

## **A Transactional Method for Redefining the “Design Process” within Academic Programs for a “knowledge-based architect” (KBA)**

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### **Abstract**

Expression within architecture has been applied in an over-simplified manner without an understanding of the cultural milieu of present-day society. During the Industrial age the primary focus was on iron and steel as the method for constructing mega-structures. Similarly the Functional and Modernist viewpoints reflected a ‘mechanised’ architecture and the treatment of buildings as a manufactured product. The more sophisticated High-tech architecture stressed on revealing the latest in building technology *per se*. Historicists and Post modernists expressed heritage with the over-simplified method of ‘patching on’ historic forms at the expense of present and future socio-cultural requirements.

It is argued that over-simplified architectural expression results from rigid teaching programs within academic courses that tend to stress on design as a final product at the expense of determining the forces that configure the process of design. In other words, the paper argues for *design process* as opposed to the traditional viewpoint, which solely stresses on *design product*.

Furthermore, multi-disciplinary tutoring within the design studio is called for, in order to identify culture, heritage and main stream world-views as tools for appreciation and expression by architecture students. Globalisation, and rapid changes in technology and society raises the challenge for identifying these tools. This suggests a transactional methodology for studying the design process, as a course of action that sets to determine past and present forces in our cultural milieu that affect the way we think and design.

## Introduction

Design education has recently emerged from a period of treating history as deserving academic study but making little connection with the present. Today’s architecture students’ are expected not only to appreciate historical work in its own right, but also to use it to formulate contemporary design. The design constraints of the past have differed from today’s design constraints. Traditions have developed to show structural variations, not only between countries, but also along different design trends. The progression of our heritage within future architecture can only take place with a more fundamental understanding of design, based on a process that would allow for differences within different localities to flourish. It is the purpose of this paper to present a teaching guide that allows for those variations to take place and further enhance future architecture through the examination of the *design process*. The past has produced an immense vocabulary of historic forms, from which architects have constantly borrowed and reused. In reality this vocabulary is essential for understanding past heritage, but solely depending on the past can be rather dismissive if present and future forces that configure the final product of architecture, are overlooked. Following the UIA Beijing Charter (1999) term 3.5, it is important to highlight that regional architecture is not a mere product of the region’s past but it is derived from the region’s future.

*We should use our professional knowledge to guide an informed choice amongst the options that are increasingly opened to local communities.* (UIA Beijing Charter, p.6., 1999).

History is most certainly essential, but requires the examination of architecture in-transition through time in addition to identifying its historical backdrop and forces of change. It is further important to recognise the fact that the process of discovering heritage is ongoing and endless. It is therefore required to challenge past techniques for determining architectural heritage, particularly the techniques that tend to borrow and copy the architectural vocabulary of the past and present them in an oversimplified manner.

Many lessons from history can be examined, in a more transactional perspective by examining changes in architecture as an ongoing process (Nabih, 1999). This perspective indicates that the design process is endless and further facilitates our task for determining the architectural products of the past, present and future. Examples of this are the industrial, modernist and post modernist view, which briefly show how particular events led to the appearance of different design approaches. Some schools of thought emphasise the significance of the discoveries of that time, whilst the postmodern classicist view re-introduced past motifs for the purpose of reviving historic forms of architecture (Jencks 1993). It must be mentioned that these movements uncovered social, economic and aesthetic demands for design, however it displayed the formal idiosyncrasies of architectural movements. Here, the final product of design is stressed upon at the expense of the design process. Final forms introduced and mediated by critics and presented within coloured architectural magazines also help in driving architectural students away from the design process.

Lessons can be examined through the study of major architectural movements even as recent as late 18<sup>th</sup> century architecture that expresses the constraints and abilities of the local economies and the rise to the latest industrial innovations of that time. The reduced price of pig-iron in 1750 and the development of the steam engine made it possible to produce larger quantities of cast iron and wrought iron and gave way to the use of steel in the construction of

bridges as opposed to the traditional use of wood (Gympel 1996). These discoveries primarily adjoined the industrial revolution had paved the way for a new perspective on built structures. Steel skeletons and fine glass panes founded a new rationalised method of construction based upon standardisation, which accelerated the building process. The resulting structures, later labeled as ‘Industrial architecture’ had appeared in the form of factories, railway sheds, exhibitions, which were specific industrial products of that time. They were considered as the main icons of Industrial Architecture expressing the commanding forces of the industrial revolution.

By sequence of events but based upon rather different goals, the dependence on steel was the main drive, later leading to the Chicago school of architecture appearing in the late 19<sup>th</sup> century. The goals here were based on the need to create higher office buildings having more effective floor space, which had earlier been limited due to the dependence on two-metre wide stone bearing walls (Curtis, 1987). Thus, this school was driven by economics and efficiency and the consequent expression of the latest in building technology using skeleton structures with grid facades and glass filling in between the spaces. Later Louis Sullivan’s “form follows function” motto founded the modernist school of architecture. Architecture of efficiency took course, creating the bases for expressing a more futuristic architecture with the pressure to seek architecture of ‘pure form’ totally neglecting architectural motifs that had for centuries been the aspiration of architects.

In reaction came the idiosyncrasy of post-modern classicists using historic forms of the past but in a rather twisted fashion. Past architectural vocabulary was blindly reused in the name of historic revivalism, expressing true qualities of a pop culture of architects. Certainly not all Post modernists have succeeded in presenting society with architecture representing the heritage of different societies. Post modernism and the constant attempt in ‘excavating’ for a historic vocabulary to reintroduce into present day architecture, has been criticised for producing kitsch architecture. Post modern revivalists such as Leon Krier and Abd El-Wahid El-Wakil labeled as straight-revivalists – have remarkably tied themselves with the basic construction materials and principles of the past. They have been criticised for their lack of innovation (Jencks 1993) in addition to creating architecture without foreseeing the present or future role of architecture within a changing society. These architects perceive architecture as taking a more static nature neglecting modern construction techniques, present-day economics, and clientele emphasis on budget in addition to the changing lifestyle of inhabitants.

Consequently, many architectural journals direct their attention to new forms of architecture, in an art directed way, has hijacked the focus on an increasingly artistic architecture at the expense of studying the design qualities that direct the final product. This dismissal threatens architectural diversity and suppresses the true course of the *design process* leading scholars of architecture to follow a more formal type of architecture driven by the inspiration of the architectural *product*. We can no longer afford to immense the student of architecture to past design form. Rather they must learn to appreciate and exploit new technology as it develops.

## Postulation

Design training within universities is usually subjected to a variety of factors that may limit the scholar’s understanding and perception of design. Imagery is an inherent attribute of architectural composition and usually dictates the attention of many critics towards the final form of architecture. The visual composition of finalised architectural forms within the media as well as its physical reality, dominates the view of architectural design and the core perception of design methods. For an ever-changing society it is argued that the appreciation of *design process* is essential as it is based upon the changing constraints in our societies. Thus the paper introduces a transactional method (i.e. addressing changing phenomena of design through time) for academic design training by enhancing our knowledge of the design process.

## Objectives

This paper initially attempts to identify particular factors within training programs that exert more attention to final product as opposed to the design process. Secondly it attempts to identify a training strategy that would allow for a more balanced approach to design, including both *design product* and *design process* collaboratively within a four stage teaching strategy. Finally, it is found important to stress that the *design product* results from particular forces that control the *design process*. This suggested emphasis on the design process within teaching programs allows the future architect to obtain a method for understanding the inherent forces controlling the design product. Furthermore, the paper presents an applied application on students for the specific purpose of raising their awareness to the design process.

Architectural education should allow for open mindedness to utilise new technological advances, to create the basis for a professional knowledge (UIA Beijing Charter 1999). It is therefore argued that teaching *design process* is a more flexible guiding tool that would facilitate the future architect to create architecture that reflects the different aspects of our changing socio-cultural milieu in transition. The objectives are specifically listed as follows;

1. Identifying particular problems within current design-training programs that stress on architecture as a final product.
2. Introducing a flexible design training approach combining *design product* and *design process*.
3. Highlighting the various dimensions that configure the design process.
4. Training future architects to individually acquire design skills for reflecting architecture that would represent a specific socio-cultural milieu derived from past and present forces.

## What is the design process?

The design process as identified by Lawson (1972) suggests that it consist of a sequence of distinct identifiable activities, which occur, in some predictable and identifiable logical order. The RIBA handbook (1965) suggests that they are separated into; assimilation, general study, development and communication, and are not necessarily in sequential order. It is important to highlight that the process takes place in our minds (Lawson 1999) and is not a clearly

explicit process. Nevertheless, as earlier mentioned it is found important to increase our awareness with the multi-dimensional nature of the process and its influencing factors.

Design is usually guided by different components affecting the finalised product. These components can be represented as constraints as well as guiding principals, that control the design process of the final shape of the end product. Practical constraints such as the materials used and the construction system, configure the design product (Lawson 1979a). The arch is an innovative example of overcoming the limited spans of the lintels, thus overcoming the practical constraints of material and structure. Basic ideas and examples as such should be examined for their inherent qualities, rather than blindly copying the final form. Unfortunately the practical constraints may reach a level of glorification, as did the so-called ‘high-tech’ school of design. It is therefore required by students to be aware of the basic guiding principles that configure architecture.

Similarly, the users of building and their cultural and behavioural differences shape architecture in different ways. The lifestyle and norms of a specific culture shape the interior circulation of buildings (Lawson 1975a). Technology in its strength can easily modify traditional relationships between people and their environment and constantly challenges the existing norms, lifestyle and values of cultures. It should therefore be necessary to allow architects to examine the socio-cultural nature of the users and treat them as a guiding principle of design. Likewise, environmental factors and specific site constraints lead to a local architecture extending from a past heritage if combined with present technologies. Design limitations can become main catalysts for creativity and should shape our present and future architecture

### **Design Problems within academic courses**

It would be rather lengthy and difficult to assume that all the problems within current teaching programs can be highlighted and effectively discussed within this paper. In this case it is found appropriate to mention particular problems relating to the issues highlighted earlier within this paper. An overview of the current curricula guidelines of architectural training programs within some of the main universities within Greater Cairo and mainly stress on architecture within a historical context and within a building-type framework. They examine buildings as a product of architectural trends within a chronological sequence and further study different building types and their requirements. Other courses particularly introduce the final form of buildings and evaluate the aesthetic values of the final composition of architecture. Table 1 below briefly highlights the constituents of the various courses included within three different Egyptian universities within the Greater Cairo region.

Table 1 shows specific targets within different training programs particularly, ‘Theory of Design’. In certain cases, it indicates the particular attention to the study of different building types (design products). In other cases, the attention is directed towards evaluating the aesthetics of the final form of buildings under the label ‘Theory of aesthetics’.

Classifying design by its end product seems to be opposing to the reality of design. The reason behind classifying design in this way is a reflection of the specific nature of architectural departments within Egypt and North Africa as they affiliate to schools of Engineering. Engineers are different from architects in their design approach, not just because they may use a different design process but more importantly because they examine different materials and requirements. Constant subjection to this type of design approach may unfortunately limit the students’ thinking method, directed towards a predefined goal. If we

are not careful then design education may restrict rather than enhance the ability of the students to think creatively.

Course Name	Course description (key word description)
History and Theory of Architecture*	Examining philosophies and architecture movements within the 20 <sup>th</sup> century. International style –Art Nouveau – Organic architecture – International style (In Germany, France and Holland). The Post-war era. Industrial Revolution. Back to Nature. Traditional architecture, Post Modernism, The technological revolution. Futurism.
Aesthetics and Composition	Increasing the students’ awareness to architectural aesthetics and the formulation and composition of space. Application on local examples and interrelationships between aesthetics and composition. Types of spaces within chosen examples from architecture. (ex. Islamic architecture).
Theory of Architecture I	Examining architectural space and its association with human behaviour. The study of buildings with particular emphasis on circulation, function and spatial relationships. Examination of residential buildings and its services, furniture distribution, safety and efficiency.
Theory of Architecture II	Social and environmental factors are studied. Examining different types of buildings – residential, educational, commercial, cultural, etc. including their design requirements.
* Theory of architecture is explained within a historic framework. Note: The table represents a collective summary from three different universities within the greater Cairo region.	

Table 1: Summarised overview of current design courses showing emphasis on design product

The main issues at hand, are basically listed below and clearly identify the lack of diversity in design products:

1. Course subjects are taught independently without a basic connective strategy, to understand the process of design and its significance.
2. Lack of teaching strategies, teaching the required skills particularly targeted to each academic year.
3. Unclear teaching goals where the main requirements for graduating a more knowledge based architect.
4. ‘Theory of Design’ courses, emphasise the analysis on building products, Hotels, Hospitals, Concert Halls, at the expense of teaching the factors that dictate the final shape. This tends to limit the diversity of final designs.
5. Design process is vaguely introduced to students, whilst the design product is represented within different approaches.
6. Praise for chosen design trends, ex. Modernism, Post-modernism, Formal, at the expense of examining the original forces for creation.
7. Introducing architectural movements within a historical and chronological framework, overlooking the true nature behind the movements.

The above highlights the nature of teaching historical accounts in an oversimplified manner, which can easily mislead students due to over-subjection to the final form of buildings. Therefore it is required that academic teaching, dealing with the design process should go hand in hand with the subjection to architecture products. Furthermore, collaboration between lecturers within colleges is required, particularly the curricula directly related to the design field.

### Introducing a Transactional Methodology for the Design based training program

The course methodology suggested is directed by a transactional viewpoint, which examines the training process of design through time within a developing and changing framework (Nabih 1999). Figure 1 below shows the model used for analysing the nature of this training program. It highlights a 4-stage course of action within 4 consecutive years as a basis for studying design methodology and theory of design (table 2).

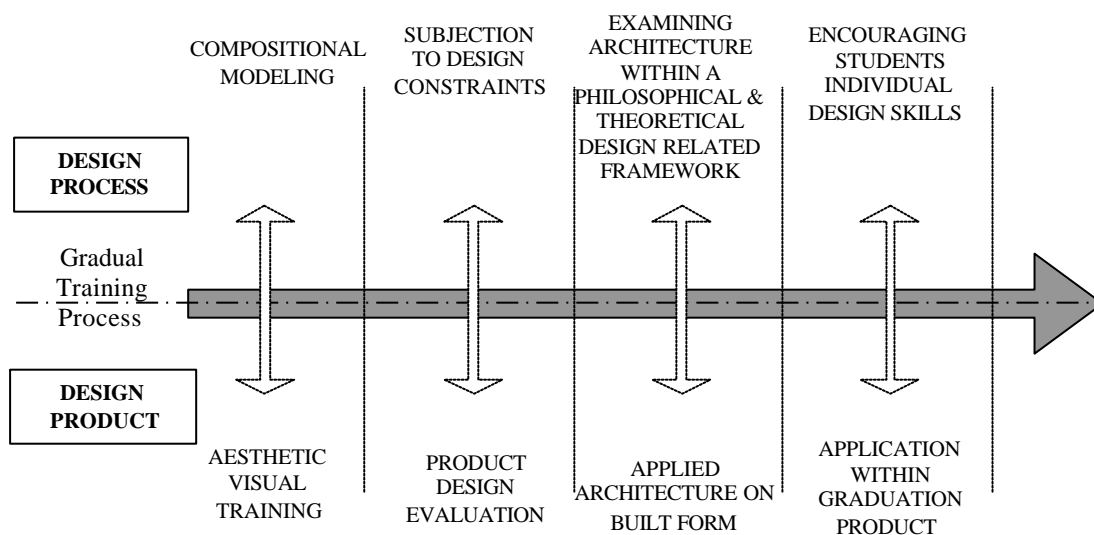


Figure 1: Bi-polar model of Design Process & Design Product introducing the various functions within a transactional framework of the training program

Students are subjected to both design process and design product collaboratively throughout the years. The main point of this methodology is highlighted as follows;

1. Introducing both the *Design Process* and *Design Product* to training programs in a more integrated fashion.
2. Allowing for the study of *Design Product* to gradually build up within the program within four consecutive steps as follows;
  - a. Stage I – Training initiates by introducing the aesthetic appreciation and composition of form.
  - b. Stage II – Examining non-architectural designed products, (ex. ranging from interior furniture to kitchen tools, etc.).
  - c. Stage III – Examining different types of buildings using previously acquired tools for criticism.

- d. Stage IV – Allowing the student to apply individually gained skills through the final designed product within the design studio and the graduation project.
3. Allowing for the study of the *Design Process* to gradually build up within the program within four consecutive steps.
  - a. Stage I – The Design Process is initiated by training students on modeling techniques and is applied on the aesthetic and visual analysis course, mentioned within the Design product training program, as mentioned above.
  - b. Stage II – Modeling reaches a more specific stage, where the student is subjected to a specific task in order to achieve identified goals, the purpose of this stage is to introduce the student to the limitations and constraints of the design process (see application introduced below).
  - c. Stage III – The study of the theoretical and historical background of architecture and analysing the different design techniques of architects.
  - d. Stage IV – Allowing students to develop and apply personal and more individual design skills within projects.
4. The aim of this methodology is to create a flexible training program, developing the ability for future architects to determine and analyse the different forces that direct the process of design and the final form of the designed product. This allows the final product to genuinely express the intrinsic forces derived from the place as opposed to the more personal idiosyncratic beliefs of the architect to dominate.

	Basic requirements of design and aesthetic appreciation		Philosophical approaches and applied architecture	
	(Stage I) 1 <sup>st</sup> year	(Stage II) 2 <sup>nd</sup> year	(Stage III) 3 <sup>rd</sup> year	(Stage IV) 4 <sup>th</sup> year
Design Process	Practicing and applying various modeling techniques and applying to the basic elements of composition.	Basic principles of design process, through model making. Avoiding designs of an end product, gaining physical and visual appreciation –	Examining architectural movements and design methods in addition to their philosophical, and theoretical backdrops	Encouraging the students to establish individual design thoughts and design methods from gained experiences
Design Product	Introducing elements of composition: Introducing aesthetic principles; (Ex: Scale, Symmetry, Dynamic, Static, Unity, Complexity, Mystery).	Introduction to a large variety of non-architectural and basic design products; Chairs, door knobs, kitchen wear to	Architectural design. Introducing different building types as a product of theoretical and philosophical differences	Application; Applying the student’s individually gained techniques and experiences with in design studio projects.

Table 2: Presentation of Model Objectives on a four year program. The table introduces suggested examples for training on both Design Process and Design Product.

## **Application**

The application represents Stage II of the method (see table 2), this method has previously been applied by Lawson (1999), in an attempt to educate students on the design process. The aim is to examine the appreciation of form as a consequence of design process rather than as an outcome of the architect’s individual appreciation of form. This applied experiment is considered as being crucial for the students’ initial hands-on experimentation with the design process. The applications is based on 160 students within the 2<sup>nd</sup> year architecture and were divided into 16 separate groups for the specific purpose of collaboration in problem solving and to further identify the most appropriate solution. It highlights a specific taught course namely ‘Theory of Architecture’ (contents of the curriculum is earlier highlighted).

## **Training Task**

1. The students were asked to implement a specific design task avoiding an end product dominated by form. The objective was quite simple and straightforward, mainly to separate a total of 9 marbles unto 3 groups within 3 containers. One container had to contain 2 of the total number of marbles, another had to contain 3 marbles and the final container had to contain the final 4 marbles. (Lawson, 1999)
2. It was also required to map the different steps of the design process leading to the finalised design.

The objective of the application was to drive the students through a design task avoiding the prediction of the final form of the design. As earlier mentioned, being driven by the final form can be misleading and dismissive of the processes undertaken through design. The objectives of this application are listed as follows (see applied models figure 2).

## **Task Objectives**

1. Subjecting students to a design that specifically stresses the design process as opposed to the design product.
2. Subjection to the various constraints of the design process.
3. Increasing their knowledge of design products as being an outcome of an elaborate design process.
4. Raising their awareness of the bi-polar nature of design including both design product and design process.

## **Observation**

It was clear that the groups of students have produced diverse means for achieving the required goals. The models largely varied in its end products and techniques used, even though the objective task was unified across all the subjects. This would suggest that the working groups varied from one to the other and depending upon the various techniques used, chosen materials and particularly the design process itself. The design processes were uniquely individual to the different groups. The main observations and results from the application are listed with the recommendations below. The different forces exerted on the marbles by the students also symbolised the design constraints that are forced upon the design process. The result is a product more specific to the required task.



Figure 2: Applied experiments showing the diversity of design products

## Recommendations

1. Design process should be integrated with design product within design training.
2. Training programs for design education should include tasks that avoid leading to an end product gaining visual and physical appreciation (see application and picture gallery).
3. Architectural training should discourage the blind borrowing of architectural elements from the past and reproduce them in a different cultural milieu.
4. It is necessary to design training programs solely emphasising architectural form and individual aesthetic appreciation as the dominating and deciding factor of design.
5. Education on past techniques should avoid chronological frameworks as they overlook underpinning theoretical design approaches.
6. Students should follow the design process and seek inherent design constraints and use them as guiding principals for achieving the final product. This would allow students to create architecture unique to local demands.
7. It is also necessary to train architects on methods of identifying and evaluating different constraints (environmental, social, technical, formal, etc.) resulting in architecture that is unique to the required design product and place of construction.

8. More flexible training programs should be introduced allowing individual skills to develop in an attempt to utilise technological advances for creating a basis for determining more knowledge-based architects.
9. Knowledge-base architects should acquire the skills to guide an informed design not only to derive from the region's past but to derive the region's future.

## Conclusion

The approach included within this paper is to search for architecture that is expressive of our present social, cultural and technological stance. Creating architecture for the present and the future, expressing past heritage based on a greater understanding of design technique in addition to creating architecture of our time and age. Architecture created through processes that are controlled by today's technology, present socio-cultural environment and behavioural aspects of our time. This training approach allows for greater flexibility in design allowing for variations in addition to being controlled by the constraints of the present day and specific constraints of the required architecture. Character, local style and historical structures, considered as today's heritage have always been driven by technological, social and economic and political demands of that time. Likewise, it is found important to direct our future architects on the value of determining and analysing our present day constraints, experienced within different localities. Predicting future architecture should result from examining current constraints as was the case with previous built environments.

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