Tradition and Innovation in Architectural Education

Some Reflections on Architectural Design Teaching with the Computer in the Background

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Abstract. The presentation is devoted to the problem of introducing computers into the educational process during the last semester of architectural studies for a master's degree. Non-linear structures become almost the principle of design through modifying the traditional, orthogonal image of architecture. Students are open to the creation of concepts which modify the traditional orthogonal spatial system of architecture.

The two-level system of teaching at the course of graduate studies results in students with varying degree of preparation being admitted. This fact in conjunction with large exercise groups and a relatively short time allocated for the project require methodical preparation of the classes. The shaping of the future form of an object can be presented using a freehand sketch, mock-ups or computer models. These tools correspond to the subsequent three phases of the development of the project: exploration of ideas and the context of the environment, working out variants for decisions on functional solutions, spatial and aesthetic concretization of design solutions. In the opinion of the authors of the paper extending the discussion in the first two phases of the teaching process, that take place without the use of computer drawing, leads to a higher originality of the solutions and to an increased efficiency in their preparation.

The above thoughts, supported by examples, are the subject of this presentation.

Keywords: architectural design, teaching in architecture, sketch, mock-up, computer model, idea, concept, dialog in architecture.

1 Introduction

Architecture has accompanied mankind for thousands of years. It creates a spatial frame of life, expresses different contents, different sense of the relationships of humans with their environment. Maybe this is the reason why we are instinctively inclined to look for richer meanings in architectural objects than just information about

their utility. Architecture expresses the relationship of individuals with their home, town or generally with the space surrounding them.

Architectural design of buildings and urban planning of districts, urban quarters, or generally speaking complexes of objects together with their environment has two dimensions: functional and cultural. Both are also subject to quality assessment of the proposed solutions. Functionality means that the building/urban complex should meet the pragmatic requirements of the program assumptions or ideas (social, psychological, architectural, economic, environmental, etc.). The cultural dimension means that the shape of the designed/implemented space expresses not only the excellent quality of the technical process, but above all the creation of a new non-material quality of the material environment. Gothic cathedrals, or the earlier antiquity buildings, perfect in proportions medieval and renaissance squares, illusory baroque palaces and gardens, modernism of Le Corbusier, buildings-sculptures and sculptures – Gaudi gardens, classic in their modernity buildings of R. Maier, as well as the revitalized spaces of the historical centres of Warsaw, Glasgow, Lyon – to mention a few places from many – lead to the reality of the architectural/urban planning allowing us to feel our humanity more fully. The expression of these places in the development of thought and culture means more than an increasing technical perfection, it also signifies the changing forms of human existence. This, in turn, is the essence of activities forming the culture and history of the place. Currently, the two dimensions of solutions, the functional excellence and the achieved aesthetics of form articulate the importance of the design of built environment for a technical society at the beginning of the new millennium.

This problem, which is extremely important, poses questions of fundamental importance: "How should we teach?" and "What should we teach?". The topicality of these questions in the international academic world of architects makes the discussion about the hierarchy of needs, the range of knowledge necessary for practicing the profession, etc. increasingly widespread. The variety of tasks posed by the architectural profession triggers different strategies for directions of development and ways of teaching.

Considering the teaching process of architectural design this means a reference to:

- the transfer of multi-faceted knowledge related to architectural design
- the concept of the teaching process itself.

Acting in a consumer society architecture, as well as other types of human activity, is subject to conditions of development of technology and civilization, changing social values and trends. One thing is certain – architecture is never neutral nor devoid of relationships with its environment. This cannot be changed even by such icons of architecture as Rem Koolhaas who encourage to ignore the context. These relationships, although expressed in realisation concepts should also emerge in the conception of the teaching process itself. Thus, the qualifications of architects and, consequently, the reality created by them, are equally a result of the development of the tradition and culture of the local population, as well as of the teaching process. Regarding the contemporaneity of actions in the architecture a very interesting observation was

made by Ł.Zagała, a Polish designer of the younger generation, who wrote that today we can confidently state that architecture is lagging behind the rapidly changing lifestyle of people and rapid technological development. This temporal changeability, as a factor of the present day has to influence the space and architecture, as well as its design methodology. He noticed that we still build in the same manner, but we live increasingly differently. Contrary to appearances, we are building warmer, more transparently and economically, while the general principles, apart from a few spectacular experiments, have not changed significantly [1]. And so it sometimes happens – modern architecture responds to changes and passing time. Buildings similarly to other everyday devices do not always have to be characterized by long lifetime. Maybe we are moving toward a situation where all modern objects have a short lifetime, similarly to modern consumer goods (cars, washing machines, refrigerators, etc.). Examples include sports facilities built for the Summer Olympics held in London in 2012 (additional grandstands of the Aquatics Centre, Basketball Arena, Olympic Shooting Venue).

Today both economics and energy efficiency associated with the use of the object, closely connected with the technique and technology of solutions, enter the sense of architectural design issues. Turner [2] in studies of relationships between economic efficiency and the concept of spatial (architectural) solution distinguishes five components in the structure of a building: the foundation, structure, enclosure, mechanical devices and finishing elements – each of them brings about, a variable in time, particular set of technical and construction problems.

The publication is based on the experience in teaching architectural design developed within the framework of course exercises conducted at the masters degree level of studies, diploma supervision and workshops for students of the Faculty of Architecture of the Silesian University of Technology in Gliwice (Poland). The subject are utility objects for science, production, trade, sports, offices, etc. The paper focuses on problems which transposed onto the process of teaching can be expressed in three stages, which are also the three terms of evaluation of the learning progress of students during the semester. These are:

- exploration of ideas and the context of the environment – an idea often expresses a symbol of the concept presented in the form of a graphic sign, drawing, graphics, colour;
- generation of solutions of architectural and constructional concept, in which of particular importance is the ability to present a range of variants of spatial, structural and aesthetic decisions;
- concretization of design decisions.

This allows you to implement the concept of architecture, which departs from the Cartesian idea of immovable networks and stability. The architecture of the information age, creating a space seemingly chaotic, often "ecstatic", co-creates the contemporary culture of desire and admiration fever [3]. Today's students are participants and followers of such culture.

2   Architectural Design – Complexity, Interdisciplinarity, Creating Variants

Architecture, however still perceived as an art whose task is the symbolic expression of the role of objects in space, and sometimes even the ability to create a "decoration " for construction and installation solution, is seen as an activity at the interface of theory, applied sciences and practical knowledge. The reasons lie probably in the directions/trends of modern architecture, in which, generally speaking, we can distinguish:

- traditional design based on the realization of human/user's needs,
- design aiming at creating environmentally friendly architecture,
- design, in which computers are widely used [4] [5] [6].

Lately, this trend has been actively pursued in the form of parametric design, in which a prominent role, next to the architect, is played by the computer with modern software and technology associated with the implementation of the undertaking at hand and is usually a matter of interest of students. The technique, which increasingly enters various aspects of life in large, complex projects often results in shifting the role of the architect in the direction of interdisciplinary activities, combining theoretical knowledge with experience and practical engineering knowledge. Similar observations can be made in the current pro ecological trend – the so-called "zero energy architecture".

The most striking feature of architectural design, as well as an ergonomic design, is its complexity and interdisciplinarity. The easiest explanation of it is that each project is a response to a given functional program in a material form (drawings, visualization) and offering a uniform architectural vision. This principle may be expressed in different ways:

- architectural concepts, using a "simple" idea merge knowledge coming from the different areas of expertise (within ergonomics, ecology, social conditions, etc.);
- architecture is associated with signs and symbols, and therefore with emotions developed on many levels, its "language" is the form of the object, which inspires to pose existential questions, but its function descends into the background in this design phase;
- design that uses knowledge about modern technologies implements solutions simple in form and spatial organization, while developing complex construction-technical systems.

The issues of the economics of solutions, closely connected with technology and technique, enter the centre of design and teaching architecture. Its definition is: „economics" is a social science that studies how rational individuals, groups, and organizations manage scarce resources which have alternative uses, to achieve desirable ends [7]. When speaking of economics dealing with the laws governing the economy it should reached also into its other aspect of meaning, which says that economics is a skill of rational use... or the ability to cost-effective use of...

When teaching issues related to architectural design are discussed, the interpretation of problems connected with economy, in the opinion of the authors of the paper, focuses mainly on two issues: construction in conjunction with materials and energy efficiency. The first, concerning questions about the relationships between the spatial, construction and installation structure, and cost of materials of an object makes one think about the impact of the changing techniques and technologies on the spatial shape of architectural solutions. The second involves the general global preference for activities leading to the sustainable use of natural resources. The most common reason to seek new implementation opportunities, even the most ephemeral ones, are decisions about the new possibilities of techniques and technology concerning their effectiveness - although this effectiveness is not always "right away" or "directly" expressed.

Teaching at a school of architecture is a simultaneous game of reality, hence the huge receptivity to changes in the given project and receptivity to changes in design and teaching. New trends are born together with spatial and social changes. The educational system should also evolve within the schools of architecture under their influence.

3   Idea, Concept, Project

Architectural design is a process of creation related to transformation or to formation of the new reality. Methodically speaking there are two formulas functioning next to one another: thinking of a project which leads from the details (functional and technical solutions) to an overall layout concept and a geometrical form. The second approach leads the designer differently. The first step is a thought – an overall picture. Detailed solutions are the second step. In each case there are three stages of action:

- analysis – synthesis – evaluation
- synthesis – analysis – evaluation

Both models are consistent and form symmetrically different approaches to the design process. But they split architects, of which almost 90% is on the first side, and 10% on the second side – this situation is somewhat the effect of inborn abilities and somewhat the effect of the teaching methodology. The ideal model is to be able to conduct detailed analysis at the beginning of the design task and to create an overall shape of the object as a summary (according to modernists' rule "form follows function") as well as to be able to visualize the whole object in the first place and (in time) to lead to solutions related to function, structure and technology. An important aspect of the learning process is to teach both skills.

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We deal with ideal designers when they can equally success in beginning the concept design with details and ending up with a whole, or the other way round: beginning with an overall idea of a building form which leads to the details. From the didactic point of view it is essential to teach the students both skills.

At the level of teaching as well as during the professional work, each practicing architect and each student should start the design process with lining their conceptual path according to the following rule: idea – solution alternatives – architectural concept – project. The mentioned stages should be referring to the methods of visualizing – presenting the developing thought.

- Idea – one needs an idea to be able to hypothesize. An idea helps to form criteria and provides a framework of evaluation possibilities in the architectural creation.
- Solution alternatives – alternating teaches how to move freely around the two formulas of the teaching process: "from the particular to the general" and "from the general to the particular" which is particularly important in the phase of concept creation.
- Architectural concept – the search for solution alternatives should lead to clarifying one concept picturing the new architectural object and/or the new urban plan.

The design course conducted by the author pursues the first two phases to be performed as a freehand sketches or watercolors. In the next phase a draft is also required but in the form of a model. The last phase of the design in architectural teaching is the time of generating a digital project – creating the visualization and the technical documentation.

Summarizing:

- Idea and solution alternatives – freehand drawing or watercolor
- Chosen object concept – draft model
- Deciding on the object shape (project) – digital visualization (Fig.1) (Fig.2)

4   Case Study – Students' Feelings

In order to justify our argument (uncertain about the outcome), a survey was conducted at the end of the course among the students (60 persons) of the 3rd semester of extramural master's degree course (and thus a paid course)

The exceptionality of this group lies in the fact that:

- as teachers we meet them in classes only on Sundays, and the schedule of meetings is very scant;
- among the mentioned students we have many from outside of the Faculty of Architecture at the Silesian University of Technology;
- a few of them are from other Polish regions;

- almost all students are employed in architectural firms, and so they often think of themselves as having sufficient knowledge to design independently.

The more, the answers they gave us were for us, the university teachers sometimes regarded as excessively conservative, very encouraging.

During the first few classes (whose a total maximum is 9-10 per semester, and the real contact with the student, allowing us, the teachers, to transfer knowledge, experience, and conduct discussions on the project is limited to 3-4 meetings) we required from students freehand drawing and preparing mock-ups reflecting the idea and concept of the designed facility. At that time the students did not have positive opinions about such approach – they were irritated by our requirements, they rebelled against such "restrictions". They treated our requirements as a necessary evil on the grounds that nowadays projects are generated using computers and there is no need to "waste" time on manual search for solutions. At that time they did not accept the argument that the computer is only a tool to a relatively quick and neat drawing of the ready/selected concept.

A total of 26 persons aged 25-36 years participated in the study: 18 men and 8 women. Only 2 of the respondents do not have a job.

In the prepared questionnaire four questions were posed (three of a closed character and one open). The table below shows the questions with the percentage of responses (Table 1).

Table 1. The results of the survey conducted among the students

L.p.	Question	YES	NO
1.	In your opinion, is freehand drawing/sketching needed by the architect in the creation of the first idea about the object?	95 %	5 %
2.	In your opinion, does a mock-up facilitate conceptual thinking?	85 %	15 %
3.	In your opinion, does a computer „library" restrict creative thinking?	60 %	40 %
4.	In your opinion, which computer software you are familiar with can successfully substitute CREATIVE THINKING? Please, specify.	AutoCad, SketchUp ArchiCad,,,Photoshop RevitArchitecture, Atlantis, 3DMax	none
	% of answers given	65 %	35 %

The interpretation of the conducted survey is clearly positive. At the end of the class a very small percentage of students, despite the initial resistance and irritation, considered our requirements as impractical and without future. The survey revealed that it was agreed that an architect seeking an initial concept/thought about an object should, or maybe has to, search for it using hand drawing. Also, the perception of the teaching method, involving the obligation to prepare a working mock up (more time-consuming way of reflecting one's mind) has gained approval.

Fig. 1. Examples of students' semester's work: idea and chosen object concept. A - freehand drawing; B – watercolor; C - draft model.
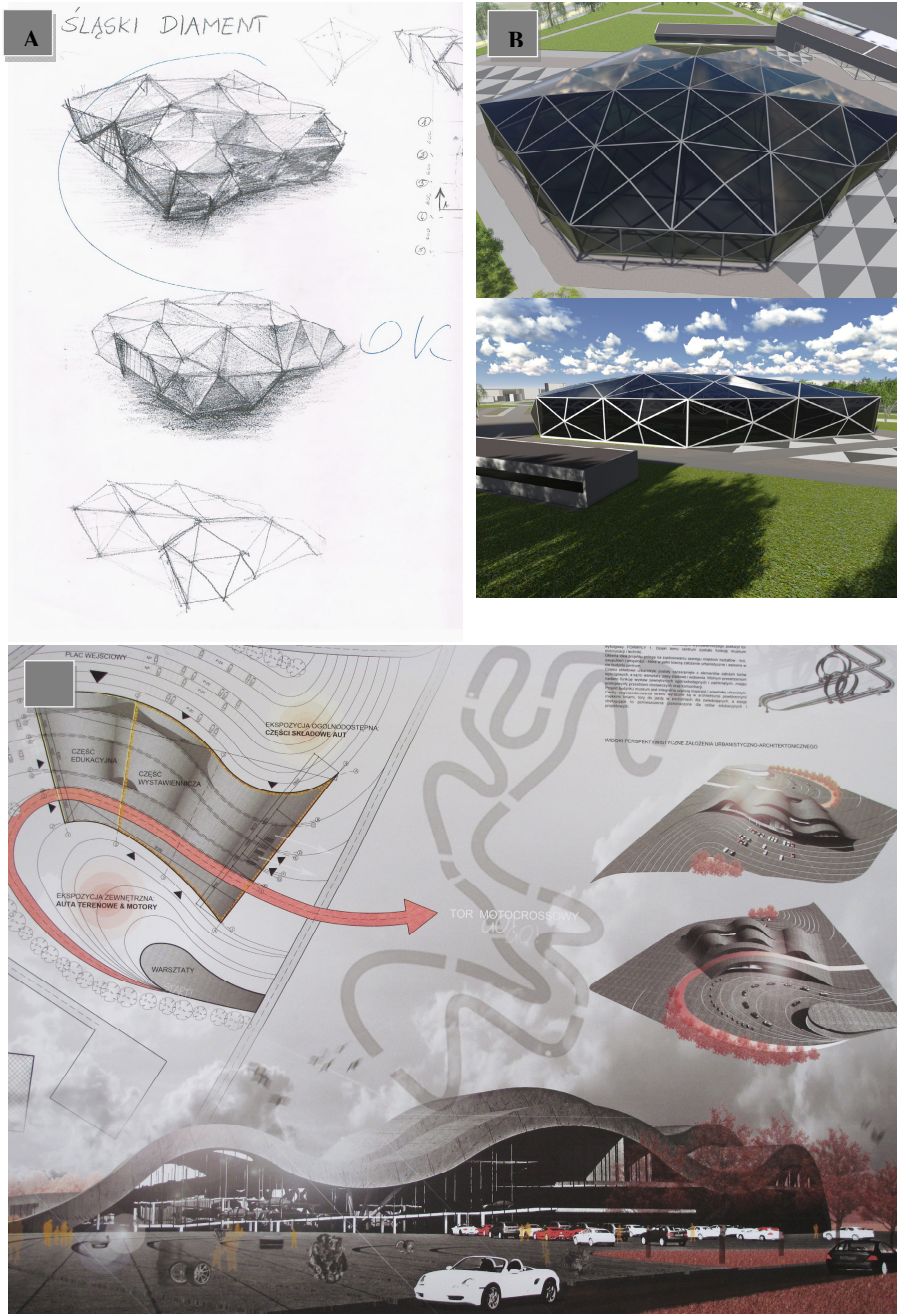
Fig. 2. Examples of students' semester's work: idea and project. A - freehand drawing; B - digital visualization.

There exists, however, a significant group of people who believe that computer software can replace the logic and culture of design and that many software packages meet their and the investors' expectations, accelerates the process of creating documentation, creates forms which are a response to the aspiration of present times and future.

5   Conclusions

An architect/ an urban planner presents a graphic solution of a given problem. In the beginning the architect doesn't know either the final outcome or the range of complexity of the undertaken task – the awareness of both evolves during the design process. The reasons are of course the complexity and interdisciplinarity of the task as well as the instability spread in time and uncertainty of the final result. The design process is therefore a form of a game, or maybe more a form of a dialogue between the problem and the solution. Dialogue is here a keyword which allows establishing an agreement between the architect and the drawing, the architect and the client, the drawing and the client, the developer/investor and the user etc. In this dialogue the designer uses the practical knowledge drawing from professional experiences, theoretical knowledge, occurring facts and values. These direct relations between spontaneously used theoretical knowledge and an experience most probably influenced the popularity of expressions: Knowing in Action; Reflection in Action; Reflection on Action [8] – these expressions are aiming to highlight the creative use of knowledge, reflection, the ability to compare and the use of experiences of others in solving similar design issues.

In presenting the discussed problems other issues should be emphasized as well – the issues of facility management and qualitative surveys of buildings. K. Fross notes that during preparing an architectural project in the traditional way the idea and inspiration are still used as dominant elements. Rarely are performed pre-design analyses, calculations of the capacity of the plot, investigations of user groups and their needs, matrices and diagrams of functional links, surface calculations, "work carpets", defining the characteristics of the image fitting for the given organization, case studies, assessment of the object in various fields, surveys, interviews etc. [9]. It is hard not to agree with this point of view, especially when we are referring to engineering students. However, it seems that the main task of the educational process at the next stage of teaching in higher education, at the master's degree level, primarily should be the emphasis on deepening the passion for creative thinking. Otherwise such architects become the usual technocrats.

Of course the discussed issues are open. In the era of an easy access to modern technologies and mental changes of societies everything is dynamically changed. The question is: Will the computer captivate the humankind and limit its intellectual possibilities? Or maybe it will develop these possibilities? Will we live matrix lives?

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