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Research based design: Competition Proposal for the Cyprus News Agency

Abstract:

The paper attempts to explore the interrelation between a) the architects' individualism and "pre-structures" b) research- based findings during the design process through experimentation and c)an integrated design approach, where morphology, construction and bioclimatic design are integrated from an early design stage. Through a thorough presentation and analysis of a competition proposal for the Cyprus News Agency, we discuss a number of important findings in relation to the present and possibly future form of the design studio. We suggest that the designer's "prestructures" may not only be the basis for creative action, but also the basis for understanding and interpretation. Design informed and enriched at every stage by a research-based process, might well be the transmission and transformation of "prestructures", a process of elaboration and discovery which facilitates and enhances design creativity and possibly allows for a multiplicity of approaches through a range of possibilities. Furthermore, an integrated approach from the early stages of the design process facilitates innovation in materials and systems.
Keywords: Design studio, architect's prestructures, research-based design, design knowledge, integrated design methodology.

1. Introduction

The design studio has undoubtedly been at the core of architectural design education since its inception in the nineteenth century. The traditional studio-based pedagogy has remained fairly stable and unchanged for more than a century, based on the historical models of the Beaux-Arts and the Bauhaus. The idea of the design studio was first developed as a form of collaborative learning, in 19th century France, by students of the Ecole de Beaux Arts. The school's formal activities consisted of theoretical lectures and the setting of design competitions but there was limited opportunity for design tuition. Students consequently organized independently established workshops (ateliers), inviting and paying qualified architects to assist them with their design work. This system has continued into the 20th century, initially within the offices of architects (the atelier of Le Corbusier), at a later stage within schools of art and design, and more recently within schools of architecture.

Research related to pedagogical approaches to architectural education, reveals considerable differences in the process of education of future architects around the world; schools of architecture adopt different models of how learning within a design studio may occur. In some situations, (the year system), students will all work on the same project, within a shared studio environment for a whole year. In other situations, (the unit system), students from various backgrounds may work together in a similar way to the Beaux Arts ateliers[1]. However, the overriding primacy given to the studio as the main forum for creative exploration, interaction and assimilation remains a common characteristic. Students encounter fundamental principles, basic skills and knowledge of visual environment and start formulating initial ideas about their future role and responsibilities as architects to be. The design process as the core of the design studio has been extensively researched. As Salama suggested "*the design studio is the melting pot of different types of knowledge thereby occupying the core of the education of architects*" (Salama, 2001).

We cannot of course overlook the fact that during the past decades the traditional design studio has come under considerable criticism enforced by social, cultural, epistemological and economical factors, knowledge and technological developments and increased use of information technology and computer aided design. However, we believe that it can still be rightfully considered as the foundation of architectural education albeit in a possibly different form. Different types of knowledge need to be an inherent part of the design process, which we believe include individual knowledge

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[1] This enables the sharing of expertise from experienced to inexperienced, usually under the guidance of a 'unit leader'.

(personal experiences, background, values) and research-based knowledge, within an interdisciplinary framework.

The designer's individualism, (what we will call in this paper "prestructures" or "preconceived" ideas), integrated and interdisciplinary design methodology and research - based design are, we suggest, three of the most important issues central to the approach towards architectural education in general and the architectural studio in particular. The paper attempts in the following sections to explore the interrelation between a)the architects' individualism, b)research- based findings during the design process through experimentation and c)an integrated design approach, where morphology, representation, construction and environmental design are integrated from an early design stage, as possibly a contemporary approach to the design studio. Through a thorough presentation and analysis of a competition proposal for the Cyprus News Agency, we discuss a number of important findings in relation to the present and possibly future form of the design studio.

We suggest that the designer's "prestructures" and individual knowledge, may not only be the basis for creative action, but also the basis for understanding and interpretation. Design informed and enriched at every stage by the knowledge acquired through a research-based process, might well be the transmission and transformation of individual knowledge and "prestructures", a process of elaboration and discovery which facilitates and enhances design creativity. Furthermore, an integrated approach from the early stages of the design process facilitates merging of interdisciplinary knowledge and hence innovation in representation, materials and systems.

2. Architectural Design Process

2.1. Design process and types of knowledge

Architectural design involves the generation and gradual transformation of ideas/concepts into concrete spatial formations. Such ideas, although described in a variety of terms -as image by Alexander (1964), primary generator by Darke (1984), organising principle by Rowe, (1987) or concept by Lawson (2003), all refer to the individual unique idea that distinguishes each architectural design and view design as a sophisticated cognitive activity. Through this process, students search for

satisfactory ways through which their ideas will be formulated/reflected into spatial layouts to be inhabited and experienced. Through self reflection and evaluation of a number of alternatives, a proposal is reached.

Design process is thus no-longer viewed as a linear problem-solving activity (Jones, 1984; Archer, 1984; Alexander, 1964) where sequential activities are carried out e.g. problem definition, analysis, synthesis, evaluation in a linear order as there is no direct flow from one activity to another. An alternative to a linear design methodology is what Schon (1987) has termed a "reflective conversation", where variables of solutions are generated, tested, abandoned or optimized, in pursuit of design versions and adaptation. Schon's suggestion of design as a kind of "making", largely learned and practiced through "action and reflection" is highly relevant,

Designing in its broader sense involves complexity and synthesis. In contrast to analysts or critics, designers put things together and bring new things into being, dealing in the process with many variables and constraints, some initially known and some discovered through designing. Almost always, designers' moves have consequences other than those intended for them......beginning with the situations that are at least in part certain, ill defined, complex and incoherent, designers construct and impose a coherence of their own. Subsequently, they discover consequences and implications of their constructions – some unintended- which they appreciate and evaluate. Analysis and criticism play critical roles within their larger process, (Schon, 1987).

Moggridge (2007) described such an open structure of the design process, in which phases are grouped in a circular arrangement, yet the process itself does not develop in a linear manner. Lawson (2003) further suggested that architects tend to learn about a "problem" through their attempts to achieve a desired result rather than through distinct and deliberate study of the "problem" itself. In other words, they discover through self reflection and critical evaluation. A comprehensive architectural knowledge is thus needed to help architects through this process. Vitruvius (1990) defined such knowledge as a synthesis of practice and theory, which we could suggest involves intuitive (individual knowledge - personal experiences, values, believes) and rational (theoretical and scientific knowledge related to human beings, the environment, history, society) ways of thinking, see also relevant suggestion by Simon (1996), Fig.1 .
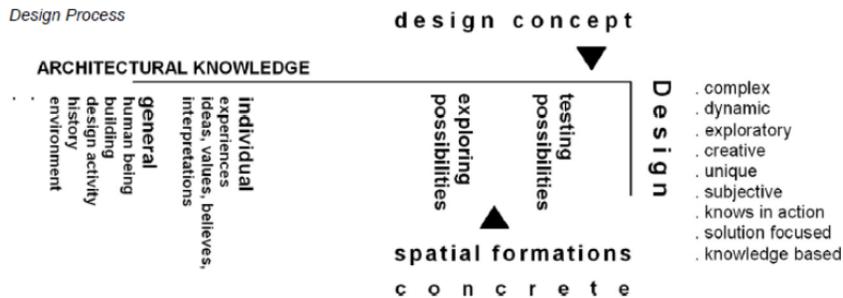
Fig. 1 – Design Process, Simon (1996).

Ziesel (1984) added that the design process involves two types of information: heuristic catalyst for imaging and a body of knowledge for testing, which for Lawson (2003) means the designers' reliance on information to tell them how things might be, but also the use of information to tell them how well things might work, introducing experimentation in the design process. Design process is rather about experimentation and probing: experimentation allows discovery, which in turn allows evaluation and redefinition of initial ideas and concept. Reinhardt (2008) suggests that design is neither result nor technique, but the performance of a creative process driven by a logic that equally employs calculation and creativity. Within this context, he highlights the need for explorative design methodologies, as opposed to either linear or reflexive design methodologies. Explorative methodologies, according to the author, employ experimentation through the design process and further take an open process structure into research throughout the design process.

These proposals introduce an important link between research-based information through experimentation and design activity. This paper suggests that this link, within an interdisciplinary framework, and in addition to the types of knowledge described above, opens up a new perspective for students in architectural education.

2.2.   Individual knowledge – "Prestructures"

"Preconceived ideas" or the designer's "prestructures" is, we believe, one of the most important issues central to the approach towards the design process and raises a fundamental question in relation to the pedagogical approach to the studio. Historically, we have been familiar with a "rational" approach to design as a problem-solving method, which links a procedure to a field of information (analysis and

synthesis of a number of constraints through a given brief, user profile and site conditions); in fact the designer has been repeatedly referred to as "problem-solver". Reflecting on the arguments presented in the previous section, it is suggested that the exclusive use of a method or a medium through a linear methodology, renders the design process only partially effective. A controlled phasing seems to dismiss intuitive passages and individual interpretations.

According to a very interesting article on what makes design possible, Hillier and Leaman (1974) suggested that this "rationality" in design aimed basically at purging the mind of preconceptions[2]. Approaching the question "How is design possible", Hillier and Leaman suggested that design is a relatively simple set of operations carried out on highly complex structures. They stressed through their work, that the designer's "prestructures" are not at all an undesirable phenomenon, but the very basis of design. Moreover, it is exactly these "prestructures" they argued, that are not only the basis for creative action, but also the basis for understanding and interpretation[3]. Design, they concluded, is the transmission and transformation of "prestructures", a process of elaboration and discovery within which every solution may be unique[4].

In line with the thoughts expressed in the previous sections, we suggest that individual knowledge, background experiences, personal beliefs, values and ideas, are vital during the design process and possibly facilitate and enhance design creativity, while allowing for a multiplicity of approaches through a range of possibilities. By taking into account design constraints, architects rely on individual knowledge brought together with research-based[5] knowledge, through a cyclical process of experimentation, evaluation, self reflection and redefinition.

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[2] This paper is on line with the work of Bill Hillier and Adrian Leaman in a very interesting article "How is Design Possible?" the suggestions of which we find appropriate for contemporary approaches to architectural design education; Hillier and Leaman (1974).

[3] According to the authors, to ignore these prestructures in representing design as a design procedure is like assuming that a speaker re-invents semantic and syntactic structures which he depends on knowing in advance in order to use and understand the language.

[4] As they suggest through extensive research "*the problematic of design method studies is therefore twofold: to characterize the autonomic prestructures by which the designer interprets his problem and which also act as a "solution field"; and to characterize the operations which may be performed with and upon such structures in a more or less complex environment to produce unique and effective solutions*"; op.cit. p.5.

[5] In this article we make a distinction between research-based and science-based design, in line with the thoughts of Rendell J. (2004) Architectural Research and Disciplinarity, and Till, J.

2.2. Research-based knowledge

Several recent works suggest that we are today in the process of defining and refining the idea of architectural research and seek to define a mode of scholarship and inquiry that is special to architecture and is not adequately described in terms of the "scientific" method. The argument about research-based design is probably part of a wider argument about architectural practice today and the future of the architectural profession. Architectural research- based knowledge is gradually considered vital throughout the design process. This type of knowledge may be seen to have two main contexts for its production, the academy and practice. We believe it is important that neither is privileged over the other as the appropriate form of research, but that they rather complement and inform each other. Such a relationship can be of great significance to the studio, both within the academic environment and in practice.

In a recent paper, which takes as a starting point the essential tenet that architecture is a form of knowledge that can and should be developed through research, Till (2005) suggested that architecture "has its own particular knowledge base and procedures, which demand a definition of research appropriate to architecture[6]. Rendell (2004) supported this argument and suggested that architectural research is best understood as a complex subject area that involves a number of disciplinary procedures, including the specific practice of architectural design. She argues that "architecture encompasses several disciplines and uniquely brings together modes of research that are often kept apart (historical analysis, and material science for example) and so provides possibilities for multi-and interdisciplinary research".
Central to the subject of architecture, is architectural design, a particular mode of practice-led research whose disciplinary specificity cannot be found in other types of practice or design. As Till points out, the stretching of architecture across separate areas of knowledge does not address the particular need for architectural knowledge

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(2005) in Architectural Research: Three Myths and One Model, which take as a starting point the essential tenet that architecture is a form of knowledge that can and should be developed through research and propose that in order to fully acknowledge the wide range of methods adopted and outputs produced within architectural research, we need to engage with discussions around disciplinarity.

[6] This particularity, according to Till (2005) does not mean that one should avoid the normal expectations of research, but in fact demands us to define clearly the context, scope and modes of research appropriate to architecture, whilst at the same time employing the generic definitions of originality, significance and rigor.

and practice to be integrative across epistemological boundaries. "Buildings as physical products function in a number of independent but interactive ways – they are structural entities, they act as environmental modifiers, they function socially, culturally and economically. Each of these types of function, can be analyzed separately but the built form itself unifies and brings them together in such a way, that they interact" Till (2005).

Research into architecture thus has to be conscious of these interactions across traditionally separate intellectual fields, which according to Lawson (2003) can be divided into three stages: architectural processes, architectural products and architectural performance[7]. The advantage of this proposal, according to Till, is that it avoids the science/art and qualitative/quantitative splits, allows thematic approaches to emerge as well as interdisciplinary research into any of the three stages.

Underlying all stages today, is the question of the relationship between the digital and the analogue worlds which forms a central issue for architectural research. It is acknowledged that digital technology has brought a radical change in the contextual frameworks in which architecture and architectural production are normally placed. Examining such issues, recent research work suggested an interesting finding, related to Rendell's argument presented above: that advances in digital technologies are paving the way to achieve "integrated design" -a type of practice in which various disciplines involved in building design work together to achieve efficiency and other benefits. These technologies enable the designers to collaborate, visualize, research and modify building performance with relatively high accuracy. If such an approach gradually becomes widespread, architectural education and studio in particular, needs to take it into consideration[8]. A curriculum based on a "schism" between "technology" and "design" is inherently in conflict with the principle of integration, as Per Olaf

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[7] According to Till (2005) the first stage, process, "refers to research into processes involved in the design and construction of buildings, and thus might include for example issues of representation, theories of design, modeling of the environment, and so on. The second, product, refers to research into buildings as projected or completed objects and systems and might include for example issues of aesthetics, materials, constructional techniques and so on. The third stage, performance, refers to research into buildings once completed and might for example include issues of social occupation, environmental performance, cultural assimilation, and so on".

[8] Per Olaf Fjerd recently pointed out that architecture is evolving into far more of an infrastructure capable of taking on a variety of spatial and functional programs, than the actual physical edifice. Critical thinking becomes thus, an essential instrument in a research-based architectural education which needs to actively navigate towards strengthening reflective and inventive capacity.

Fjerd (2008) recently pointed out. This approach requires the integration of technology and allied disciplines at the outset of the design process.

2.3. Integrated design-Interdisciplinarity

In line with the thoughts expressed in the previous section, we propose that the integration of input from allied disciplines in the education of architecture students through the studio needs to be further explored[9]. The interdisciplinary aspect in architectural design constitutes an academic and professional field of growing complexity, responding to the rapidly evolving needs of contemporary communities. Interdisciplinary design covers a mindset of collaboration and cross-disciplinary communication at all stages of the design process. The success of the methodology rests on an integrative approach to education and research in architectural design which examines not only the social, behavioral and cultural relationships, but also the increased complexity and quality of building systems in producing sustainable forms in the physical context[10].

In studios that follow this approach in their pedagogy, faculty members try to give students an integrated experience in architectural design, while also giving them the opportunity to work outside of their normal areas of knowledge and experience. The approach also has repercussions in the way that architectural graduates are expected to influence and inform professional practice as a result of their training. Collaborations among faculty, students and corporate partners aim at exploring the potential for genuine cross-functional communication and cooperation, while highlighting strategies fundamental to the success of the approach (Buchanan & Vogel, 1994).

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[9] In defining this association of disciplines, a distinction ought to be made early on between a multidisciplinary approach – a collection of disciplines brought together to solve a problem – and an interdisciplinary approach – a collection of disciplines on a team with a shared commitment to solving a problem (Buchanan & Vogel, 1994). It is the second definition of interdisciplinarity that is proposed as the basis for experimentation in the design studio.

[10] On this basis, methodologies and generic frameworks for interdisciplinary design at the conceptual and construction level of the design process have been proposed (Leslie & Dong, 2003; Macmillan et al., 2001; Pearce & Frewer, 2003; Seidlein & Schulz, 2001). A proposal for a comprehensive description of the interdisciplinary design process is also included in Sanvido & Norton, 1994]. The model can be used as a basis for implementing digital technologies to upgrade the entire design profession.

3. Competition proposal for the Cyprus News Agency

The application of interdisciplinary thinking approach to the studio, building on individual and research-based knowledge throughout the design process, was explored through a competition proposal for the Cyprus News Agency. The architectural design was pursued within an interdisciplinary context of development, where the building morphology, the structure and construction and the energy efficiency were considered as equally important design parameters, and were investigated interactively from the initial design stages.

These parameters were explored through both digital and analogue forms of representation, through the different scales of design. Students and faculty used a multiple iterative conversion between analogue and digital media to investigate the design concept through material, texture, structure and shape in a detailed and intuitive way. The proposal sought to examine the use of digital technologies in the collaborative learning environment of the studio, as a facilitator and catalyst for the promotion of the underlying pedagogical objective of integrated design and research-produced knowledge, at every stage of the design process. A design methodology, enhancing an explorative design process and employing representation as research, was explored, as suggested by Reinhardt[11] (2008). An integrative approach, part of which is presented in the next section, was used, in which design elements and partial solutions in different media (analogue and digital design techniques) were cross-referenced and re-informed each other.
Consequently, the studio team needed to draw on the expertise of faculty and design professionals and consultants affiliated to fields beyond that of architectural design, such as engineering, information technology, environmental studies and the social sciences[12].

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[11] Reinhardt's argument frames representation as research: it is not seen as an end product but as an active component at phases of ideation, conceptualization, experimentation and visualization in the creative design process.
[12] Whether partnering with specialized consultants from a variety of fields or collaborating with fellow students from other departmental disciplines, the aim of the interdisciplinary studio team concept was to create a responsible and creative learning environment. Coupled with multi disciplinary participation, such a studio structure may produce changes to the physical environment of communities that can lead to the systematic utilization of untapped professional and community resources and aspirations.

3.1. Architectural design

The proposed architectural morphology was perceived as an expression of the social and organizational structure of the building. It is characterized by a functional and aesthetic simplicity that enhances physical, visual and acoustic interactions and differentiations within the interior and the external environment. Based on the organizational structure and the operational system of the Cyprus News Agency, the design reflects the differing and discrete functional sections of the building, promoting and expanding at the same time its social identity. In this frame the spatial sections of the building remain identifiable, but within a unified building complex, in aesthetical and functional terms. Architectural design operations, such as the relations between movement and pause, individual and collective spaces, transparent, semi-transparent and mass surfaces and different levels aim at the internal unification of the workers and the functions, while preserving their individuality and autonomy, when necessary.
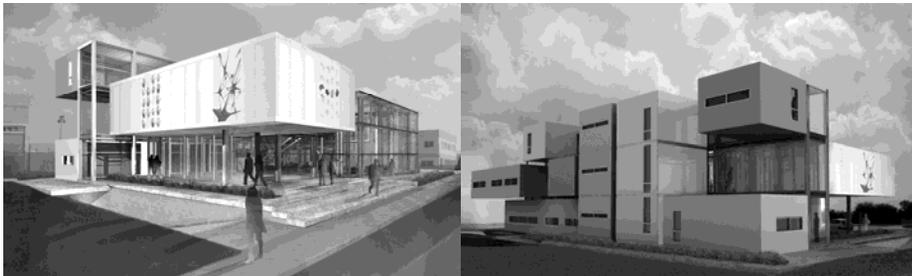

Fig. 2 – South-west and north-west perspective view of the building.

On the east, the spatial section of information "production" (unified newsroom) is placed, on the west, the section of information "presentation and dissemination" (multipurpose room), and on the north, the individual offices of the organization. A "corridor" comprises a significant element of the design, acting as spatial axis that engages, divides and unifies movements and programming elements, Figure 2. The circulation zone ensures free visual correlations between all main functional sections and preserves in parallel the physical and acoustic isolation of the spaces, when functionally required.

Bioclimatic design considerations influenced to a high degree the development of the building morphology and the functional configuration in the interior. In addition, the construction design of the building envelope was developed interactively with the

consideration of the thermal comfort in the interior spaces and the visual correlations with the exterior. The present paper emphasizes the last mentioned points of development, demonstrating the environmentally driven building design direction on one hand and the design driven technological developments achieved in the building façade design, on the other.

In terms of sustainability, the interactive development of the spatial configuration and the façade elements design according to the needs for natural ventilation of the interior and the external sun-protection systems, was of major importance. In the first case, a central corridor in the first two floors in the longitudinal axis acts as interior wind tunnel for the air-circulation and ventilation of the adjacent spaces. In the second case, the glass façade of the newsroom is sun-protected in the three main sides through a double layer of steel elements, consisting of a rectangular steel mesh of round steel profiles with constant geometry (primary element for sun-protection) and of vertical steel bars, placed in variable distances along the horizontal axis (primary element for visual correlation). Horizontally, the layers form a filigree "curtain" with openings that are defined parametrically, in relation to the visual interconnections from the inside to the outside and vice versa. In accordance with the construction design of the system, the environmental analysis of the space relates to the natural lighting and the thermal comfort of the users[13].

The architectural design was also developed in an integrated context as regards the structural and construction design of the building. The structure and the construction elements and materials applied, aim at the enhancement of the architectural concept (news production and dissemination), as well as at the achievement of the required static and seismic behavior of the system, Fig.3.

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[13] The hourly solar exposure of the transparent, south oriented, sun protected façade was determined by employing the Ecotect „Solar Exposure" tool, using the five minute time step calculation. The bioclimatic performance of the innovative solution of the double mesh layer presented in the paper was obtained by using the Ecotect software, a concept-to-detail sustainable design analysis tool. Ecotect offers a vast range of modeling features in order to determine how fundamental criteria, such as solar, thermal, shading, lighting, and airflow, affect the building performance in the conceptual and detailed phases of design.
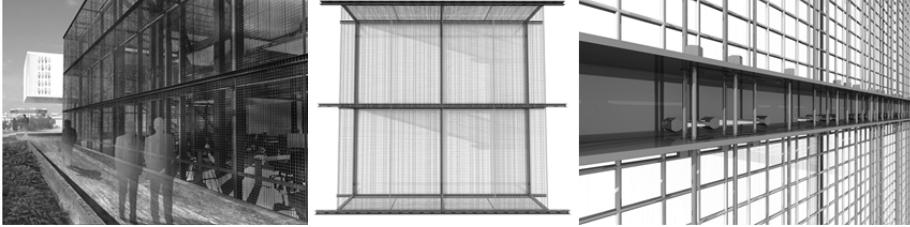
Fig. 3 – South-east perspective view of the unified newsroom façade with double steel mesh layer.

The design, construction and bioclimatic performance of the innovative solution of the double mesh layer, was explored through the use of both analogue and digital technologies, employed by all participating disciplines, from concept-to-detail.

Conclusion:

The design example clarifies the methodology of interdisciplinary integrated design, whereas architecture, morphology, construction and bioclimatic design are interrelated from an early design stage to achieve innovation in materials and systems. The proposed design for the Cyprus News Agency building that was developed in an interdisciplinary integrated context, addressed in the present paper aspects of sustainability that were considered from the initial design stages. The proposed methodology of design development aimed at first place at the achievement of thermal comfort in the interior spaces, through respective formulation of the building morphology and the functional disposition in the interior, as well as the development of technological systems to form a multi-layering building skin that would allow for environmental protection of the interior spaces and visual correlations between the interior and the exterior. The architectural design, proper choice of the materials as a result of research-produced knowledge, as well as the integrated bioclimatic design of the building explored through digital representations, resulted at the reduction of the cooling and heating loads which would have been needed to be achieved by mechanical means. Individual knowledge, through each member of the interdisciplinary team, was brought together with research-based knowledge, through a cyclical process of experimentation, evaluation, self reflection and redefinition.

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