most fundamental issue.

All these radical transformations are occurring in final velocity, which means that there is no enough time for profound researches about the consequences of them. ICKT enlarges its zone of influence every single day. The advisable way to deal with them could only be starting by realizing the big picture: enlarging the field of interest of architecture and equip new architects with a robust knowledge of technology and its economical and socio-cultural effects.

The pessimist and optimist views are always present together when it comes to the ICKT. Nowadays, the encountering of digital-analogue, virtual-real, local-global, technology-art and many more contradicting concepts are subjects of discussion. These contradictions are somehow indicating a dynamic and productive process. The tension could be provocative in re-thinking and catching the chances. Risks and opportunities which are hidden in the ICKT are mentioned in the article. For architecture, against the risks of being a soulless computational industry, loosing its relevance to culture and context and being a subject of consummation, there could be hidden opportunities of gaining its avant-garde presence and its dignity.

Main objective of this article was to question contemporary position of architecture and ICKT while introducing these mentioned opportunities and risks and on the other hand underlining the need of a new educational model for controlling and leading the transformation process. Questioning the boundaries of the discipline, re-conceptualizing it and re-defining its role in the future are the subjects that should be discussed in educational platforms.

Architectural discipline should update itself to protect its cultural values, its validity and its meaning. This process should start from its source; educational platform and has to diffuse in to the whole discipline.

**References**


Al-Faleh, O. (2000) **The Virtual dimension in Architecture, Re-designing the Virtual world,** http://www.morscad.com/portfolio/Text/VirtualDim.html, accessed on May 2007.

Baudrilliard, J., (1995) Simulacra and Simulation, **The Body, In Theory: Histories of Cultural Materialism**, University of Michigan Press.

Bricken, W., (1992) **Glimpses of Heaven, Visions of Hell**, p.21, eds. Sherman, B., Judkins, P., Hodder & Stoughton General Division

Calliot, N. And Ehlert, K., (2005) Adaptive Architectural Design, **Architectural Design**, vol 75, issue 4, pp. 66-69.

De Kerckhove, D., (2001) **The Architecture of Intelligence**, Birkhauser, Basel.

Erdem, A., Pak, B., (2005) Information and Communication Technologies in Design Studio: New Tools, Strategies and Techniques at Work, **A|Z, ITU Journal of the Faculty of Architecture**, Vol:2, No:1-2, pp. 52-61, ITU Faculty of Architecture Printing Office, Istanbul.

Foster, H., (2004) **Tasarım ve suç: müze-mimarlık-tasarım**, çev. Gen, E., İletişim Yayınları, İstanbul.

Mccullough, M., (1996) **Abstracting craft: the practiced digital hand**, MIT Pres, Cambridge, Massacusettes.

Piotrowski, A., (1998) Digital Technology and The Disipline of Architecture, **Proceedings of the Forum II: Architectural education for the 3rd millenium**, Gazimagusa, Turkish Republic of Northern Cyprus, İstanbul, Türkiye, 22-24 April, p. 539-545.

Ritchie, I., (1995) Architects in Education, **Educating Architects**, Eds. Pearce, M., Toy, M., pp. 126, Academie Editions, London.

Sökmenoğlu, A., (2005) **Transformations Created by ICKT on Social and Built Environments and on the Discipline of Architecture**, Master Thesis, (Thesis Adviser, Prof. Dr. Gülen Çağdaş), I.T.U Institute of Informatics, Architectural Design Computing Program, Istanbul.

Şentürer, A., (2005) Gerçeklik ve Gelecek Arasında Mimarlık Mesleği Olası Senaryolar, **mimar.ist**, issue 15, 67-70.

Tschumi, B., (1995) One, Two, Three: Jump, **Educating Architects**, eds. Pearce, M., Toy, M., pp. 24-25, Academie Editions, London.

Uluoğlu, B., (2002) '… miş gibi' **Mimarlık ve Sanallık**, p. 37-45, Çağdaş Mimarlık Sorunları Dizisi, Boyut Yayın Grubu, İstanbul.

Vesely, D., (1995) Architecture and the Question of Technology, **Educating Architects**, eds. Pearce, M., Toy, M., pp. 44-51, Academie Editions, London.

Virilio, P., (1998) Paul Virilio interviewed by Andreas Ruby; 'Architecture in The Age of Its Virtual Dissappearance', **The Virtual Dimension**, ed. Beckmann, J., pp.178-188, Princeton Architectural Press, New York

Yürekli, H., Yürekli, F., (2004) **Mimarlık bir entellektüel enerji alanı**, Yapı Yayın, İstanbul.

Zenger, Y., (2005) 'Yılmaz Zenger ile Tasarım, Mimarlık ve Gelecek Üzerine Konuşmalar…' (Söyleşi Kubilay Önal), **mimar.ist**, issue 15, 71-77.

http://www.architectureweek.com/2001/1003/tools_1-2.html, accessed on May 2007.

http://www.e-architekt.cz/, accessed on May 2007.

http://www.eikongraphia.com/

http://www.lozano-hemmer.com/, accessed on May 2007.
http://en.wikipedia.org/wiki/Interdisciplinarity#Varieties_of_disciplinarity

## Enformasyon, iletişim ve bilgi teknolojileri etkisi ile mimari tasarım ve eğitiminde yaşanan dönüşümler

Enformasyon ve iletişim teknolojileri insan, yaşam, mekan bağlamlarında ekonomik, sosyal ve kültürel anlamlarda çok ciddi dönüşümlere neden olmaktadır. Mimarlık disiplini de bu ciddi dönüşümleri yaşamakta olan alanlardan biridir. Makalenin amacı, enformasyon ve iletişim teknolojilerinin mimari tasarıma ve mimari tasarım eğitimine olan dönüştürücü etkilerini tartışmaktır. Teknolojik gelişmelerin büyük çoğunluğu akademik platformlarda derinlemesine araştırılmadan pazara sürülmektedir ve bu durum dijital teknolojiler olarak da adlandırabilecek olan enformasyon ve iletişim teknolojileri için de gözlemlenmektedir. Dijital teknolojilerin mimarlıktaki yeri de benzer şekilde bir araştırmaya tabii tutulmamış ve kullanılırken yeterince anlaşılamamıştır. Oysa söz konusu teknolojiler sıklıkla görünenin ötesinde mimarlık disiplini bağlamında son derece önemli potansiyeller taşımaktadır. Günümüzde enformasyon ve iletişim teknolojilerinin mimarlık alanındaki kullanımı hala bu teknolojilerin gerçek potansiyellerini değerlendirmekten uzaktır. Bu konuda son derece ciddi bir çok araştırma yapılmaktaysa da, söz konusu çalışmalar genele bakıldığında son derece küçük grupların çalışmaları olarak kapalı kalmaktadır. Bu konuda yapılan anket çalışmaları özellikle göstermektedir ki tasarım eğitmenlerinin bir çoğu bilgisayar ortamını ve aracını hala yardımcı bir temsil makinesi olarak görmektedir. Oysa mimarlık ve enformasyon ve iletişim teknolojilerinin kesişmesi bundan daha fazlasını hakeder. Bilgisayar destekli mimari tasarım, 1970'lerden itibaren atılan ilk adımlar ile günümüze kadar gelirken bilgisayarı önce bir araç, sonra bir ortak ve ortam, şimdilerde ise bir bedensel ve mekansal uzantı olarak algılamaya başlamıştır. Dijital teknolojilerin akıl almaz bir hızla ilerlemesi ve mimari tasarım pratiği, eğitimi ve eleştirisi adına yarattıkları yepyeni gelişmeler, yaşanan evrenin bir tür geçiş devresi olduğunu açıkça belli etmektedir. Gelecekte enformasyon ve iletişim teknolojilerinin gitgide daha yaygın ve neredeyse görünmez şekilde yaşantılarımıza eklemleneceği ve vazgeçilmez hale geleceğini öngörmek zor değildir.

Enformasyon ve iletişim teknolojileri mimari tasarımın bir parçası haline gelmesinden bu yana, tasarım ve üretim süreçleri, bu süreçlerin araçları, yöntemleri ve biçimleri son derece ciddi dönüşümler yaşamıştır. Kartezyen tasarım uzayı bir zorunluluk olmaktan çıkmış ve Euclid dışı geometrilerin hesaplanabilmesinin mümkün hale gelmesi ile tasarımı ve üretilmesi de son derece kolaylaşmıştır. Standart dışı mimarlık kavramı ortaya atılmış ve mimari tasarım, güncel yaklaşımlarda standartlaştırma yerine kişiselleştirme üzerine kavramsallaştırılmaya başlanmıştır. Söz konusu teknolojiler sayesinde, tasarım ve üretim süreçleri tek bir sistemin parçaları haline gelerek bir bütün halinde çalışmaya başlamış ve bu nedenle mimarlık bir endüstri olarak, otomobil ve uçak endüstrileri ile yakınlaşmaya başlamıştır. Bütün bu önemli gelişmeler, mimari tasarım eğitiminin çerçevesi çizilirken dikkate alınmalıdır. Akademik alanda, söz konusu teknolojilere ilişkin olarak kavrayış zorluğu, ilgi eksikliği ya da ileri derecede hayranlık nedeni ile bir tür belirsiz tutum hakimdir. Bu belirsiz durumu, adı konulmamış bir kaos olarak değerlendirmek mümkündür. Durmakta olduğumuz eşikte, teknolojiyi kendisinin ötesinde başlattığı dönüşümler ile birlikte düşünmek ve anlamak akademik ortamdan başlamalıdır. Geleceğin mimar adayları bu tip bir yaklaşım ile problemi doğru tanımlayarak yetiştirilmelidir. Mimari Tasarımda enformasyon ve iletişim teknolojilerinin yeri kendi araştırma alanını hak eder. İlk bölümde, enformasyon mimarlığını tanımak ve yukarıda tanımlanan söz konusu kaotik durumun giderilmesi için öncelikle ve mutlaka irdelenmesi gerekli görülen üç konu başlığı önerilmiş ve detaylandırılarak tartışılmıştır: **Temsiliyet, Tasarım Süreci ve İletişim**. Bu konular, enformasyon mimarlığının anlaşılabilmesi için önemli görülen konulardır:

- **Temsiliyetin Temsiliyeti**
  - Mimarlığın anlamını kaybederek imgeleşmesi
  - Gerçek deneyimlerin yerini benzetimlerin alması
  - Temsiliyetin temsiliyeti ve özün bulanıklaşması
  - Mimari bilginin hesaplanabilir değerler sistemine indirgenmesi
- **Tasarım Süreci**; Temsiliyet sistemleri ve zaman-hareket değişkenlerinin birer mimari veri olması ile dönüşen tasarım süreci
- **İletişim**; mimarlığın mevcut kelime dağarcığının yeni kavramlar ile genişlemesi ve yeniden tanımlanan kavramlar

Açılan bu tartışma başlıklarına dayanarak ortaya konulan, yeni ve yaratıcı mimari tasarım eğitimi modelleri oluştururken dikkate alınması gereken önemli maddeler ise ikinci bölümde ortaya konulmuştur. Bu maddeler;

- Mimarlık; Kültürel Bir Bellek Deposu, Sembolik Bir Temsiliyet Mekanı
- Mimarlık Enformasyon ve Iletişim Teknolojilerini nasıl karşılamalı?
- Mimarlık; Disiplinleşme Sorunları

şeklinde sıralanmıştır.

Makalenin sonuç bölümünde, enformasyon ve iletişim teknolojileri etkisi ile mimarlığın kendi varlık alanında temel dönüşümler yaşadığının farkına varılması ve söz konusu teknolojilerin yaratıcılık anlamında birer araç, ortam, ortak ve uzantı olarak ele alınması gerektiğinin altı çizilmektedir. Bütün bu dönüşümlerin son derece hızlı bir biçimde gerçekleştiği göz önüne alınırsa, bu hızla başedebilmenin tek yolunun geleceğin mimarlarının son derece sağlam bir teknoloji bilgisi ile donatılması ve teknolojilerin sosyo-kültürel etkileri de tartışabilecek şekilde yetiştirilmesi gerekliliği önem kazanır.

Makale boyunca tartışılan olası riskler ve fırsatlar mimarlık adına şunu göstermektedir: Mimarlık, içi boşaltılmış bir hesaplamalı mühendislik bilimi olma, kültürel ve bağlamsal özelliklerini kaybetme ve bir tüketim nesnesine dönüşme risklerinin yanısıra, avangard duruşunu ve itibarını yeniden kazanmak şansı ile de karşı karşıya olabilir. Bu anlamda, mimarlık disiplinin sınırlarını sorgulamak, yeniden kavramsallaştırmak ve gelecekteki rolünü tartışmak konuları mimarlık eğitimi platformundan başlayarak bütün disipline yayılmalıdır.