

## **Investigating the most common design approaches for each building type in architecture**

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### **Abstract**

Architecture design curriculums do not contain a clear process of how to choose a design approach when it comes to designing a certain building type. This is mostly because any design approach can be convenient for any building type and the decision is left for the architect to choose the most convenient and suitable approach based on the project type, constraints, designer's vision and so on. However, it can be noticeable that some building types tend to relate more to some approaches than others. The objective of this study is to create a matrix that determines the relationship and the tendencies of the design approaches to be used in each building, this matrix would guide first year design students in choosing a suitable approach for their design project through this matrix. A statistical qualitative analysis is done to study the relation between the various design approaches and the building type in order to determine the most common approaches used in each type. Results show that some approaches are used more than others in some building types, and this could be an indication that these approaches suit this building type more than the others. Approaches like context, scenario and scheme tend to have higher occurrence tendencies in all building types because they relate to the programmatic and spatial organization design which is found in any type and especially in the programmatic building types like healthcare, residential, etc. While other approaches like analogy and metaphor have higher tendencies in cultural, mercantile and religious building types.

### **Keywords:**

Architecture Design, Design approaches, building type, Analogy, Metaphor.

**الملخص:**

يعتبر عدم وجود منهجية معروفة لإختيار مدخل تصميمي عند تصميم نوع معين من المباني من المشاكل المهمة في المهنة والتي يجب أن تغطي في مناهج تدريس الهندسة المعمارية خاصة في السنوات الأولى لتدريس التصميم المعماري. يمكن أن يكون السبب في عدم وجود هذه المنهجية هو أن أي مدخل تصميمي يمكن أن يكون مناسباً لتصميم أي نوع من المباني والقرار في ذلك يعود علي المصمم وفقاً لقرائنه وفهمه لظروف المشروع ومحدداته وإمكانياته. ولكن، من الممكن ان نلاحظ ان عددا من هذه المداخل التصميمية تستخدم لتصميم نوع معين من المباني بصورة أوسع عن غيرها. إن الهدف الرئيسي من هذا البحث هو دراسة العلاقة بين أنواع المباني المختلفة في العمارة و المداخل التصميمية المستخدمة في تصميم هذه المباني بالإضافة ألي تحديد نسب إستخدام كل مدخل تصميمي في كل نوع من هذه المباني. تحديد هذه العلاقة سوف يسهل علي طلاب السنوات الأولى في التصميم المعماري إختيار مدخل تصميمي معين لتصميم مبانيهم حيث يطغوا علي هذه المرحلة بعضاً من الغموض بالنسبة للطلاب لعدم وجود منهجية معينة لإختيار مدخل التصميم. تم عمل إحصائية لتحقيق هذا الهدف حيث تم جمع عدد ٦٠ مشروع من كل نوع و تحديد المدخل التصميمي المتبع في كل مشروع منهم للوصول إلي نسب إستخدام كل مدخل تصميمي في كل نوع من المباني. أظهرت نتائج الدراسة أن هناك بعضاً من هذه المداخل تستخدم أكثر من غيرها عند تصميم نوع معين من المباني. ظهرت المداخل التي تتعلق بتصميم التنظيم البرنامجي مثل المخطط و السياق و السيناريو إلي تحقيق نسب أعلى في الإستخدم و خاصة في أنواع المباني التي تعتمد بشكل أساسي في تصميمها علي حل الجوانب الوظيفية و الخاصة بالبرنامج الوظيفي للمشروع مثل تصميم المستشفيات و المصانع. أما المداخل الأخرى مثل التشبيه و الاستعارة فكانت موجودة بنسب أعلى عن باقي المداخل في أنواع المباني الثقافية و التجارية و الدينية.

**الكلمات المفتاحية:**

التصميم المعماري, مداخل التصميم, أنواع المباني, التشبيه, الإستعارة.

**1. Introduction**

“In studio, designers express and explore ideas, generate and evaluate alternatives, and ultimately make decisions and take action. They make external representations (drawings and three-dimensional models) and reason for such representations is to inquire, analyze, and test hypotheses about the designs they represent.”[1]

Usually, for a first-year architecture student, this process is very difficult to comprehend and digest due to the lack of processes that would direct the student towards accomplishing the design of the project at hand.

**Research Problem:**

In architecture design studio, the learning process usually depends on practice (master-apprentice learning process). Therefore, this causes the following deficiencies in the design studio:

- 1- Absence of a clear framework that guides students towards choosing a design approach that better suits the nature of their design project.
- 2- The absence of this framework results in students feeling confused and intimidated during the process of generating ideas during the design task.

**Research Objectives:**

In this study, the following objectives are addressed:

- 1- Design approaches and their relation to each building type are examined to determine the most common design approach for each building type.
- 2- Providing a framework for first year design students to be able to choose a certain design approach for a certain building type.
- 3- Documenting literature related to the design process, its steps and procedures since this knowledge was often transferred through the design practice to students from their professors [2].

Also, this study will help in a future research project concerned with objective design assessment of creativity in architectural design projects as it will be the basis from which we would be able to add weights for the conceptual design approaches selected by students in their architectural design project.

**Research Methodology:**

This study uses an empirical case study as the main research method of this paper and a statistical analysis for the results of the case study was carried out, where 60 projects for each building type were gathered and their design approach of their form generation were determined in order to measure the tendencies of selecting one approach over the other depending on the building type of the project. This could later on help as a guide for first year students in the selection of the suitable design approach for their projects which would facilitate the design process for them at the beginning instead of being intimidated by the process.

**1.1. Research Structure:**

The research is divided into three parts: The first part is the theoretical part concerned about the literature review on the design approaches that are being widely used in architecture design. The second part is the practical part where the study is carried on by performing a statistical analysis of 60 projects for each building type, determining the design approaches used in each of them. The third part is the deductive part where a matrix is generated to determine the relation and usage ratios of each design approach in each building type.

**2. Design Approaches in Literature**

Concept production is a crucial step in the architecture design process. This concept has a direct effect on the process of decision making throughout the entire project phases. These concepts are derived from various design approaches. Choosing one approach to follow depends on many factors for example: project constraints, building type, location, vision, intent or objective of the designer, etc. [3]. It is a crucial design for the designer to select which approach he would follow to develop his/her project. These approaches - although rarely found in literature – are stated below but it is important to note that as the world around us change and the invention of new technologies develops, user need might also revolute and therefore design approaches may also develop and new techniques may be invented. However, the approaches stated below remain the basic methods currently chosen by architects in their design projects.

## 2.1. Theme

In this approach a thematic work is selected, for example a novel, story, poem, song, painting and its characteristics are analyzed in order to provide base for the space organizations of the project at hand and its form generation and massing strategy [3]. These characteristics could be in case of a novel the characters' typology, the timeline and sequence of events, the narrated locations, the type of drama. All these characteristics would directly affect the space organizations of the project constituents, the massing of these components and its expressive qualities, the circulation pattern inside the building, etc.

One of the examples of this approach is that of Rietveld Schroder House seen in (Fig. 3), where its design and massing composition where inspired from the famous De Stijl painting (Fig.1). The geometrical massing and graphical organization (Fig. 2) of the house where inspired from the artist work. Cubism and color schemes were directly derived from the painting language and the architecture expression is highly influenced by the thematic derived concept from the painting.

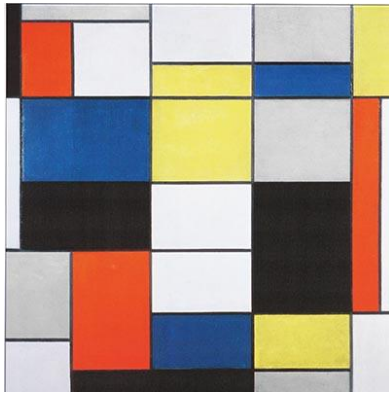


FIGURE 1. DE STIJL PAINTING

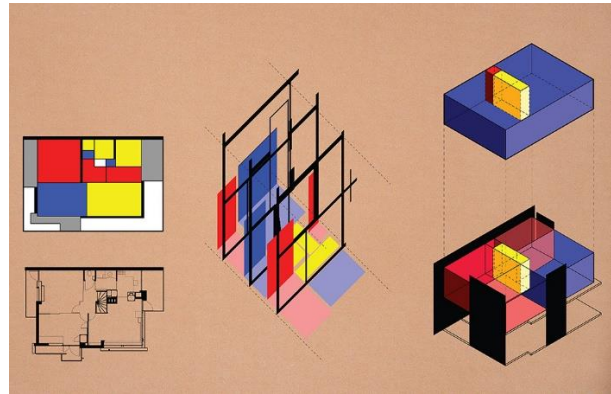


FIGURE 2. DIAGRAMS OF THE RIETVELD SCHRODER HOUSE REVEAL ITS GRAPHIC AND GEOMETRIC BRILLIANCE



FIGURE 3. RIETVELD SCHRODER HOUSE

## 2.2. Analogy

Analogy is a method from which solutions of known matters can be borrowed in order to help solve target problems. This method can help in achieving creative solutions to design problems [4]. To facilitate the understanding of the process of this method, [3] explained that the designer has to think of keywords that would relate to the type, function or the philosophy of the project at hand and then think of shapes and forms that would represent the expressive qualities of these

keywords. If we would for example design a library, then we would think of keywords like books, paper, words and so on and we would for example choose to represent the form in a layering method to represent that layering of pages in books.

### **2.3. Metaphor**

[5] In their book they stated that “we typically conceptualize the nonphysical in terms of the physical – that is, we conceptualize the less clearly delineated in terms of the more clearly delineated” [6]. Metaphor resembles analogy in the extraction of some keywords. However, Analogies tend to deal with extracted keywords and interpret them into external expressive forms while metaphor, on the other hand, tends to induce these keywords into the project in the form of implications, interpretations, meanings and connotation [3]. So, for example, if the design project is a religious building where users come to pray and seek enlightenment through God, we would present this by integrating generous amount of environment light in the design of the building to symbolize this relation.

### **2.4. Experience**

In this approach the designer focuses on inducing a certain kind of experience that he wants to subject to the building users. For example, if he wants to design a futuristic building all of the interiors would be design using future technologies and futuristic design schemes [3]. This approach aids the designer in visualizing the entire style of the project, the space allocations, circulations, etc.

### **2.5. Symbolism**

In this approach the design is referenced to a traditional, conventional or cultural symbol. The design usually contains elements that would remind the users of a certain symbol. For example, a library design could contain elements from a temple to indicate the sacredness of knowledge. [3].

### **2.6. Context**

This approach is used widely by designers while designing their projects or it is somewhat added to another approach in order to form the design idea of the project. In this approach the design tends acknowledge its aesthetic value based on and in relation to its surrounding context where the result could be in harmony or in contrast to its surroundings. It can be a geographic, temporal or a cultural context. For example, if the project location is in a historic district, the design could extract its aesthetical element from these historical characteristics or on the other hand use different schemes to stand out between the other buildings. [3]

### **2.7. Scheme**

In this approach, there are 5 types of schemes that the design can be derived or developed from these are, a) geometry, for example when the design depends on a certain shape as a building unit and it undergoes transformations in scale, transmission, rotation in order to achieve the overall design. B) Material, and that is when a design is directly dependent on the properties or the aesthetic qualities of a certain material. C) Technology, and this is when the design depends on a certain technology to achieve its purpose, this can be found in responsive and interactive

architecture examples such as an interactive façade. D) Landscape, this is when the landscape becomes an important component of the architectural design projects and blends with its constituents, like when integrating internal landscape in designs to determine and define other spaces. E) Mixing one or more of existing concepts in order to produce a new design or invention.

## 2.8. Scenario

In this approach, a “what-if” scenario is used to predict how users would use a certain space according to its use and provide the most suitable circulation and space organizations in order to accommodate this type of scenarios, according to the specified use of the building type. So, if we are to design a shopping center, then shops, atriums and corridors should be designed in a way to facilitate the use of the building for users and also help the shop tenants to achieve their target shoppers. Also, if there is a certain type of events that might be carried out in a certain time of the year, a proper space allocation should be provided for that use. The goal is to design a space which is easily accessible with clear circulation paths, clear egress exits and easy way of finding solutions.[3].

These design approaches are the most common ones used by architects worldwide in order to generate and develop their projects. One, two or more of these approaches can be combined to generate the idea / concept of a certain type of building. However, usually there is one which is more dominant than the other and which would be of higher importance in generating decisions throughout the design process or project phases.

As it is aforementioned, these approaches are subjected to change or increase with time in order to keep up with the future technological advances, architectural innovations and modern schemes.

## 3. Building types in Architecture

In order to collect the number of building types found in architecture, we used the standard data books to determine this information. According to [7], [8] these are the various building type categories found in Architecture.

1. Residential Buildings.
2. Office/mixed use buildings.
3. Mercantile buildings.
4. Industrial buildings.
5. Sport Facilities.
6. Educational buildings.
7. Healthcare facilities.
8. Public buildings.
9. Cultural buildings.
10. Transport buildings.

## 4. Methodology

An Empirical case study and a Qualitative statistical analysis were performed to determine the tendencies and reoccurrence of the usage of certain design approaches in certain building types.

#### 4.1. Selection Criteria for the case study:

60 projects were selected from each building type category using random selection methodology for each of the previously stated building types. Project selection criteria included the following:

- Diversity of projects attributes including location and architect/designer within the same building type category.
- Project description exhibits a clear design process, explanation for the used design approach and form generation methodology.
- Project form is clearly inspired and induced from the stated design approach and process in the project description.

#### 4.2. Selection Criteria Limitations:

The selection of the 60 projects were mostly from the Arch daily articles which provides a wide collection of projects in each of these categories and a detailed explanation to each project design approach, strategy and process which in turn is usually deducted from carrying out an interview with the project designer.

Through critically analyzing each of the 60 project design in each category, the approach by which the designer generated or developed the building design was determined to reach a clear ratio/statistic of which approach tend to be used more in each building type. Figure 4. Shows the process map for the research methodology of this paper. The aim of this study was to generate a matrix that would clarify this relation which can be used later on as a guide for first year design students as well as a guide to the assessment of concept approaches in architectural design projects.



FIGURE 4. PROCESS MAP FOR RESEARCH METHODOLOGY

## 5. Analysis of building types and their related design approaches

The research started by categorizing each of the building types that is found in architecture. Then, a search was conducted to randomly select 60 projects for each building type, analyze their design concept and form generation process, then determine the design approach selected to generate the design of the buildings.

In the *residential building* type, the scenario approach was clearly the most approach used in designing this type of buildings, this is because, in this type that main focus is to achieve the user's accommodation needs through space organizations, adjacency and user circulations.

Also, in this building type, the problem of space allocation, sizes, orientation, circulation, etc., where the most important aspects of the design problem that needed to be solved and organized to achieve the building design. After these problems are settled, the designer then thinks of the exterior treatment for the massing of these components as in the material used, solid and void ratio and so on. (Fig. 5-10) they are samples from the 60 projects selected which contained the usage of the scenario approach as a primary approach in the architecture designs of their project. It is noted that this approach can be combined with other approaches to visualize the final concept for the project at hand. Like in (Fig. 7 & Fig. 10) where the scheme approach was integrated to produce the façade treatment for the project through using geometrical morphologies. (Fig. 8) The designer used the contextual approach as a secondary approach in the design of the buildings where he manipulated the building's roof to be in harmony with the surrounding mountains [9].










While analyzing the *Offices/Mixed use* type, it was generally noticed that approaches like, context, scheme and scenario, have approximately equal ratio and the highest ratio of usage among the other approaches. These types of buildings tend to have a known space program and space allocation scenario which could differ according to a certain company policy. They are buildings which are designed to accommodate either one or most probably more than one company or office at a time. Mostly designed as an open plan module which is intended to be modified according to the tenant company policy and flow of work. Therefore, these types of buildings tend to induce their design from the surrounding context, or from applying a certain type of technology or geometrical patterns, usage of parametric design, creating a certain type of scenario which could manipulate the building's organization. The design of No.1 Quayside (Fig. 11) illustrates the use of the contextual approach in the design of the building where the building takes on the curved and sinuous design as inspired by the architectonic elements of the site, the surrounding bridges and landscape [10]. (Fig. 12) the OXXEO office building used the scheme approach in the design of its significant geometrical skin [11]. The emergence of Beijing water group (Fig.13) used the scenario approach in the utilization of its building's space components [12]. On the other hand, office building's owned by an institution, tend to use approaches as Metaphor and analogy to conceptualize and express their institutional identity as seen in examples from (Fig. 13-15). Arm's holding headquarters (Fig. 14) used analogy where the building design is inspired from the structure of the silicon [13]. The emergency of Beijing water group (Fig. 13) used scenario as a design approach where spaces are utilized to achieve perfect adjacency scenario and efficient circulation and orientation.

*Mercantile and cultural* building types are the only types amongst the others who exhibited the usage of all eight approaches in the design of their buildings with varying ratios. It is because these types tend towards the conceptualization of philosophies, meanings, connotations and so on. Cultural buildings like museums, pavilions, libraries, exhibitions tend to inspire their designs from the topics they will exhibit, its historical timeline, technology, product characteristics and so on. Their designs are always the outcome of analyzing certain keywords of philosophies or analyzing keywords for a certain meaning that the architect wants to induce into his design.






That is why the use of Analogy and metaphorical approaches appeared in a larger ratio during analyzing the examples of this type as in (Fig. 17-19). Usage of analogy approach is illustrated in the UCCA Dune Art museum (Fig.17) where the design of the museum form is inspired from the children's tireless digging on the shore [14]. The Lamborghini exhibition (Fig. 19) also used this concept where the exhibition design is inspired from the design of the Lamborghini car lines [15]. The Aga Khan museum (Fig. 18) used the metaphoric approach in its design where the design is inspired by a vision statement of Light by his highness Aga Khan. The notion of "Light" has been an inspiration for numerous human faiths and decades of history are referred to as the enlightenment. The Aga Khan had hoped that the building and the spaces around it will be seen as a celebration of light and the mysteries of light that nature and the human soul illustrate at every moment of our lives [16].







Thematic approach is also used in designing Mercantile and Cultural buildings, where a certain story, novel, painting or poem can be the inspiration for designing a building and organizing its spaces according to the story timeline like Mu Xin Art Museum (Fig. 20) whose design was inspired by the artists' works of art. Also, this approach is widely used in memorial buildings which tells the story of a certain event [17]. Experience is seen in designing some museums or malls where a certain experience is determined by the designer and he designs the building in a way that s its users experience something different, as in the design of the mall which used a chocolate/sweets factory (Fig. 21) as an experience which the designer wanted the users to experience [18]. Symbolism is also seen in these building types where certain buildings inspire their design concept from a traditional or cultural symbol as seen in the design of the Albert campus multimedia library (Fig. 22) where the design of its exterior skin references the color and patterns of Sumerian Cuneiform script on clay tablets – one of humanity's first known systems of writing [19]. The other approaches like context, scheme and scenario are also used in a wide range in designing these buildings because they always deal with the programmatic aspects of a building's design.

 <p><b>FIGURE 4. CENTRAL PARK FIRST STAGE / MIGDAL ARQUITECTOS</b>  <a href="https://www.archdaily.com/582491/CENTRAL-PARK-FIRST-STAGE-MIGDAL-ARQUITECTOS"> &lt;HTTPS://WWW.ARCHDAILY.COM/582491/CENTRAL-PARK-FIRST-STAGE-MIGDAL-ARQUITECTOS&gt;</a> ACCESSED 7 SEP 2020.</p>	 <p><b>FIGURE 5. ZELIGE HOUSING COMPLEX / TECTÔNE + TACT ARCHITECTS</b>  <a href="https://www.archdaily.com/948730/zellige-housing-complex-TECTONE-PLUS-TACT-ARCHITECTES"> https://www.archdaily.com/948730/zellige-housing-complex-TECTONE-PLUS-TACT-ARCHITECTES</a> &gt;Accessed 21 Nov 2020.</p>	 <p><b>FIGURE 6. WIND TOWER / AGI ARCHITECTS</b>  <a href="https://www.archdaily.com/876432/wind-tower-agi-architects"> https://www.archdaily.com/876432/wind-tower-agi-architects</a> Accessed 7 Sep 2020</p>	
<p><b>Approach</b></p>	<p><b>Scenario</b></p>	<p><b>Scenario</b></p>	<p><b>Scenario + Scheme</b></p>
 <p><b>FIGURE 7. VILLA LÓLA / ARKÍS ARCHITECTS</b>  <a href="https://www.archdaily.com/233742/VILLALOLA-ARKIS-ARCHITECTS"> &lt;HTTPS://WWW.ARCHDAILY.COM/233742/VILLALOLA-ARKIS-ARCHITECTS&gt;</a>. ACCESSED 3 SEP 2020.</p>	 <p><b>FIGURE 8. THE CORAL VILLA / HUNI ARCHITECTS</b>  <a href="https://www.archdaily.com/935017/the-coral-villa-huni-architectes"> &lt;https://www.archdaily.com/935017/the-coral-villa-huni-architectes&gt;</a> Accessed 3 Sep 2020.</p>	 <p><b>FIGURE 9. MORI HAUS RESIDENCE / SOMDOON ARCHITECTS</b>  <a href="https://www.archdaily.com/946761/mori-haus-residence-somdoon-architects"> &lt;https://www.archdaily.com/946761/mori-haus-residence-somdoon-architects&gt;</a> Accessed 3 Sep 2020</p>	
 <p><b>FIGURE 10. NO 1 QUAYSIDE / BIG</b>  <a href="https://www.archdaily.com/934703/big-designs-no-1-quayside-an-office-building-in-Newcastle-uk/"> &lt;https://www.archdaily.com/934703/big-designs-no-1-quayside-an-office-building-in-Newcastle-uk/&gt;</a> Accessed 6 March 2020 .</p>	 <p><b>FIGURE 11. OXXEO BUILDING / RAFAEL DE LA HOZ ARCHITECTOS</b>  <a href="https://www.archdaily.com/931396/oxxeo-building-rafael-de-la-hoz-arquitectos/"> &lt;https://www.archdaily.com/931396/oxxeo-building-rafael-de-la-hoz-arquitectos/&gt;</a> Accessed 6 Mar 2020 .</p>	 <p><b>FIGURE 12. THE EMERGENCY OF BEIJING WATER GROUP / 6A8 STUDIO</b>  <a href="https://www.archdaily.com/925224/the-emergency-of-beijing-water-group-6a8-studio/"> &lt;HTTPS://WWW.ARCHDAILY.COM/925224/THE-EMERGENCY-OF-BEIJING-WATER-GROUP-6A8-STUDIO/&gt;</a> ACCESSED 7 MARCH 2020</p>	
<p><b>Approach</b></p>	<p><b>Context</b></p>	<p><b>Scheme</b></p>	<p><b>Scenario</b></p>

 <p><b>FIGURE 13. ARM HOLDINGS HEADQUARTERS / SCOTT BROWNRIGG</b></p> <p><a href="https://www.archdaily.com/931958/arm-headquarters-scott-brownrigg/">https://www.archdaily.com/931958/arm-headquarters-scott-brownrigg/</a> Accessed 6 Mar 2020.</p>	 <p><b>FIGURE 14. UNILEVER HEADQUARTERS / AEDAS</b></p> <p><a href="https://www.archdaily.com/877351/unilever-headquarters-aedas">https://www.archdaily.com/877351/unilever-headquarters-aedas</a> Accessed 17 Nov 2020.</p>	 <p><b>FIGURE 15. UNIOPT PACHLEITNER GROUP HEADQUARTERS / GS ARCHITECTS</b></p> <p><a href="https://www.archdaily.com/122064/uniopt-pachleitner-group-headquarters-gs-architects">https://www.archdaily.com/122064/uniopt-pachleitner-group-headquarters-gs-architects</a> Accessed 17 Nov 2020.</p>	
<p>Approach</p>	<p>Analogy</p>	<p>Metaphor</p>	<p>Metaphor</p>

In *Educational* building types, approaches like context, scheme and scenario were mostly found as the approaches used in the design of these buildings. This is because these building main design issue, is the space organization of the components of these buildings according to its assumed users as well as their circulation paths.

 <p><b>FIGURE 16. UCCA DUNE ART MUSEUM / OPEN ARCHITECTURE</b></p> <p><a href="https://www.archdaily.com/907596/ucca-dune-art-museum-open-architecture/">https://www.archdaily.com/907596/ucca-dune-art-museum-open-architecture/</a> Accessed 15 Feb 2020.</p>	 <p><i>Figure 17. The Aga Khan Museum / Maki and Associates</i></p> <p><a href="https://www.archdaily.com/899013/the-aga-khan-museum-maki-and-associates/">https://www.archdaily.com/899013/the-aga-khan-museum-maki-and-associates/</a> Accessed 17 Feb 2020.</p>	 <p><b>FIGURE 18. LAMBORGHINI EXHIBITION CENTER / PMA</b></p> <p><a href="https://www.archdaily.com/930861/Lamborghini-exhibition-center-pma/">https://www.archdaily.com/930861/Lamborghini-exhibition-center-pma/</a> Accessed 17 Feb 2020.</p>
<p>Analogy</p>	<p>Metaphor</p>	<p>Analogy</p>

 <p><b>Figure 19. Mu Xin Art Museum / OLI</b>  <a href="https://www.archdaily.com/785110/mu-xin-art-museum-oli-architecture-pllc/">https://www.archdaily.com/785110/mu-xin-art-museum-oli-architecture-pllc/</a>            Accessed 15 Feb 2020.</p>	 <p><b>FIGURE 20. WILL ALSOP'S STUDIO SHOPPING CENTER IN NAIROBI</b>  <a href="https://www.dezeen.com/2018/07/10/will-alsop-all-design-shopping-center-the-Beacon-Africa-Kenya-architecture/">https://www.dezeen.com/2018/07/10/will-alsop-all-design-shopping-center-the-Beacon-Africa-Kenya-architecture/</a> last accessed: 23/3/2020</p>	 <p><b>FIGURE 21. ALBERT CAMPUS MULTIMEDIA LIBRARY / DE-SO</b>  <a href="https://www.archdaily.com/450661/albert-campus-multimedia-library-de-so/">https://www.archdaily.com/450661/albert-campus-multimedia-library-de-so/</a> Accessed 17 Feb 2020.</p>
<b>THEME</b>	<b>Experience</b>	<b>Symbolism</b>
 <p><b>FIGURE 22. THE HEIGHTS / BIG Suzanne Stephens, 2020, The heights building by B. IG with Leo A Daly, Architecture records</b></p>	 <p><b>FIGURE 23. PETER COALDRAKE EDUCATION PRECINCT / HENNING LARSEN + WILSON ARCHITECTS</b>  <a href="https://www.archdaily.com/920764/peter-coaldrake-education-precinct-henning-larsen/">https://www.archdaily.com/920764/peter-coaldrake-education-precinct-henning-larsen/</a> Accessed 9 Mar 2020.</p>	 <p><b>FIGURE 24. SMART SCHOOL IN RUSSIA / CEBRA</b>  <a href="https://www.archdaily.com/773253/cebra-wins-competition-to-design-smart-school-in-Russia">https://www.archdaily.com/773253/cebra-wins-competition-to-design-smart-school-in-Russia</a> last accessed: 12/3/2020</p>
<b>Scheme</b>	<b>Scenario</b>	<b>Scheme</b>

In these buildings, Architects tend to carefully study the adjacency of the space components of these buildings as well as the optimum circulation routes for students, teachers and instructors that would provide easy way of finding solutions, and does not cause time to be wasted as in examples (Fig.23-27). Some examples also have shown the use of the analogy or the metaphorical approaches throughout their design. Like Jean Nouvel University (Fig. 26) which takes the analogy approach in its design by mimicking its region's undulating terrain [20]. Also, the metaphoric approach was used in the design of the International School of Debrecen by BORD (Fig. 27) where they used the shape of a circle in their design as it traditionally gives the meaning of protection, union and community [21]. However, these conceptual approaches tend to be used less than the aforementioned ones (Scheme-Context-Scenario) in this building type.

		
<p><b>FIGURE 25. JEAN NOUVEL UNIVERSITY</b>  <a href="https://www.designboom.com/architecture/jean-nouvel-stelios-ioannou-learning-resource-center-nicosia-cyprus-04-25-2019/gallery/image/g2-557/">https://www.designboom.com/architecture/jean-nouvel-stelios-ioannou-learning-resource-center-nicosia-cyprus-04-25-2019/gallery/image/g2-557/</a>                      Accessed 12 Mar 2020.</p>	<p><b>FIGURE 26. INTERNATIONAL L SCHOOL OF DEBRECEN / BORD</b>                      &lt;<a href="https://www.archdaily.com/929492/international-school-of-debrecen-bord-architectural-studio/">https://www.archdaily.com/929492/international-school-of-debrecen-bord-architectural-studio/</a>&gt;                      Accessed 12 Mar 2020.</p>	<p><b>FIGURE 27. CASA-PORT RAILWAY STATION / AREP + GROUPE3 ARCHITECTS</b>  <a href="https://www.archdaily.com/769001/casa-port-railway-station-arep">https://www.archdaily.com/769001/casa-port-railway-station-arep</a>                      Accessed 18 Aug 2020.</p>
<p><b>Analogy</b></p>	<p><b>Metaphor</b></p>	<p><b>Scenario</b></p>




In *Transport building* types, the use of approaches like analogy, metaphor, symbolism, context, scheme and scenario were detected in the design of these types of buildings with a noticeable higher ratio for the programmatic approaches (Context-Scheme-Scenario). The scenario approach was found in a higher ratio in this type because of the need in this type of buildings to achieve an optimum space organization layout and critically study users circulation paths and wayfinding scenarios as in Casa-Port Railway station (Fig. 28) where these factors were critically designed in order to produce the final design for this project [22]. Context approach is also used in the design of transport buildings as in the design of the Daqing highway passengers transport hub (Fig. 29) which takes its form from the ice and snow geographical features of its area [23]. Analogy and metaphorical approaches are also used in this type of buildings as in the design of the Shenzhen Bao'an International (Fig. 30) where the analogy approach was used as its design was inspired from the mantra ray fish, a fish that breathes and changes its own shape, undergoes variations, turns into a bird to celebrate the emotion and fantasy of a flight [24]. Suizhou South Railway Station (Fig.31) used the metaphorical approach in its design where the design where the natural artistic feeling of "under the ginkgo tree" was incorporated into the concept design of the project [25]. Symbolism was also used in the design as in the design of Beijing Airport by Foster + Partners (Fig. 32) where the roof of the airport has a dragon-like form as an interpretation of the traditional Chinese culture [26].

 <p><b>FIGURE 28. DAQING HIGHWAY PASSENGER TRANSPORTATION HUB / HAD ARCHITECTS</b>  <a href="https://www.archdaily.com/344939/daqing-highway-passenger-transportation-hub-had-architects">https://www.archdaily.com/344939/daqing-highway-passenger-transportation-hub-had-architects</a> Accessed 17 Nov 2020.</p>	 <p><b>FIGURE 29. SHENZHEN BAO'AN INTERNATIONAL AIRPORT / STUDIO FUKSAS</b>  <a href="https://www.archdaily.com/472197/shenzhen-bao-an-international-airport-studio-fuksas">https://www.archdaily.com/472197/shenzhen-bao-an-international-airport-studio-fuksas</a> Accessed 18 Aug 2020.</p>
<p><b>Context</b></p>	<p><b>Analogy</b></p>
 <p><b>FIGURE 30. SUZHOU SOUTH RAILWAY STATION / CSADI</b>  <a href="https://www.archdaily.com/950783/suzhou-south-railway-station-csadi">HTTPS://WWW.ARCHDAILY.COM/950783/SUIZHOU-SOUTH-RAILWAY-STATION-CSADI</a>. ACCESSED 17 NOV 2020.</p>	 <p><b>FIGURE 31. BEIJING AIRPORT / FOSTER + PARTNERS</b>  <a href="https://www.archdaily.com/1339/beijing-airport-foster-partners">https://www.archdaily.com/1339/beijing-airport-foster-partners</a> Accessed 18 Aug 2020.</p>
<p><b>Metaphor</b></p>	<p><b>Symbolism</b></p>

*Public building* types also had higher ratios in using programmatic approaches especially the scenario approach. This is because buildings as courthouses, fire stations, police station, etc. all depend in their design solution in achieving optimum space utilization and user's efficient circulation scenarios. Fire Station of Tianfu New District (Fig.33) used the scenario approach in its design where the design adopted a centralized layout, making different function such as office building, dormitory, dining halls, multi-purpose training facility, and the public visitation gallery into an integrated arrangement as well as creating a circular layout. The function becomes compact and efficient and creates sufficient training ground [27]. This approach was also used in the design of a Police headquarters and a civic center (Fig. 34 & 35). Contextual approach was also used in a relatively high ratio as in the design of the Jalisco Federal Judicial City (Fig. 36) [28]. Scheme was also used as in the design of Palace of Justice (Fig. 37) in the design of its building skin form [29].

Sports facilities exhibited higher usage ratios of approaches like Scenario, Context and Analogy. Scenario is used in these buildings where the design solution also depends on the space utilization and effective generation of user's circulation paths and related sport space standards as in examples in (Fig. 38-40). Contextual approach was also used as in Barclays Center (Fig. 41) where the aim was to integrate this center's form to the surrounding

neighborhood [30]. The analogy approach was also used in a significant number of examples for sport facilities as in the design of Zhejiang Huang Long Aquatics Center (Fig. 42) where the wavy, floating form of the building brings the shape of waves in a swimming pool to the

 <p><b>FIGURE 32. FIRE STATION OF TIANFU NEW DISTRICT / CSWADI</b>  <a href="https://www.archdaily.com/879439/fire-station-of-tianfu-new-district-cswadi">HTTPS://WWW.ARCHDAILY.COM/879439/FIRE-STATION-OF-TIANFU-NEW-DISTRICT-CSWADI</a>            ACCESSED 27 DEC 2020.</p>	 <p><b>FIGURE 33. POLICE HEADQUARTERS / JUAN ALBERTO MORILLAS MARTÍN</b>  <a href="https://www.archdaily.com/361310/police-headquarters-juan-alberto-morillas-martin">https://www.archdaily.com/361310/police-headquarters-juan-alberto-morillas-martin</a>            Accessed 27 Dec 2020.</p>	 <p><b>FIGURE 34. CIVIC CENTER IN LOHR AM MAIN / BEZ+KOCK ARCHITEKTEN</b>  <a href="https://www.archdaily.com/911480/civic-center-in-lohr-am-main-bez-plus-kock-architekten">https://www.archdaily.com/911480/civic-center-in-lohr-am-main-bez-plus-kock-architekten</a> Accessed 27 Dec 2020.</p>
 <p><b>FIGURE 35. JALISCO FEDERAL JUDICIAL CITY / TACHER ARQUITECTOS</b>  <a href="https://www.archdaily.com/529185/jalisco-federal-judicial-city-tacher-arquitectos">HTTPS://WWW.ARCHDAILY.COM/529185/JALISCO-FEDERAL-JUDICIAL-CITY-TACHER-ARQUITECTOS</a> ACCESSED 27 DEC 2020.</p>	 <p><b>FIGURE 36. PALACE OF JUSTICE / MECANOO + AYESA</b>  <a href="https://www.archdaily.com/887773/palace-of-justice-mecanoo">HTTPS://WWW.ARCHDAILY.COM/887773/PALACE-OF-JUSTICE-MECANOO</a> ACCESSED 6 DEC 2020.</p>	 <p><b>FIGURE 37. MATMUT ATLANTIQUE STADIUM / HERZOG &amp; DE MEURON</b>  <a href="https://www.archdaily.com/633554/the-new-bordeaux-stadium-herzog-and-de-meuron">HTTPS://WWW.ARCHDAILY.COM/633554/THE-NEW-BORDEAUX-STADIUM-HERZOG-AND-DE-MEURON</a> ACCESSED 22 NOV 2020.</p>
 <p><b>FIGURE 38. OLYMPIC FIELD HOCKEY CENTER / VIGLIECCA &amp; ASSOCIADOS</b>  <a href="https://www.archdaily.com/792726/olympic-field-hockey-center-vigliecca-and-associados">https://www.archdaily.com/792726/olympic-field-hockey-center-vigliecca-and-associados</a>            Accessed 22 Nov 2020.</p>	 <p><b>FIGURE 39. SIVAS STADIUM / BAHADIR KUL ARCHITECTS.</b>  <a href="https://www.archdaily.com/800600/sivas-stadium-bahadir-kul-architects">https://www.archdaily.com/800600/sivas-stadium-bahadir-kul-architects</a> Accessed 22 Nov 2020.</p>	 <p><b>FIGURE 40. BARCLAYS CENTER / SHOP ARCHITECTS</b>  <a href="https://www.archdaily.com/900593/barclays-center-shop-architects">https://www.archdaily.com/900593/barclays-center-shop-architects</a> Accessed 22 Nov 2020.</p>

Imagination [31]. Another example is Hangzhou Olympic Sports Center (Fig. 43) which its design was inspired from the shape of lotus petals [32].



**FIGURE 41. ZHEJIANG HUANG LONG AQUATICS CENTER / CSADI**

<https://www.archdaily.com/926218/zhejiang-huanglong-aquatics-center-csadi> Accessed 22 Nov 2020.



**FIGURE 42. HANGZHOU OLYMPIC SPORTS CENTER / NBBJ**

<https://www.archdaily.com/940104/hangzhou-olympic-sports-center-nbbj> Accessed 22 Nov 2020.

*Healthcare* and *Industrial building* types are noticed to have high ratios of usage of the scenario approach and significant lower ratios of the rest of the design approaches. The common design problem of these types of buildings are the space utilization, achieving very efficient and optimum circulations and wayfinding scenarios. Healthcare buildings included plenty of examples using the scenario approach for example, the Mafraq Dialysis center (Fig. 44) which is designed according to a patient centric design scenario, where the conventional arrangement of the dialysis treatment beds is flipped from an inward orientation to an outward orientation allowing patient views of the landscape and access of natural light. Another example is La corredoria healthcare center (Fig. 45) where the design program demanded up to four separate functional areas, from Emergency Room to psychiatric ward, through the typical outpatient program. The design of the building was later on conceived according to this scenario. Another example for using scenario approach in designing healthcare buildings is the ID hospital (Fig. 46) where the project program was divided into zones/departments and the building's final form was generated by the vertical stacking of all of this components on top of each other.



**FIGURE 43. MAFRAQ DIALYSIS CENTER / STANTEC**

<https://www.archdaily.com/254751/mafraq-dialysis-center-stantec> Accessed 16 Nov 2020.



**FIGURE 44. LA CORREDORIA HEALTH CENTER / DÍAZ|ROJO ARQUITECTOS**

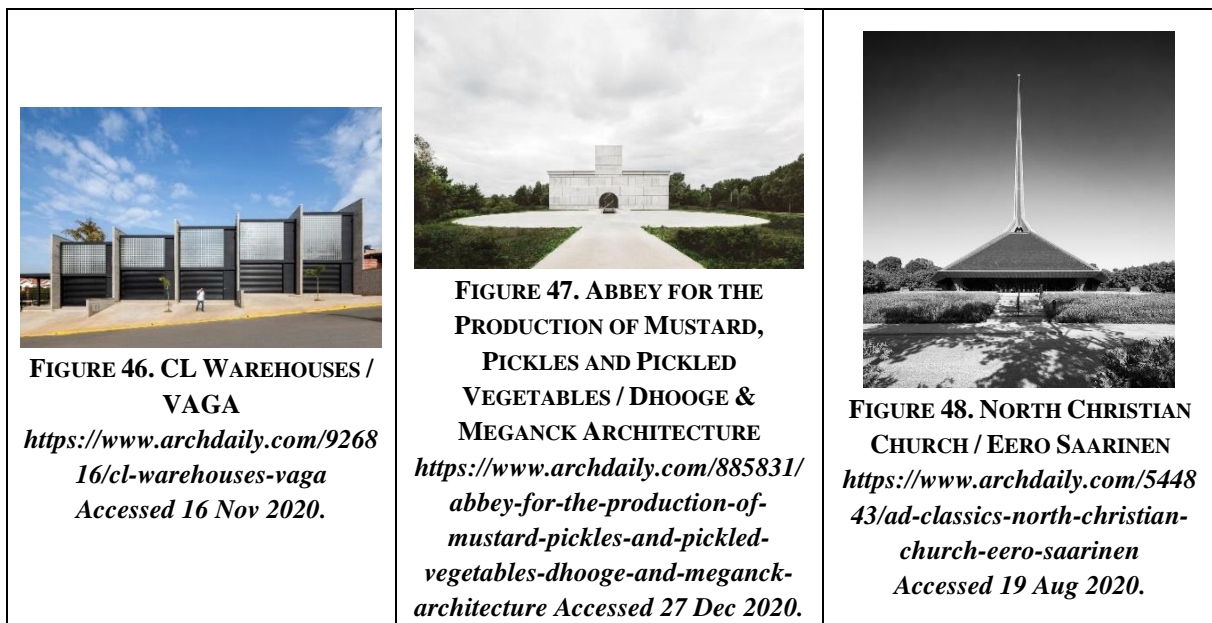
<https://www.archdaily.com/403170/la-corredoria-health-center-diaz-rojo-arquitectos> Accessed 16 Nov 2020.



**FIGURE 45. ID HOSPITAL / DONGJIN KIM + L'EAU DESIGN**  
<https://www.archdaily.com/887840/id-hospital-dongjin-kim-plus-leau-design> Accessed 16 Nov 2020.



Industrial building types had the same significant high ratio of using the scenario design approach in the design of its buildings. Also, because this type of building's main design problem lies in terms of its programmatic space solution and circulation paths along with the other programmatic aspects. The design of CL Warehouses (Fig. 47) illustrates the use of the scenario approach in its building design. Warehouses were stacked in a structurally safe module beside each other to reduce building costs and allow for maximum flexibility [33]. Another example is the design of the abbey for the production of mustard (Fig. 48) where an arena extends around the building allowing for minimum paving (turning radius) for loading and unloading. The production was commemorated together with the client from horizontal to vertical, with the mustard tower where the silos with mustard seed are located [34].



Two main approaches were used on a wider scale and high ratios in the *Religious* building type. These approaches are Metaphor and symbolism approach. This is because most of these buildings tend to carry a certain type of message, feeling or meaning behind its architecture design. These buildings are always related to the spiritual side and the relationship between an individual and God. Therefore, Architects tend to choose the metaphoric or the symbolic approach in their designs of these types of buildings to illustrate this relationship and make its users get affected by it.

The metaphoric approach was seen in many examples of this building types. One of these examples is the North Christian Church (Fig. 49) with its high spire that acts as an expressive gesture of reaching to the sky and metaphysically bridging the gap between heaven and earth [35]. The design of the Våler Church (Fig. 50) is another example in using the metaphoric approach as the project's design approach where the architect used light coming from different daylight openings as a symbol of hope and that light defies darkness [36]. Another example is the Tanatorio Municipal de Leon (Fig. 51) where the building is conceived as a tomb of tombs. With a sheet of water reflecting Leon's sky like an allegory of death, all that emerges are forms that appears as fingers searching of light for prayer [37].



**FIGURE 49. VÅLER CHURCH /**  
**SIVILARKITET ESPEN SURNEVIK AS**  
<https://www.archdaily.com/911031/valer-church-sivilarkitet-espen-surnevik-as>  
 Accessed 27 Dec 2020.



**FIGURE 50. TANATORIO MUNICIPAL DE LEON / BAAS**  
<https://www.archdaily.com/3891/tanatorio-municipal-de-leon-baas>  
 Accessed 27 Dec 2020.

Symbolic approach is also widely used by architects in the design of their religious buildings. The church of S. Tiago de Antas (Fig. 52) is an example of using the symbolic approach in the building’s design where elliptical form of the church emerges from the chalice and the cross of passion, and the rings surrounding the temple symbolize the crown of thorns, an instrument of torture used by the Romans during the crucifixion of Jesus [38]. Another example of using symbolism is the temple of steps (Fig. 53) where the integration between land and water with steps symbolizes the ghats of the ancient city of Benaras which is a part of India’s architectural heritage [39]. The Harajuku church (Fig. 54) uses symbolism in its design where the design consists of six arches and a bell tower that symbolically lay importance on the seven elements, the seven days of creation, the seven churches of the Orient [40].



**FIGURE 51. CHURCH OF S.**  
**TIAGO DE ANTAS / HUGO**  
**CORREIA**  
<https://www.archdaily.com/897218/church-of-s-tiago-de-antas-hugo-correia>  
 Accessed 27 Dec 2020.



**FIGURE 52. TEMPLE OF STEPS /**  
**SAMEEP PADORA & ASSOCIATES**  
<https://www.archdaily.com/943320/temple-of-steps-sameep-padora-and-associates>  
 Accessed 27 Dec 2020.



**FIGURE 53. HARAJUKU CHURCH /**  
**CIEL ROUGE**  
<https://www.archdaily.com/134128/harajuku-church-ciel-rouge>  
 Accessed 27 Dec 2020.

## 6. Discussion:

### 6.1. A Matrix for the Relation between Building Types and Design Approaches

**Error! Reference source not found.** illustrates the results of the study of this paper where an investigation was done to determine the tendencies of design approaches which are most used in each building type. It is noticed that approaches like context, scheme and scenario have the highest percentages among the other approaches in most types. This is because these approaches are the most likely to be combined with other approaches to complete the building’s design

effectively. These three approaches are concerned with designing with respect to the surrounding context, imagining user's scenarios in how they will use a building, their optimum circulation paths, space utilizations and organizations, using new materials, geometrics or integrating the landscape in the building's interior, all of these aspects, tend to deal with the programmatic parts of the building and are an important part of the design in most of building types therefore, they are most likely to be combined with another design approach in order to formulate the holistic design concept for a specific project.

However, these approaches (Context, Scheme and Scenario) percentages tend to increase programmatic building types like Healthcare, Office/Mixed use, Industrial and residential buildings, because in these types an optimum design mostly depend on circulation, space organizations, relation to context, using sustainable and innovative materials and so on. On the other hand, building types which depend more on the conceptual value of the building design like the Cultural, Mercantile and sport facilities have higher percentages in using approaches like analogy, metaphor, experience and so on. The designer can generate creative concepts which would add to the aesthetical and morphological value of these building types using these types of approaches. Creativity in design increases in these approaches because following its processes, it can help generate something that is novel and original and that is only suitable for the project at hand.

It can be noticed from **Error! Reference source not found.** that there are some approaches which have a 0% to show in some building types. This should not mean that these approaches are not used or not recommended to be used in these types. However, there usage is of a rare occurrence only, but some projects and some designers have the freedom to choose them to fulfill their project concept or vision. These projects are later on assessed according to the process that the designer follow in order to generate his or her idea of the project and where the approach was appropriate and fulfilled the overall purpose and vision of the project at hand.

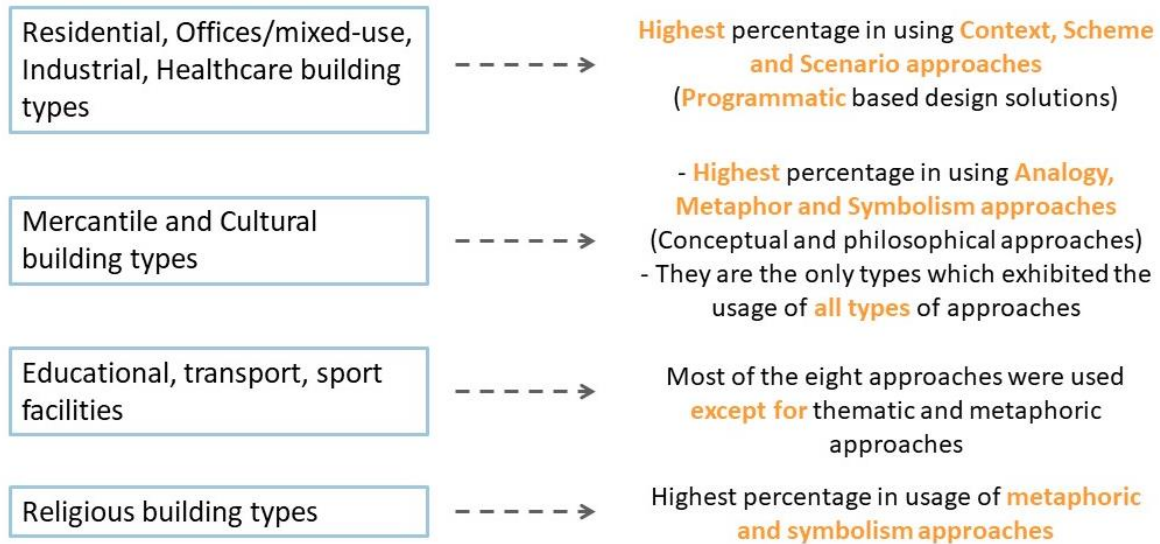
This matrix can serve to act as a framework for first year design students. It can aid these students in laying out the design approaches widely used by designers in order to develop their design projects and it provides a clear relationship for tendencies of these approaches to be used in a certain building type. It can help them to kick start their projects without fear or intimidation from the conceptual phase. This intimidation was usually caused because these approaches were rarely documented in any literature, so when a student tries to perform some research about them, they get lost because of their many synonyms and because the information is not usually collected in a single complete document.

**TABLE 1. A MATRIX ILLUSTRATING THE RELATION BETWEEN BUILDING TYPES AND THEIR MOST COMMON DESIGN APPROACHES**

	THE ME	ANAL OGY	METAP HOR	EXPERI ENCE	SYMBO LISM	CONT EXT	SCHE ME	SCENA RIO
Residential	0%	9%	4%	0%	0%	24%	24%	39%
Offices / Mixed use	0%	10%	6%	0%	0%	22%	30%	32%
Mercantile	2%	17%	10%	9%	8%	18%	15%	21%
Industrial	0%	2%	4%	0%	3%	6%	27%	58%
Sport Facilities	0%	22%	6%	0%	3%	17%	10%	42%
Educational	0%	10%	8%	1%	2%	23%	22%	34%
Healthcare	0%	4%	2%	0%	0%	9%	24%	61%
Public	0%	2%	6%	3%	3%	19%	23%	44%
Cultural	3%	39%	8%	5%	10%	18%	12%	5%
Religious	0%	11%	34%	0%	21%	10%	12%	12%
Transport	0%	13%	12%	0%	4%	18%	17%	36%

## 7. A framework for students illustrating design approaches and their relation to building types.

From the previous study, and the illustrated matrix, it can be concluded that some design approaches tend to have higher occurrence in certain building types. This helped in the formulation of a preliminary criteria for first year design students that could help them choose a certain design approach based on the building type of their project. The following (Fig. 55) illustrates a framework that can help first year students in choosing a suitable design approach for the building type of their design task.



**FIGURE 54. FRAMEWORK FOR STUDENTS ILLUSTRATING THE RELATION BETWEEN DESIGN APPROACHES AND EACH BUILDING TYPE**

## 8. Conclusion

This paper was focused on an investigation on the most common design approaches which are most used in each building type. The aim of this study was to provide a framework or reference for first year design student by documenting these approaches and processes and their relation to each building type which would eventually help them in the start of the conceptual phase of their design project. Another objective determining the tendencies of usage of design approach in relation to a certain building type. This relation would – later on – determine the weighs for the design approach implemented in the design of a certain building type which would contribute in another research concerned with the assessment of conceptual design in architecture design project.

To achieve this goal, a literature review was done in order to collect the design approaches widely used by architects in order to derive their concepts and develop their project ideas. There were eight popular approaches used by architects which are theme, analogy, metaphor, experience, symbolism, context, scheme and scenario. A detailed explanation of each of these approaches was discussed and the process of each was explained in order to document these approaches as they were rarely found in literature.

Building types were collected from standard data books and then the study began by collecting 60 projects from each building type and determining the design approach used in each to fulfill the full project design. This would help in giving percentages for approaches and their usage in each building type.

Results show that approaches which tend to deal with programmatic aspects in projects such as Context, Scheme and scenario are widely used in all building types. This is because these approaches deal with the programmatic aspects of the projects which must be respected in any building type. These approaches, for this reason, can most likely be combined with other conceptual approaches to develop the final project design concept.

There are some building types which tends to be programmatic like offices, healthcare, industrial. Approaches like context, scheme and scenario have significantly higher percentages in these types. While other types like Cultural and mercantile tend to have a higher conceptual aspect in their design and therefore approaches like analogy, metaphor, and symbolism scores high in them than the other types. Also, Approaches with zero or low value percentages should not give the impression that they are wrong or not recommended to follow but rather rare in presence and tend to be used to achieve certain goals or aspects by a designer in a project.

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