Constructive truth and creativity in contemporary Iraqi architecture

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Abstract:

Truth and purity are an important concept in modern architectural design, as it is considered one of the significant concepts in architectural discourse. In many literatures, the significance of creative meanings can be added by the structure to the general formation through honesty and truth that resulted from the use of construction in an expressive way to achieve visual tracking of the correct paths of force transmission in the components of the construction formation, and deepen the aesthetic meanings that can be added by the construction. Thus, linking the character of creative construction truth to the constructive integrity. The research problem lies in the lack of knowledge in studying the aspects of constructive truth and its range of effect on the architectural creativity sides in general and for the local architecture in particular, therefore, the research aims at clarifying the relationship between the concept of structural truth in all its intellectual and formal dimensions which affect the achieving of the construction creativity and thus the creativity of the apparent architectural production. It also discusses the creativity in architectural productions through studying the creativity sides that can be reached through the constructive truth vocabulary and items in the contemporary Iraqi architecture applications. Also and identifying the possibilities of interdependence between structural truth and structural creativity. The other aim is to analyse constructional applications that integrated with the design of the building in order to establish the fundamentals of creative architectural decision-making. In its methodology, the research methodology depends on comparison analysis style through the creating of a theoretical framework that starts from the mentioned above knowledge rule and applying it to a group of local examples to get some indicators that explain the role of structural honesty in the local architectural results.

1. Introduction

Many concepts played a major role in the architectural formation (Intellectual and Scientific Architecture), by enriching their formations and achieving harmony and communication with human and environment, the concept of structural truth is the key concept of these issues. It was and still a desirable feature to be present in the architectural product. There are aesthetic meanings that can be added by the construction through constructive truth that results from the use of the structure and construction in expressive and mechanical aspects of construction to link the expressional truth with the constructive truth, and thus achieving architectural innovation. Structural creativity in architecture is one of the significant things that an architect should be aware of because it has a great importance in coming up with architecture that can integrate with its different designing systems. The construction design aims, in most of its sides, at achieving the construction truth and construction balance,
where structural design depends mainly on general Structural Ideas which the designer can form, from his interaction with the environment, and relying on his ability to understand the apparent relationship between power and form.

2. Constructive truth concept in architecture

Structural design set out from the relation between the architectural form and construction formation. As for the truth according to this form, what is considered to be (truthful) according to a specific approach, may not be consider to be so by another. For instance, is the use of the construction systems and techniques as an expression of formality (such as in Pompidou Centre building), While others believe that the mismatch with construction logic is there. Both of these approaches can produce distinct products, so the diversity in the Contemporary architectural theories which did not reflect a general and stable standard (the Relativity of Applied and Aesthetic Standards) shall cause a variety of ideological choices for designers [1].

The idea of building analysis led to the emergency of two principles of truth, as follows:

1. Constructive truth: it requires that the building must not appear as a facility according actually applied to the constructive concept in the whole building.
   This is mean that the building did not seems never constructed according to different static principles that can be deployed in the construction process, this requires
2. Constructive unity: it requires that what is truthful for construction is truthful for decoration, which means that it requires the existence of decoration system to be consistent throughout the whole building.

Accordingly, any model is the logical result of the logical consequence of application for the fundamental ideas throughout the whole building and not in set of ideas [1].

Le Duc refers that the architectural truth can be achieved as a result of the constructive truth from one of two sides: first, achieving the functional needs and second, is the truthfulness and clarity of the constructional methods [2].

The term (constructive truth) is used to express the architectural matching between the practical and aesthetic construction function, through the use of the same construction sources to achieve both functions. It was expressed by the Gothic and Greek styles, as the Rationalists believe [3]. In spite of using the construction sources to do the aesthetic and practical function, it did not necessarily means that there is matching between the practical and aesthetic construction function, as the practical function ensures the stability of the building while the aesthetic function is the expression that suggestion of the structural elements as a result of the ability of man to understand the biological relationship between power and form [4].

Adrian Forty realizes that, in modern architecture, the truth of architecture which is applied by the architects and the critics, occurs in three senses:

- Constructive truth: the exterior form of the work should match the system structure and material properties.
- Expressive truth: sense of truth to its inner essence, or to the spirit of its makers.
- Historical truth: the work is honest with the historical development [5].

The most significant features of design process for Mies in his confirmation of the magnificence of honesty and truth in its various acts [5]. He also linked knowledge with construction material which lead to spotlight on the evaluation that express the meaning carried by the construction material. Mies referred: “where we can find greater clarity and truth than that we find in the old wooden buildings that carry intellectual unit in the use of structural material, in addition to the method of building stone and bricks” [6].

From the mentioned above facts, constructive truth can be defined as the relation between the form and content. It is related to perception and compatibility of external appearance with system structure and material properties, building constructed according to deployed static principles in one actual construction process for the whole building. It includes construction truth and construction unity and truth expressed of its structural construction.
3. Constructive efficiency and constructive truth aesthetic

Constructive Efficiency is defined as the percentage of the total weight to the dead weight, so as much as the dead weight is lower, the structural efficiency is increased [7]. The constructive efficiency depends on the construction material and the shape and number of structural elements.

- **Construction elements:** They depend on the relation between material mass and its ability to withstand stress, so it differs from material to another [8].

- **Shape of construction elements:** structural efficiency also depends on the shape of construction elements in strength resistance, and the number of structural elements depending on the type of involved stress

Constructive efficiency can be defined in many ways. It may be explained as a mathematical equation based on the based weight ratio to the constructive weight, so the Constructive efficiency measure in considered as one of measure of the cost-effectiveness of the structure [9]:

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\text{Constructive efficiency ratio} = \frac{\text{The highest limit of the structural load}}{\text{Structural weight}}
\]  

Basic principles that can achieve the maximum possible efficiency are those that focused on that it’s better that constructive shapes be similar to the shapes that are found in nature and working on studying, analysis and devising systems from them, so quotation and inspiration from natural shapes is preferred [10]. In his work in Labor castle in Turin, the architect (Nervi) used this concept a very simple way in structure, as the shape became similar to tree branches that works to collect all the weights and direct them to the Props (such as the reed that works as a column) and then it goes down and reflects the bases image.

Moreover, Vitruvius mentioned that the aesthetic can be achieved when the building or its parts achieve its functions for which it is designed, with honest and clear structural efficiency in building ratio and its parts and whether these parts are carrier or structurally carried parts? This is the truth in the constructive expression that Ranken called for in one of his seven beacons of architecture (Beacon of truth) [11].

(Chris) believes that the structure earns its aesthetic from the honest expression of its part and component about the purpose, and this leads to the need to the functions and economy leads to simplicity in form and construction [12].

With Multitude of philosophical and creative perspectives of researchers, there are various opinions and walks that explained the Aesthetics of Semantic Expression in constructive Systems and took their appearance and significance.

To conclude, constructive efficiency depends on the construction material and the shape and number of construction elements. There is a close relationship between the principle of constructive efficiency and achievement of constructive truth through the constructive mechanical function that includes multiple meanings related to constructive truth. This is done through the explicit and clear expression of the paths of power by clarifying the way the components of the construction structure are linked. This leads to the aesthetic expression of architectural productions.

4. Constructive truth and achievement of constructive creativity in architecture

It is necessary for an architect to understand the role of the construction of the architectural Innovation Process, and constructive knowledge become very important to produce full architecture, so the architect must face these challenges to reach up the creativity. The creativity is defined as the complete unit for a collection of subjective and objective factors which leads to achieve a new genuine and valuable product for the individual and group.

Nervi defined creativity and explained its relation with constructive truth as “the honest construction that carries the aesthetic satisfaction characteristics” so each improvement in the function and technical effectiveness of the product bring an improvement of its aesthetic quality” [13]. This means that creative structure that is the more stable, solidity, steady and strongest, and be more performance and functional, and more economical, beautiful and expressional. This creativity is called
(Honest style) the characteristic of which lie in (constructive substance, Absence for decoration and emboss, and Purity of font and shape).

“The true solutions … are the maximum efficiency’ which can be linked as a result with the honest constructive experiment.

As for Nervi, the constructive creativity can be reached through analogy with nature and this analogy replicates the forms from their natural counterparts, and thus degrees of similar efficiency can be got a as in the worker castle building where there is an analogy of origin of constructive building with tree structure and praise the natural way that is carried out by cross-cutting arms to collect and transfer loads to the columns.[11] (Nervi) calls this product the constructive honest product [13].

Leonhardt believes that the actual constructive creativity must be in the balanced and symmetrical meeting between the constructive mechanism and honest visual aesthetic, so there are some difficulties in this subject [14].

As the goal is that the architect puts the fundamentals of creative construction decision through achieving constructive truth, standards of this creativity should be known. Ali Raffat put those standards in his book “Trilogy of architectural creativity” [15], so this is linked through the truth sides in its personal and subjection sides, so the research starts about the creativity standards from the point of view of balance and economic efficiency. These standards might be contradictory or integrated, so the architect must choose to compromise between them to take a creative decision that is suitable for circumstances and design, especially with regard to the theory of honest constructive continuity which state that providing honest efficient construction energy can be achieved through the truth of using the material.

For honest efficient construction has two divisions: engineering and material upon which the criteria of structural creativity standards, and it’s known as tangent difference between one point and the other as infinite difference which can be achieved through the Pivotal stresses. As for material continuity, it is available through, either through physical persistence that shall be available within all parts of construction which guarantee it’s work as a single body in spite of its different direction which can be called Monolithity.

It is clear that the structural decision must be based on standards and values that are associated with constants that determine their type and variables that determine their shape which had an effect on the creative constructive decision. From this it is possible to conclude that the constructive creativity in architectural designing is an achievement of the following goals to reach the constructive truth and achieves the desired creativity.

5. Theoretical framework

This research puts a set of indicators of the main axes of the theoretical framework, which reflects the possibilities of achieving architectural creativity according to some architectural applications that are related to the constructive truth can be applied to various local architectural samples. These samples that resulted from the possible evaluative values to come up with general intellectual standards can be adopted as conceptual standards that embody the connection of the influence relationship between the constructive truth as an influencer and reaching to the architectural creativity as a result. The indicators are as follow:

a. **Degree of constructive display (Tectonic):** the nature of display the constructive nature of a building as a whole, or as a part of it, or not display it vary. The degree of display and clarity varies, and thus the values shall be (High, Moderate and No tectonics).

b. **Degree of the expressive Structural System:** the degree of structural expressionism varied according to the ways of aesthetic dealing with the structural system, so the value will be (High, Moderate and Hidden Structural expressionism)

c. **Degree of the constructive Manifestation:** the degree of the constructive Manifestation varied according to the aesthetic handling of the constructive system as there are high manifestation in certain buildings, and moderate and hidden ones in other buildings.)

d. **Expressive constructional materials:** the nature of Manifestation of material varies (according to leaving material as they are or being processed) this appeared in the elected projects as (High, Partial, and Full Manifestation:].
e. **Multiplicity of structural systems:** as a result of the experiences, and the growth of expressive capabilities of ideas in structural systems, structural elements and systems have acquired distinct aesthetic properties as a result of the development as there was a building consists of (One structure, primary and secondary structures and multiple structures).

f. **Degree of constructive technology:** as result of the development of technological industry and its progress all technical elements are highlighted in the designs and technical features. It varies from the inside expression and outside of the building in the different construction techniques (high technology, Traditional and Primitive Technologies).

6. **Practical studies:**

6.1. **Variables and methods of measurement:**
After the review of the most significant vocabulary and standards that form the concept of constructive truth and thus achieve the structural creativity and determine the most significant variables and its possible values which can join the vocabularies. In this part, the extent to which these vocabulary and variables are achieved and the possible values for the structural concept values to achieve the structural creativity in architecture will be discovered.

The table (1) below demonstrates the vocabulary and sub-variables related to them which can be the approved measurement mechanism to achieve the creativity in the selective architectural projects.

6.2. **case study (selective projects):**
To achieve the purpose of this research, it’s been selected several case studies for a project that gained a great importance in the architecture productions.
1. Water liquefaction, 2. Communication and mail building, 3. Iraqi Federation of Industries Building, 4. Ministry of Housing.

Those cases can be considered as good cases and examples to achieve the purposes of the research to clarify the design mechanisms associated with structural truth to achieve structural creativity.

| Sample (1) | Water liquefaction |
|------------|--------------------|

Water liquefaction: this building is located at Al-Khinali Square – Baghdad, designed by Arch. Mahmood Al Ali and Mohammed Makea, in 1978, this building contain a yard that considered as lighting element and main ventilation source by no closing it, it maintain its environmental efficiency in spite of multi floors, also there is a partial opening on the ground floor to determine the entrance.
Sample (2)  Communication building

Communication and mail building: Located in Al-Rashid street, Al-Sinak district, designed by: Rifat Al-Chaderchi, constructed in 1971. The architecture language depended in the communication building in Al-Rashid, on showing the value of Tectonic, as a core value that lean on the Tectonic solution – Space of building. There was an attempt to the construct uses all its power providing a special building aesthetic arises from the characteristics of the approved synthetic style and its characteristics, this means in Tectonic: employing construction to achieve aesthetic values.

Sample (3)  Iraqi Industries union

Iraqi Industries union: this building is located at Al-Khinlani Square – Baghdad, designed by: Rafat Al-Chaderchi constructed in 1966. Location and shape of the land was some kind of complicated this cause a specific designing options… (Three semi-closed frontages and one arc frontage) this might provide the building some symbolic connotations but there is some differences in the functional side of the building, the frontage works as a wonderful abstract painting of Baghdad chenchel which does not disclose the reality of the structural structure behind, the frontage has nothing to do with the interior.

Sample (4)  Ministry of Housing

Ministry of Housing Building: Government administrative building located in the museum square, Baghdad, year of project completion 2012 , designed by:National Center for Engineering Consultancy. The building consists of 10 floors 43-meter height. The building is environmentally friendly for adoption of many environmental treatments. the glass surfaces of the top three floors were scaled to mimic a shape of Baghdad chenchel and reflect the heritage in a modern way.
Table 1. Showing the application of the theoretical framework of the vocabulary on elected models of contemporary architecture.

Possible values of theoretical framework vocabulary

|                        | Sample (1) | Sample (2) | Sample (3) | Sample (4) |
|------------------------|------------|------------|------------|------------|
| **Degree of structural tectonics** | High | Moderate | No tectonics | High | Moderate | No tectonics | High | Moderate | No tectonics |
|                        | ●          | ●          | ●          | ●          |
| **Structural expressionism** | High | Moderate | Hide | High | Moderate | Hide | High | Moderate | Hide |
|                        | ●          | ●          | ●          | ●          |
| **Structural Manifestation** | Explicitly constructive | Partial hide | Structure Hidden | Explicitly constructive | Partial hide | Structure Hidden | Explicitly constructive | Partial hide | Structure Hidden |
|                        | ●          | ●          | ●          | ●          |
| **Expressive constructional materials** | High Show | Partial show | Full coverage | High Show | Partial show | Full coverage | High Show | Partial show | Full coverage |
|                        | ●          | ●          | ●          | ●          |
| **The multiplicity of structural systems** | One structure | Primary and secondary structure | Multiple structures | One structure | Primary and secondary structure | Multiple structures | One structure | Primary and secondary structure | Multiple structures |
|                        | ●          | ●          | ●          | ●          |
| **Degree of structural technology** | high technology | Traditional technology | Primitive Technology | high technology | Traditional technology | Primitive Technology | high technology | Traditional technology | Primitive Technology |

A comparison and Criteria derived from the application of the theoretical framework for the selective examples:

There are obvious variations between the architectural experiment on the various systems level, it was connected tightly with the instructions and techniques that was presented at that time.

Perception in the constructional importance in the final product was showing big variation which effect on the obvious constructional expectations.

Designing directions of architectural designers play a very important role in achieving the constructional truth, by strongly bonding with designing conviction in spite of the nature of the function and the economics of the building.

- A strong link between tectonics and structural truth there is a direct correlation between increased tectonics and truth.
- Whenever there is sincerity in the structural material and system there will be a high expressiveness.
- Whenever there is Truth in the structural material and system there will be a high expressiveness.
There is a strong bond between structural manifestation and aspects of structural truth through high definition material and elements in the interior and exterior design.

- The diversity of the impact of construction materials used on the apparent structural truth, the greater the clarity of the material without concealment, the greater the degree of truth.
- The multiplicity of structural systems was not related to truth aspects where there no changes in the truth degrees individually or in multiple-systems.
- Technical subject was not linked strongly with the constructional truth in results as much as they relate to production, execution and equipment aspects.

7. Conclusions
- The importance of creativity and efficiency factors as an element that effect and affect by the honest structural, their existence does not lie as factors or elements of the design represent the result but to be one the reasons of the architectural and structural form together if they were not in a single entity.
- The architectural practice comes out with characterized by formal exaggeration and simplicity of structural by using architectural heritage vocabularies in the technical formations of the executed buildings and deployed it in the modern structure with all its enormous construction techniques and materials.
- In spite of never receiving attempts the desired attention because of the importance and the size of the occurring progress in the nature of the structural materials and modern structural structures, there is a clear diversity for construction materials, and this was affected by the after the modern directions in combining the local material and the traditional construction material.
- Some of the architectural formation was a state of the implicit dichotomy between the appearance and content of structure, the appearance of the building its mission is to reflect the content and function of the building In so far as it is a prior acknowledgment in the emphasis on separation as the project was features contrast in interface processors which was complicated in an usual ways between the clearance and plans simplicity and the structure behind it who contributed here in the creation on a structure that based on or attached to the curtain that forms the general composition of the facade of the building.
- The emergence of the phenomenon of structural tectonics in most of the samples especially the ones that was related with the structural material itself as a design element in the frontage and the construction.
- There was an obvious using for the structure as an important element in the expressional sides especially in the public buildings that was the great scale in those periods by invest the structure on the elements and material level.
- There wasn’t multiple using for the constructional systems but there was always one constructional system for the building which it was almost the structural concrete system. With the using of the same traditional techniques in the construction except one attempt to invest imported modern techniques in some buildings at that time.
- The constructional expression and Tectonics had a clear appearance at the study stage which results the appearance of the High expressiveness of the structure and a clear impact on the resulting architectural formations of that period, on the material and constructional level… this period faces the confirming of the significantly using the local material in frontages.

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