

THE ROLE OF INTEGRATION OF DISCIPLINES IN ARCHITECTURE

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Abstract:

Recent years have witnessed rapid development in various fields and interest in expanding studies and research in different fields of knowledge, and due to there are many topics that are studied by more than one discipline, these studies and their discipline began to converge and intertwine with each other. The boundary between the interfering topics in their disciplines has begun to blur because this type of studies goes beyond the traditional disciplines, and this leads to the creation of renewable intellectual spaces capable of supplementing the common fields of knowledge. Architecture cannot be in isolation from the expected future progress of the intersection and integration of disciplines. There is a necessity of architectural openness towards the research spaces, as an attempt to bridge the knowledge gap about the intersection of disciplines and their relationship to the field of architecture, since the fields of knowledge are no longer Completely independent and witnessed the interfere and integration of intellectual spaces with each other, and this does not mean that a field of knowledge cannot work independently of the other, but rather the possibility of benefiting from the common space by both fields to achieve integration between them in order to reach a specific goal. The integration of architecture with other fields is done through several approaches that determine the nature of the relationship between architecture and other fields of knowledge, and this leads to enriching architectural products and stimulating ideas to create everything new and innovative in the field of architecture, because the emergence of new architectural movements or currents is As a result of architecture's interfering with other disciplines, science alone does not produce architecture, and art alone does not produce architecture, meaning that architecture, by its nature multidisciplinary, cannot neglect the scientific or artistic aspect in addition to other philosophical, theological and other aspects that can interfere with architecture.

Keyword: Integration concept, integration in architecture, multidisciplinary, interdisciplinary, transdisciplinary.

Introduction:

The rapid development of contemporary life in various fields and the expansion of research and studies in the fields of knowledge have led to an increase in subtle specializations due to the ramifications of those fields into other sub-fields that may be independent to become an existing science in itself. The knowledge field and its branches on the one hand, and its relationship with other fields of knowledge, the cognitive disciplines have taken over the interfere and integration with each other, thus generating a common knowledge space that is benefited by two or more knowledge branches.

In this research, we will discuss the importance of the integration of disciplines and architecture, whether scientific or humanistic disciplines.

Integration concept:

"the action or process of combining two or more things in an effective way, or it is the process of combining two or more things into one" [1]. Integrate: Verb refers to bring together or incorporate (parts) into a whole. And also mean: to make up, combine, or complete to produce a whole or a larger unit, as parts do. [2]

Integration of disciplines in architecture

Despite the importance of the concept of integration in the planning and design in the field of architecture, it is still tainted by some ambiguities due to the lack of specialized studies in this field [3].

As for architecture, its integration with other fields may be in one direction, and this means that architecture alone benefits from this interfering, or perhaps the other field is the beneficiary.

Causes of integration of disciplines:

The development of human knowledge came mainly as a result of two broad paths:

-The first track: dividing knowledge into basic fields, subdividing into secondary fields and then into sub-sectors. This path represents pure specialization.

-The second track: is the re-integration and synthesis between the knowledge produced in the different fields in the first track and its secondary and sub-sectors, and this track represents the so-called hybrid knowledge [4].

It is noted that the first track embodies the analysis mechanism, while the second track embodies the synthesis mechanism. The narrow specialized automatic perception of reality has proven to be insufficient to address the complex, issues in the contemporary stage [5].

Integration methods in architecture:

The modernization of architectural design curricula and the development of the design process to keep pace with the rapid developments in the modern era on the one hand and to face the current challenges of the century which formed a motive towards developing and changing traditional methods of solving of the contemporary issues facing the human community

In this research, we try to provide intellectual approaches that contribute to finding solutions to problems through multiple perspectives towards the problem, so we suggest three ways of integration of disciplines, which are:

1- Multidisciplinary Approach:

An approach to curriculum integration that generates an understanding of interdisciplinary themes and ideas and the connections between different disciplines and their relationship to the real world. It usually emphasizes process and meaning rather than product and content by combining contents, theories, methodologies, and viewpoints from two or more disciplines.

The prefix multi refers to the multiplication or multiplication of number, and when added to the term discipline, which is defined as “a branch of learning or a field of study characterized by clearly defined and objectively related knowledge” or “the training of researchers and assistants to communicate and work appropriately for specific intellectually and ethically specific applications and practices.”

That is, the meaning of the term multidisciplinary is knowledge based on a number of fields, or the multiplicity of knowledge about a phenomenon, which is derived from multiple fields [6].

2- Interdisciplinary Approach:

The term Interdisciplinary is one of the most ambiguous terms, and as examples of the common and sometimes contradictory use of it:

Collocation or grouping of different fields of study even when there is no clear connection between them Continuous interactions between two or more fields, in order to solve or explore a general problem. The integration or unification of two or more fields so as to lead to the birth of a new science and a new theoretical framework. Studies based on the interactive approach have been defined as "the process of answering a question or solving a problem characterized by breadth and complexity, which cannot be dealt with through one field of knowledge"[7].

Klein, who contributed a lot to the development of this entry, defines it as "a characteristic or content of a variety of interactions aimed at integration in: concepts, methods, data or epistemology (epistemology) of multiple fields around: a question, an idea, or problem [8]. In an attempt to avoid confusion in the concept of ID, some have defined two concepts, one of which is narrow and the other broad, and according to the narrow concept, ID relates to or a new field of knowledge located between two or more fields, and the broad concept according to which ID relates to attempts or efforts or efforts that are total not one-field, that is, in other words, total knowledge. Kockel man's describes the work of ID here as relating to problems that can only be solved by merging or unifying parts of the knowledge fields available in the form of a new field[9] . Fuller's definition falls within the broad concept, describing it "as a form or method to integrate the knowledge unit, it is aspired by knowledge policy analysts on the global level.[10]

Thus, the term ID refers to the two features of composition or integration, and Klein used the two terms synonymously, that is, it is the process of composition that leads to more than the sum of the parts [11].

3- Transdisciplinary Approach:

An approach to curriculum integration that removes boundaries between traditional disciplines and organizes teaching and learning about the construction of meaning in the context of real-world problems or topics. The prefix (Trans) denotes something that passes, crosses, or goes beyond or through something else. Thus, the syntactic meaning of the term Transdisciplinary would be "to go beyond or Crossing the work and exceeding the scope of the field and one discipline. However, this concept, despite its connotations, does not provide much in clarifying and distinguishing this entry, because this meaning converges with the term disciplinary when the following prefixes are used with it: inter-, multi-, cross-...etc, All of these terms share the property of crossing over or skipping over a single field. Many definitions of cognitive integration have been mentioned in the literature, among the most famous definitions TD is the one that was used in the first international symposium on cognitive interaction, where the

merger was known Cognitive as: “a general or common system of axioms for a system of cognitive field [12]. In short, there is a conceptual development of knowledge integration, the essence of which expresses a series of changes that include transformation:

- From fragmentation to crossing borders.
- From fragmentation and isolationism to relational.
- From the unit (at the field level) to the integrative process.
- From isolation to cooperation and integration.
- From simplicity to complexity.
- From a linear relationship to a nonlinear relationship.

Objectives of integration of disciplines in architecture:

The research aims to:

1. Focusing on the common spaces between the fields of knowledge and how architecture can benefit from them.
2. Develop a methodology with a renewed and innovative basis in the method of producing ideas.
3. Develop techniques for producing architectural works.
4. Stimulating ideas through the integration of different disciplines with the field of architecture.
5. Develop a new design methodology that aims to produce a potential future architecture.
6. Answer the most complex questions.
7. In-depth exploration of multidimensional issues and issues.
8. Explore field and professional (discipline) relationships.
9. Achieving unity of knowledge to a limited or significant degree.
10. Creating new applications that lead to new technologies across or between fields of knowledge.
11. Provides multiple and varied perspectives from different cultural backgrounds.
12. Encouraging a multi-vision mentality and promoting imagination and open-mindedness and diversity.

The importance of integration of discipline was confirmed at the 2011 UIA conference in Tokyo Where architecture and cities future in 2050 were discussed, the face and overcome of many challenges related to the environment, energy, economy, population and education can be achieved when they work to The rest of the disciplines stressed that solutions will only be

found when the barriers are removed between different disciplines, because the architectural society cannot overcome these problems alone.[13]

Examples of integration of architecture and other disciplines

1- Integration of architecture and mathematics

There is a direct relationship that connects mathematics and architecture through the golden ratio, as it occupied a large space in artworks and captured attention since the era of the Greeks and the Renaissance, all the way to the modern era in the works of Le Corbusier, who adopted human proportions, since that time man has been considered the measure of all things and the center of his world, but The scientific development in the modern era soon contributed and the emergence of complex sciences that removed man from the center of his world and made atomic science a measure of everything through cosmic laws and their scientific inevitability and the assumption that everything was subject to those laws governing the universe.[14].

Stonehenge as example of integration between architecture and mathematic:

An archaeological and astronomy research has proven that the great stone ruins that were built in Northern Europe, About 3,500 years ago, they served as giant compasses, calendars, and computers for seasonal patterns and as holy sites for religious rites. The most famous of these huge uncarved stones are found at Stonehenge in the Salisbury plains in England. It was built in gradual stages from the twentieth century until the sixteenth century BC [15].

Stonehenge's diagram shows how the exact time of the midsummer sunrise (Figure:2) was established by seeing the rising sun disk between two closely spaced tall marker stones called "Sarson Stones", directly above the summit of the "Healeston" (figure:3).



Figure (1): Stonehenge



Figure (3): Heel stone framed by arched metaphor in Stonehenge

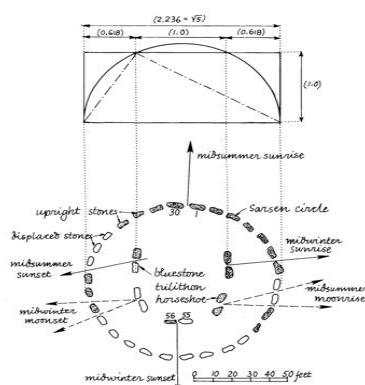


Figure (2): The plan 1 of Stonehenge, Sarsen Circle diameter, and Bluestone Trilithon Horseshoe width are on the relationship of the Golden Division.

(images sources: Doczi, THE POWER OF LIMITS ", 2005, translated by YASSAR ABDIN& others, Damascus Univ., 2011, p98) <https://www.academia.edu>

The horizontal projections (the azimuthal directions) of the sunrise and sunset and the mid-winter and mid-summer moon, which have been proven by modern scientific means that enhance the astronomical accuracy of Stonehenge (figure: 4).

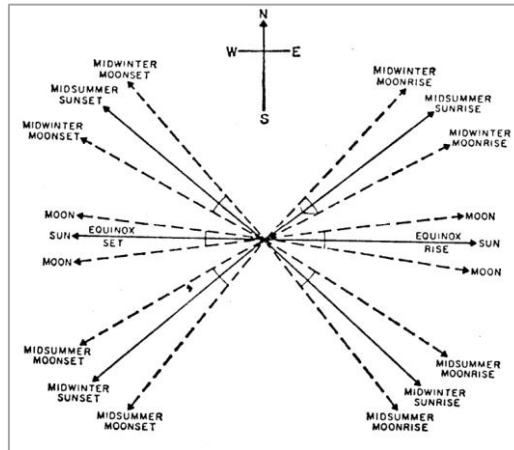


Figure (4): Horizontal projections of the lines of sight (azimuthal directions) of the rising and setting sun and moon at the solstice (summer, winter) and equinox (spring, autumn) of Stonehenge's latitude

(images sources: Doczi, THE POWER OF LIMITS ", 2005, translated by YASSAR ABDIN& others, Damascus Univ., 2011, p99) <https://www.academia.edu>

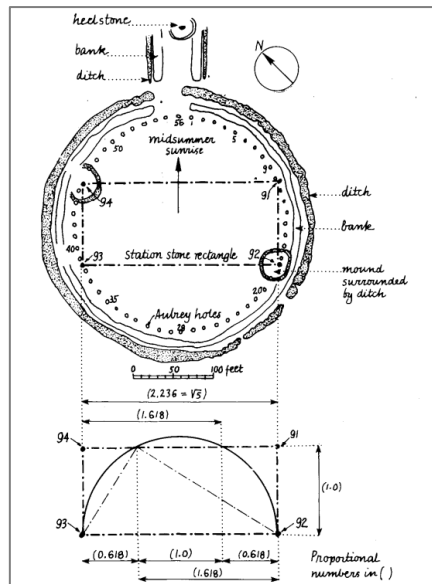


Figure (5): The Stonehenge plan 2 at the top, with the Station Stone Rectangle proportions projected below, showing its proximity to a rectangle $\sqrt{5}$.

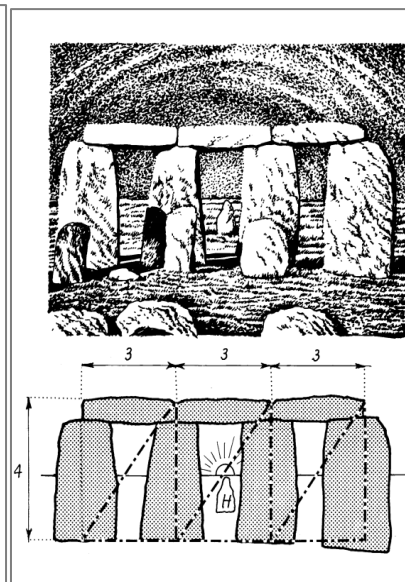


Figure (6): The proportions of the arches are 3-4-5 triangles, Arches frame the (H) Heel stone, at whose head the sun appears on the first day of summer.

(images sources: Doczi, THE POWER OF LIMITS ", 2005, translated by YASSAR ABDIN& others, Damascus Univ., 2011, p99) <https://www.academia.edu>

Stonehenge shares the proportions of the Golden Division and the proportions of the Pythagorean triangle. The classic geometrical graph of the golden division applied to the "Stonehenge" plan (Figure 2) reveals the existence of a golden relationship between the width of the "Blue Stone Trillion Horseshoe" and Sarsen's Circle diameter ($1:0.618 = 1.618$).

The same proportional engineering drawing applied to the Stonehenge's plan 2 also shows that the rectangle formed by "Station Stone" approximates a rectangle $\sqrt{5}$, which consists of two golden rectangles figure(5).

Astronomer Gerald Hawkins, who based the current analysis on his investigations, believes that the rectangle of the "station stone" was a significant historical, geometric, ritual and astronomical significance [16].

2- Integration of architecture and philosophy:

We will take deconstruction as an example of the relationship between architecture and philosophy. With the beginning of the eighties of the twentieth century, architecture entered a new turn as the trend of deconstruction appeared in language and philosophy. Some architects transferred the ideas of the French philosopher Jacques Derrida to architecture, which dealt with the idea of deconstructing meaning and the possibility of reading the literary text in more than one method.

The term deconstruction appeared in the language to dismantle the structure of texts in order to seek meanings and new linguistic dimensions, and I was drawn to architecture to achieve the same purpose, as it does not depend on the existence of any intellectual reference. The emergence of the word "deconstruction" by the French philosopher Jacques Derrida in 1966 at a conference at Johns Hopkins University [17]

Philosophy uses architecture to embody its ideas and denies the idea that architecture is a physical practice only, and architecture resorts to philosophy as suggested to form an entity that carries deep contents and dimensions that qualify it to transcend its material determinism [18].

As for (Nelson) he argued that architecture is a metaphor in philosophical thought and at the same time it is an expression of multiple ways of thinking. From influential architects such as Bernard Tschumi, Daniel Libeskind, and Peter Eisenman. The interplay between philosophy and architecture is evident not only in Derrida's writings, but also in his writings in collaboration with architects such as Peter Eisenman and Bernard Chome in Lafayette Park, which has been an area to embody Derrida's deconstructive ideas in architecture[19].

Peter Eisenman is considered one of the architects influenced by Derrida's thought about grammatical rules, and texts were borrowed as a basic entry that architecture takes outside its borders. Borrowing the text as an introduction to dealing with architecture in a post-structural, deconstructive way influenced by Derrida. He believes that architecture should be away from natural connotations and its traditional images, and look for new formal structures. [20].

3- Integration of architecture and mythology

The concept of mythology in architecture is one of the topics related to the issue of preserving heritage. Architects went to preserve this intellectual and cultural heritage from extinction, through presented buildings in which they borrowed their design ideas from the mythology of civilizations of the ancient world. [21].

The relationship between mythology and architecture, enriches the value of both architectural and mythological work together.

Myth: Myth is a tale with extraordinary and wondrous events “It means people’s tales and legends that are transmitted orally from one generation to another and are preserved from loss by the power of the memory of those who inherit it [22].

-The Dantium building

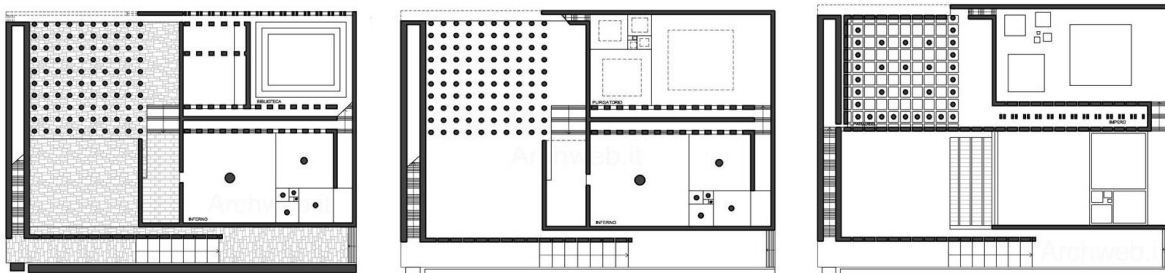
We will take the Dantium building as an example of the intersection of the field of architecture and mythology

At 1938, at the behest of Mussolini's Fascist government, Giuseppe Terragni and Pietro Lingeri made a presentation to Benito Mussolini Their proposal was to build the Danteum in Rome, an unbuilt monument dedicated to the famous 14th-century Italian writer Dante Alighieri and centered on the formal divisions of his greatest work, The Divine Comedy. [23].

The Danteum project was conceived as strict geometric, based on the square and golden rectangle, and was built of squares [24].

The levels, shapes, and spaces of the Danteum are Terragni's interpretation of Dante's Divine Comedy. The sequence of spaces the visitor passes through leads to Hell, Purgatory, and Heaven. Terragni, in turn, took the text and built a physical model for that written symbol, also using numerology and geometry [25].

Terragni focuses on the form of the text and the structure of the rhyme, translating them into the language of carefully proportioned spaces and unadorned surfaces typical of Italian rationalism [26].



(Fig: 7)The Danteum (inferno) (fig: 8) The Danteum (purgatory) (fig: 9) The Danteum (paradise)

<https://i.pinimg.com/originals/3f/60/f3/3f60f3a27e2a64352d080c6380133521.jpg>



(Fig10: a-inferno)

(Fig10: b- purgatory)

(Fig10: c- paradise)

(Figure: 10): the levels of the danteum, The Dantium of Giuseppe Terragni | paper architecture (wordpress.com)

Terragni, the designer of Dantium, expresses the need for a fusion of literary work by examining the compositional structure of the divine poem, He tended towards the intersection of architecture reference with literature (cross-reference) because this type of interterring is characterized by vitality and energy that enriches the architectural and literary production in an integrative way.

Terragni's design methodology in the process of separating form from content, separating formative structure from literary content, enabled the temporary isolation of the building and the poem.

He interprets architecture as a state of having a form and substance which we can describe it as independent, and by examining the building as an independent object, which is accordingly covered with literary meanings, it is possible to consider the design as an independent architectural work that serves Terragni's great goals of integrating the building with the poem.

Terragni organize memory in the same manner as literature in systemizes and categorizes memory as in medieval cathedrals and Renaissance gardens.

Terragni was influenced by Croce's interpretation and translation of the Divine Comedy, which separates the form from the poem's content, Croce says: "By drawing a strict distinction between structure and poetry, and placing them in a philosophical and moral relationship, and then considering them to be essential elements of Dante life [27].

Terragni claims that an architectural monument and a literary work can be linked together by the same idea (plan)... Whereas the structure of the poem provides the element of common ground for integrating the building with the poem, and declares that both the architectural monument and the literary work exist on one level as two independent entities (and not physically at a certain stage [28].

Terragni purified his dantium of all that is not essential so that his building consisted of the elements that are part of the formal formation [29].

Dante first separated form from content (separating structure from meaning).

He explains the form of the poem in the form of a descending series of structural elements, as Terragni did for the Dantium Building, the rooms of the building, inspired by the deconstruction of the golden rectangle.

The division of the message for Dante into three-tiered divisions leads to unity in Dante's Trinity and a second level of division the result is three divisions of the message in exchange for two types of divisions of it, so it is 2:3 (Unity in the Trinity versus the cross is two-layered!!) Terragni reflected the same divisions in his diagrams of dantium (triple divisions correspond to binary divisions). The golden syllable is an abstract form similar to the abstract forms of structure in comedy. Although abstraction is an effective dynamic process, it nonetheless begins with what is fixed and leads to a conceptual synthesis process.

Abstraction not only presupposes the original form, but the resulting structure includes a dialogue between the old and new meanings. As for Terragni, he used the process of abstraction to serve metaphysics [30].

In the Dantium building, the issue of the column appears in several levels of metaphorical use, and it is a comprehensive architectural element, as it is characterized by pure engineering (reducing the Christian and pagan source in order to clarify a contemporary event)

Dantium columns are similar to smooth Le Corbusier cylinders and are similar to their Doric system for classical monuments columns, integrated with crowns, and their circular section symbolizes (which is the section of the columns) the symbol of integration and the supreme form of geometry [31]

in the case of the sequence, the columns become a portico integrated with the pediment, it symbolizes the intuitive ritual and the path of purification It is a symbol of infinity and eternity, In glass architecture, the transparency of the columns is in line with Dante's concept of transparency in Paradise (fig10-c) that is, through transparency, the fullness of divine grace is revealed.

Dante wrote in Convito that "the virtue of God is received in one way by separate substances, by angels who are freed from the cruelty of matter by virtue of their being...transparent, according to the logic of the purity of their forms .Therefore, the shape is manifested by decoding (analysis) as in Terragni analysis of the column through its crystal character and by returning to comedy, the column reflects its interpretational pluralism.

The realism of this experience and the achievement of what Dante demanded in his journey from Hell (Fig10-a) and continuity through customs (Fig 10-b) towards heaven(fig10-c), is parallel to the Terragni process to remove everything, except for the most primitive architectural bases, Dantium built with its integrated plastic realism with architectural structure Which symbolizes the image of the Temple of Heaven With the purity of a refined system, it gets rid of all defamatory things, and he confronts us with another world, which seems to contradict all the laws of man and nature[32].

Thus, the spiritual interpretation symbolized the symbolic purpose that links the different levels of meaning, and abstraction is the activity with which man rises to the realm of purity and essence. And that the independent nature of architecture, which is the outcome of the abstraction process, symbolizes the spiritual interpretation intention, Thus, Terragni's

treatment, like Dante's, is broad in scope, both being universal, with implicit meanings, with reference and compatible connotations.

Conclusions:

- 1) The architecture is a multidisciplinary profession that cannot neglect various sciences and other arts such as: philosophy, social science, natural and human science for the architecture is designed for the way to live and impose its ideas and tests on consumers.
- 2) Despite the independence of architecture and integration of their internal systems, it is characterized by flexibility and ability to communicate and interfere with other scientific and humanitarian fields.
- 3) The principle of integrating disciplines achieves the possibility of creating common knowledge areas capable of developing or finding solutions to problems that one discipline may not be able to solve it.
- 4) The emergence of renewable production in architecture is the result of integration with other fields such as technologically, biology, physics and others such as philosophy and art.
- 5) The integration of disciplines in architecture facilitates designs' decisions in early stages of design, contributing multiple alternatives through the multiple views of the design problem.
- 6) There are several ways to achieve integration in architecture where these methods represent the nature of the relationship between architecture and other knowledge fields such as :-
 - **Multi-disciplinary approach:** where architecture works with other fields in parallel with the possibility of working individually.
 - **Interdisciplinary approach:** where there is common space between architecture and other fields where the knowledge field cannot work individually from the other field, because of that joint area enriched both fields together.
 - **Transdisciplinary approach:** which removes the limits of disciplines where a knowledge field can contribute to finding the solution to another knowledge field that does not be linked to.
- 7) The integration of disciplines contributes to stimulate creativity and innovation in the field of architectural design to create a renewable architectural products.

References:

- 1) <https://dictionary.cambridge.org>.
- 2) www.dictionary.com
- 3) AL-Chalabi, Fadhaa, The Planning – Design Integration in Residential Complexes, 2017, p57.
- 4) Dogan Mattei, The Hybridization of Social Science Knowledge, (Ed): Palmer Carole, Navigating Among the Disciplines: The Library and Interdisciplinary Inquiry, 45(2) 1996.
- 5) Al-Habib, Bakr, Use of cognitive integration approaches in the organizational development of public service organizations, Baghdad University, Published research paper, p5.

- 6) www.ibe.unesco.org
- 7) www.ibe.unesco.org
- 8) Klein Julie, *Interdisciplinary: History Theory and Practice*, Wayne state University Press, Detroit 1990.
- 9) Nordheim Stig, *Information Systems as Interdisciplinarity: A useful perspective on IS competence*, Stig.Nordheim@hia.no <http://home.hia.no/sting> ,p1-2.
- 10) Fuller Steve , *Strategies of Knowledge Integration* ,{ in M.K .Tolba (ed) , *Our Fragile World : Challenges , Opportunities For Sustainable Development* , { EOLSS Publisher} - For UNESCO Oxford , 2001.
- 11) Nordheim Stig, *Information Systems as Interdisciplinarity: A useful perspective on IS competence*, Stig.Nordheim@hia.no <http://home.hia.no/sting> p7.
- 12) Al-Habib, Bakr, *Use of cognitive integration approaches in the organizational development of public service organizations*, Baghdad University, Published research paper, p7.
- 13) <https://architecturenow.co.nz/calendar/conference/uia-2011-tokyo>
- 14) Doczi, György, "THE POWER OF LIMIT", 2005, translated by YASSAR ABDIN& others, Damascus Univ., 2011, p19 <https://www.academia.edu>
- 15) Ibid, p98.
- 16) Ibid, p100.
- 17) Ghonimi, *Islam towards understanding architectural theory the linguistic approach as a theorizing tool for contemporary world architecture*, 2008, p1.
- 18) Wigley, M. (1993). *The architecture of deconstruction*, Derridas, Haunt. USA: MIT press.
- 19) Fredrik Nilsson, 'philosophy and the development of architectural thinking'-congress CATH04
- 20) *Deconstruction in architecture between philosophy and practice*, Conference: The 8th International Conference - Architecture Department - Faculty of Engineering, Assiut University, **Zeinab Feisal**, P5 <https://www.researchgate.net/publication/320394807> ,
- 21) Youssef, Maged, *Effect of Ancient World Mythology on Contemporary Architectural Design Concepts*, 2009, p24
- 22) Ibid, p25.
- 23) *The Danteum* / Giuseppe Terragni & Pietro Lingeri - ArchEyes
- 24) *The Danteum of Giuseppe Terragni* | paper architecture (wordpress.com)
- 25) *The Danteum of Giuseppe Terragni* | paper architecture (wordpress.com)
- 26) *The Danteum* / Giuseppe Terragni & Pietro Lingeri - ArchEyes
- 27) AL-INIZI, Dr. ARSHAD ABD AL JABBAR, *FORM AUTONOMY IN ISLAMIC ARCHITECTURE*, master thesis, p 34, 1997
- 28) ibid, p35.
- 29) ibid, p36.
- 30) ibid, p38.
- 31) ibid, p3.
- 32) ibid, p40.