



# Towards a New Perspective for Designing Form Based on Music

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**Abstract:** *The transition from the imagination to the image can only be viewed and recognized in the context of an evolutionary process. But how an imagination that does not necessarily focus on architecture and music is thought to be conceived through particular sounds and building materials is an important and complicated issue. It is important because any researcher and anyone interested and any student of art who intends to research in these two categories can use it as a lesson in the world of experience; and it is complicated, because we know rarely an artist who can present analytically to the others the transition from his/her initial imaginations into an image that he/she has constructed. The main purpose of the design based on the architecture-music approach is to use the scientific and analytical tools to create the basis of ideas that are creative and stimulating imagination. We are looking for imaginations that lead to those imageries that cannot be transmitted to others without the figurative representation and incarnation. Because neither architecture nor music can be recognized by means of the concrete and objective methods and tools. In this research, the purpose is the representation of the form based on the principles of music and the discovery of its mathematical rules in accordance with the mental and creative schemes of architecture. In fact, the researcher is not only bound up with theoretical and fundamental differences and common features, but aims to reach the common principles of figurative imagination by exploring the foundations of these two arts.*

**Keywords:** *Architecture, Music, Essence, Imagination, Figurative.*

## INTRODUCTION

The first issue that faces the researcher at the start of studying the "Architecture and Music" is "Space." After recognizing this category, two phenomena of architecture and music are discussed. The most basic concept of the architecture is space; usually architecture is considered primarily as the construction of meaningful human space and the art of expressing meaningful space. We live in space, we design our features and attributes through it and communicate with it by emotional ties; space is not just observable but alive. Architectural space is conceived as an ideal, geometric, and specific space, a kind of negative solid or absent volume or something else a geometric and enclosed space, as clearly defined. However, historically and culturally, there are different perceptions of space (Hojjat, 1998; Daneshmir et al., 2001).

In the specialized dictionary of architecture, the term "space" has been defined in the field of architecture as follows: "Space is an expanding and, at the same time, inclusive field, and defines physically and psychologically a place or an environment in terms." It is constituted of the relations of form, color, and motion, sometimes it is empty or negative, and sometimes it determines the distance between the elements; whether it is a distance at the surface or in depth, embodied by the rules of perspective" (Shahchegrahi, 2002). The architecture is an application of the proportions in the volume of space and the music is an application of the proportions over time. The simplest form of these proportions can be experienced as the positive and negative spaces in architecture, and as the silence and sound in music. But the key to understanding the created spaces of architecture and music is the time factor. The architecture is not like music, having time in its own interior. A piece of music has a beginning, a certain amount of time will continue, and it will end at a certain time. But the architecture expects the motion from its viewer. This is the viewer who needs to move to a complete understanding of the architectural space. This movement needs time, and thus the time becomes the "fourth dimension" in the space perception. According to what is said, the "motion in space" is the main issue of our research.

Architecture is the art of thinking of time and space. Order and appropriate rhythm coordinate the dual understanding of space and time, which seems to be in conflict with each other (Gideon, 2010). Music, irrespective of native and content features, is the melodies that are organized in various ways, and any form of organization is the particularity of history and the existence of a given society. It does not matter that the melody's organization is based on a seven-point scale (Soheili, J. al-Din, 2000).

Nowadays, the importance of the relationship between architecture and music has reached its minimum. Many people, as well as architects, who have been immersed in a noisy environment and a visual and value-based pollution, have only achieved unclear perceptions of this relationship; they have remained unaware of the creative use of the relationship between music and architecture, as well as the richness of architecture by the music. An architect and musician need to consider two "absolute" and "concrete" aspects of space in order to create a work that wants and can possess a spiritual existence and to transcend human beings. This research seeks to recognize the common origins and concepts of music and architecture.

### **Research theoretical foundations**

The study of the relationship between music space and architecture in the past and today has been one of the permanent discussions in the field of art. Modern times are regarded as one of the milestones of history due to its subsequent developments, such as humanism, scientism, religious reform, enlightenment, and the industrial revolution; so two kinds of views came in existence on the relationship between these two arts (Craig, 1998).

### **Position of architecture and music in the gradual development of arts**

Architecture only finds a relative development where the human beings seek to bring themselves closer to "that world", and the music is only respected when it commemorates "that world". Churches with their tall towers tend to approach the "sky" as far as possible, and the humans who are painted in their walls lack the human proportions; it seems that, with the small, tall forms, they tend along with the tower of the churches to the "sky".

Music is also inspired by this cultural background. As the medieval architects all of their minds were focused on building churches higher, and neglected the promotion of the quality of life of peoples, the musicians of this period were also less likely to promote the quality of the music of the people.

During the medieval age, the design of large non-religious buildings was also inspired by the construction of religious buildings, but at this time, in order to represent the relative independence of man from the absolute authority of the church, for the first time, in the great non-religious monuments, the artist architects sought to find the forms independent of church forms. The original form of these monuments, which was manifested

in the palaces, was from the ordinary houses whose Cuban forms were a repetition of the form of Greek and ancient Roman homes.

In music also, a slow but constant movement towards the worldliness can be pursuable. The sign of this evolution can be seen in the more and more tendency of Renaissance composers to the application of Major and Minor scale, rather than church modes that church music was based on them for centuries. According to what has been posed, it is natural that architecture and music as the two pillars of culture have always been subordinate to the dominant attitudes and beliefs of societies, and, mutually, have shaped the culture of these societies.

Electronic music, concert music, minimal music, and many other names represent the civilized human constructive effort to find new ways of expressing music. Undoubtedly, these new ways, then, are authentic, lasting, and develop cultural competence relying on the "historical experience of a civilized man," a man who has strived for "the improvement of the quality of life" in history.

### **A formal approach by examining the external layers**

One of the contemporary approaches is the translation of audio into a visible form. One of the ways of this translation is to use a method that was invented by a German physicist, Ernst Chladney, in 1787. First, he scattered fine sands on a glass surface, then flipped them through violin vibrations. These fluctuations caused the sands to take on a variety of images.

Another way of translating music into architecture is by translating the time interval of the sounds to the numbers. "Vasily Kandinsky<sup>1</sup>" and "Paul Klee<sup>2</sup>" were two artists who tried to make music in this way in a visible form. They chose Beethoven<sup>3</sup> Symphony No. 5 for this purpose and ultimately acquired a series of visual diagrams<sup>4</sup>.

Other contemporary research in this area is the result of a digital design project by Chris Tenson<sup>5</sup>. He designed a parametric software containing numbers and ratios to generate 48 virtual forms based on the preludes of the first book of Johann Sebastian Bach (Grout, 1973).

And finally, the latest contemporary research was done by Martin Wattenberg<sup>6</sup>. He used arched diagrams to translate the most famous musical works of the world into the diagram. He argues in this study that relations existing in pre-modern pieces, in contrast to the post-modern era, have many layers; also he compares them with the diagrams derived from some of the most famous modern pieces (Gregory, 1995).

### **A formal approach by examining the inner layers**

Georgiades, at least through his specialized look, proves that a visual or audio harmony guarantees the aesthetic pleasure. In contrast, in compilation Bartock combines the principles of ancient Greek architecture, such as the golden ratio and the five principles of Pythagoras, with the principles of acoustic harmony that originate from Western thought.

Another person who in the modern era carried out serious research on the interplay between music and architecture, was Ayenis Zenakis<sup>7</sup>, an apprentice of Le Corbusier<sup>8</sup>. In his book "Music and Architecture," he emphasized the role of geometry science in adapting and bringing these two arts closer, and he examined the examples of music that turned into architecture in his work and some other architects. Interestingly, in the final section of his book, he concludes that "the relationship between music and architecture is a virtual and mental relationship, not a real one" (Chai, 2005).

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<sup>1</sup> Russian Theorist and Painter

<sup>2</sup> Swiss painter and contemporaneous with Vasily Kandinsky

<sup>3</sup> Ludwig van Beethoven, a classical musician

<sup>4</sup> HTTP: [http:// www.uia.architects.org/texte/summary](http://www.uia.architects.org/texte/summary).

<sup>5</sup> Contemporary Danish musician

<sup>6</sup> Contemporary scientist and professor of California University

<sup>7</sup> Greek architect, Composer, and theorist

<sup>8</sup> Swiss urban planner, architect and writer

Therefore, in general, the basis for the formal approach with the examination of the inner layers is based on the relations that exist jointly in music and architecture using geometry.

**Conceptual approach**

An architecture space is like a piece of music created by man and his agency and ready to be played with the presence of man. Architectural space like music will be able to play varied, happy, elegant, harmonious, or vice versa monotone, annoying, scratched and meaningless tracks; it depends on how to create components and angles of space or placement of spatial components in interacting with each other. There is a word in music called "sound-scape" that depicts the acoustic perspective of the entire music, which is equivalent to the "Landscape", meaning a perspective in visual arts and architecture.

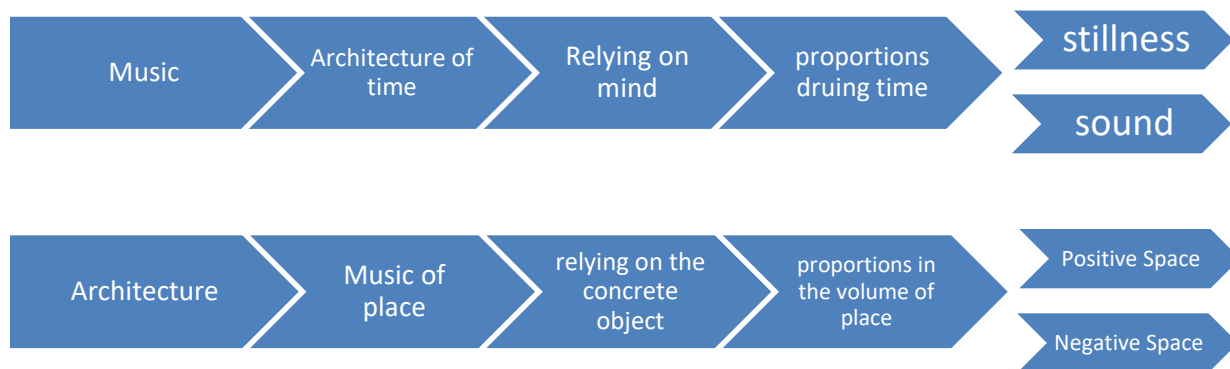
Finally, if the comparative study of architecture and music is reduced to the level of comparison of periodic motion in playing pieces of a radif and turning these corners into one another in the improvisation of the musician, with the spatial divisions in the Iranian architecture, then the result of such a comparison is a formal play and a meaningless link.

Proportion is sometimes in the visual aspect, and sometimes in an audible sense. So all the arts have one aspect, and that is what has already been designed with the geometry of our hearts. Hence, by referring to the importance of Iranian music and art, and the attention to the fundamental theory of music, and the attention to the aesthetics and the principles of architecture, a certain convergence can be found between the world of architecture and that of music.

**Relation between music space and architecture space**

Music is an audio art, and at the initial stage of "communicating with the audience" by creating the modes of sound, it can create the audience's sense at the moment or make the "unconscious" to free its associations. Musical states follow a number of distinct rules of mathematics and physics that arise from the order of nature; known mathematical rules such as "golden numbers" and "famous formulas of Fibonacci" and the foundations of geometric proportions in the geometric analysis of the nature of organisms are found abundantly in music.

Architecture is also "abstract"; the natural elements in architecture are not as they should be and are transformed. Architectural registration and maintenance are also being done in the context of "geometry" and in some way "geometry in the extension of mathematical elements". Failure to understand architecture and create a mental state for the audience and its users will lead to a kind of "symbol-like abstract" which ultimately forms a particular "geometry" in mind.



**Diagram 1:** Definition of the architecture and music space

Music is not static, but architecture is static. The approaches of the two common sciences, which are both arts derived from nature, have created such an adaptation in music and architecture that strengthens the

"common sense of architecture and music" and provides a way to evaluate these two arts. The basis of architecture is the designer's vision and the type of user's need, and the basis of music is on the type of look of the musician and the creator of the work and the type of audience.

**Table 1:** Features of Music and Architecture

Music	Architecture
Single-dimensional and dynamic	Multi-dimensional and static
Spiritual	Physical
Time architecture	Location music
Mental	Relying on the object
Proportions over time	Proportions in space volume
Without native or content features	Affected by native and content features
Abstract	Abstract

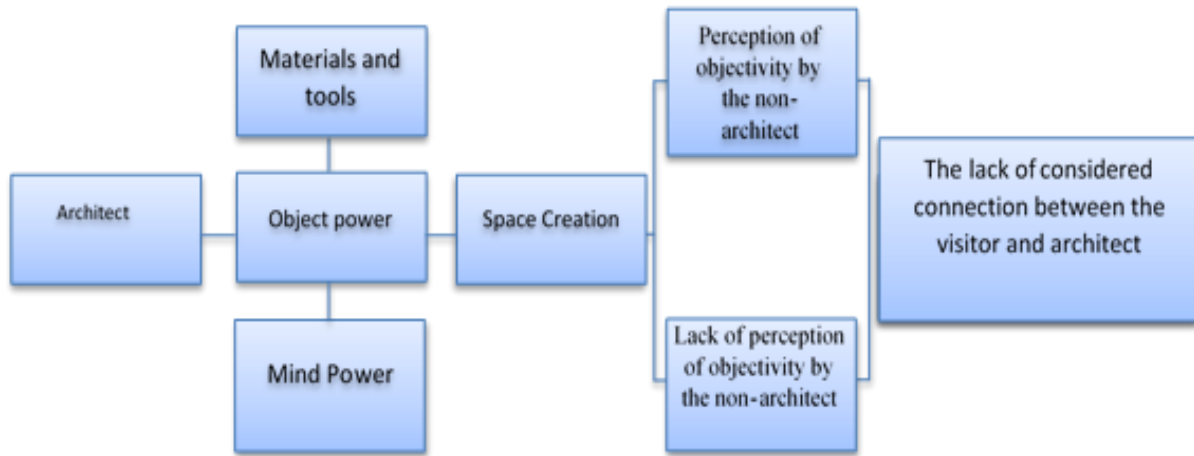
**Conceptual links and the foundation of architecture and music**

For architects, there have never been written rules and regulations that could be valid, generalizable and immortal, as in Western classical music; if some attempts at some periods of the history of architecture were carried out at discrete points of the world, they considered only the personal views, and in the best of cases have led to the emergence of limited adherents; those who are either disciples or "mannerists". This is the first problem in the way of an analytical study in order to recognize similarities and symmetries that can be derived from two areas of artistic creation in architecture and music. Another problem in such an examination lies in its nature: exploration and research in two areas or in two different knowledge, the former being intrinsically tangible and based on the objective and dimensional qualities, so that it can stimulate the emotions and affections and the other is intrinsically intangible.

**1) Architects and architecture**

Architects use an official board to represent the physical space that they see or saw; they display volumes by sections and facial expressions that complement each other, on the complementing scale on the paper or on the "video" screen, and from finite views. In fact, a blank page, with no memory, but imprinted on lines with proportions and dimensions, it wants to represent a space that is abundant or coming in existence (Fisher, 1969).

Architects can, by "seeing" the tool we mentioned, recognize some of the architectural features of the physical space or the constructed space, and, by the way of speaking, they manifest them to others. Architects know a significant number of features of the architectural space that they are not able to reveal them through the image; they know that color and shadow, the multiplicity of maps to the various scales and drawing perspectives, symbolic elements, and replicas cannot reveal what it should be revealed.



**Diagram 2:** Architecture and Understanding the Work

**2) Music makers and music**

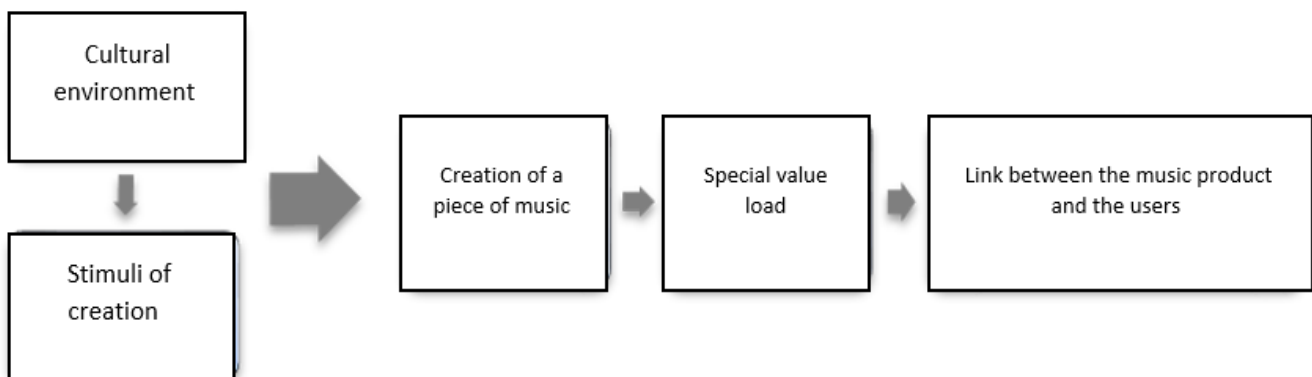
It seems that the musicians and music makers have been able to be equipped by an instrument that is able to transfer music from another (from musician to musician); it is said that the musical notation and reading music realize this relationship. In the music world, it is not something that can be "heard" but it cannot be transmitted to someone else through transcription - either phonetically or phonemically, or both, (Bruno, 1985) and even be iterated by the latter (Khorasani, 1970).

As having the idea that architecture, like music, cannot be fully understood, we will be able to emancipate ourselves through this conversation from the conventional and academic bounds to reach beyond that. But before that, some points are necessary to be mentioned:

First, we do not know enough to write music in order to recreate music, beyond the music atmosphere and the particular cultural environment that provokes the creation of music.

Second, we admit that the cultural environment and the motives that have contributed to the creation of a piece of music, could not have a direct impact in choosing specific features for a piece constructed; thus, we mention the existence of two continuous and dependent entities, namely the environmental culture and the artistic content of music.

Third: Considering the particular value of a musical work, we find a direct linkage or greater dependence between the musical product and the users of musical products in the early societies; on the contrary, there is a greater distance or fewer connections to the musical works that are reliant on the scientific methods and on the findings of advanced techniques.



**Diagram 3:** Music and Understanding the work

### **Recreation of Architecture and music**

Reproduction of architectural and musical works is associated with a special difficulty, as we have seen, due to the incomplete and inadequate tools of their representation. Are there any shortcomings in the recognition and understanding of the need for recognition of architecture and music, which is said to be compensated by the efforts of the makers and musicians? Or else, it should be argued that, in principle, there is no requirement for a specific scientific-technical set of recognition of architecture and music to be made except in generalities; these generalities in architecture include: longitudinal and superficial dimensions; distances, ratios and tunes; replacement of architectural elements in the area of tangible space; Physical aspects of the illumination of the inner spaces and the modes of light irradiation on the volumes and generation and transformation of the shadow over the outer form of space constructed; and the chromaticity of the material that creates the architectural space; the relations and ratios existing between the elements or spatial units that (internally and externally) make specific perspectives; determinants of the visual characteristics and spiritual values; the quantity of the symbols replaced in the architectural space or the aspects of the building which became a symbol and is also an inseparable symbol and so on.

The generalities necessary to recognize music are rhythm, tune (melody), harmony, and resonance or staining, as we find in the most authoritative sources, according to the scientific and technical definitions. Or the four main elements: the height (usually represented by the seven series), the pressure or emphasis on the song (rhythmic accent), length (notes in time) and resonance.

### **Creation of the Concept in music**

Music, "as the most emotional of the arts," is experienced by the humans. "Hegel" refers to the features that are manifested in "unity" and which are effective in securing it, such as "harmony" and "melodiousness" and "rhythm" which, like poetry, "have a special job (Mostaqni, 2004).

Music is a phenomenon that has an impact on the inner world of the individual on its core and provides all the necessary techniques to achieve this goal. What we intend to mention in reference to music as an artistic product and necessarily of an emotional load is focused on our next discussion in this regard, during which we will see that architecture, as an artistic product, has an emotional load; the work of this fundamental feature is that it makes the two different worlds closer to each other that are seen as (or assumed) to be distinguished: The inner world of a person or a set of emotional memories and the outside world of emotional memories of a particular person; the musical composer recreates an atmosphere in which some of the specific emotions of a specific community are reflected; whether this community is all those who are on the planet, or those whose world is their own land, and their feelings and memories and their love are real and meaningful in the form of their own lived culture. It is clear that our intention is to provide a basis for expressing this principle: the art of architecture (during an attempt to use its own techniques) requires that, through its own way of expression, affect the mind of people.

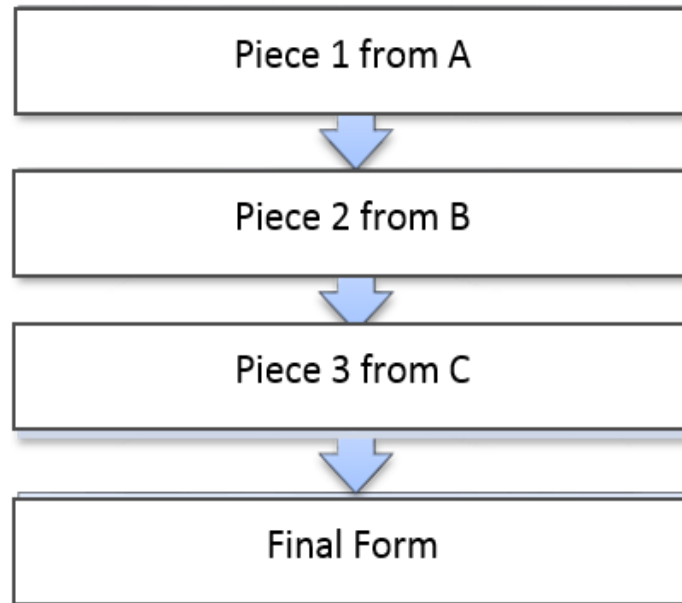
### **Form and music**

One of the seemingly subcategories that bind both the architecture and music and is reminiscent of the instrumental and conceptual relationship between the two can be the form; the form in the music, especially for us Iranians who use "figurative" expression plenteously, and in our culture we use a lot of extensions to interpret their concepts, is not very understandable.

The form of tangible entities (of which a musical piece can be the most abstract one) can also be introduced in several ways, either through speeches that describe the emotions, or through the images that are intended to recognize these feelings, or with systems whose data are provided both through the technical and descriptive expression.

The basic material used to make a piece of music, as we read everywhere, is the sound; the transformed sound from the moment it begins to its end; the sound mixed with the other sounds; the repetitive sound to a

constant song, or the like, apart from other pieces, creates a "form" in a piece of music. In other words, it can be said that the important part of influencing the inner world of a person hearing a piece of music is performed by the coherent sound composition, which has an emotional load, and one after another from the beginning to the end are presented to him in the framework of a certain form or a specific device (from the sonata to the symphony and from a given scale) (Khorasani, 1970).



**Figure 4:** Creating the ultimate form in music

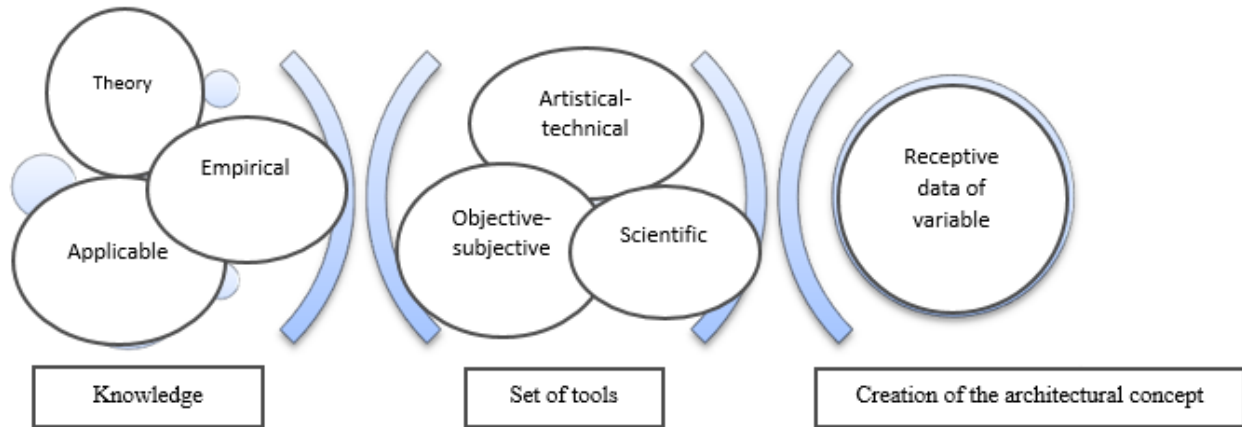
### **Creation of Concept in Architecture**

Architects have their own agents that, from two aspects, place them in the other land: first, the essence of their raw materials gives them the opportunity to engage in a variety of formal features; secondly, the practical aspect of architecture, which does not accept usually an explicit or indirect spiritual and conceptual load. Whenever we look at the architecture from both sides, we find it a separate category, and we do not find any need to find out similarities and symmetries that exist between these two disciplines. What we intend to explore and understand is to look at the architecture from the two angles and see what can be the commonality of these two.

Among many architects, there are many scholars who believe in the aesthetic role of architecture and from this point they view the built space; for them, it is worthwhile to choose both the primary material and the form given to them. The work of architecture, by its own form, by its special expression, by the potential to stimulate or by its symbols has the capacity to act as a means of social-cultural communication, and ultimately, pave the way for the exaltation in a particular social environment; this is a way that music is going too; that is to say, it brings together the sentences and themes and motifs, in a particular order, and in accordance with the rules that are empirical in nature, and depend on Mathematics and physics, in some frameworks, in the form of a sonata or symphony or fugue and so on.

In fact, during the process of shaping space, the architect, in his desire and according to the traditions and values and popular culture, "informs" the building materials that before his act, were non-formed and colorless; it gives it identity that, without this interference, would never be realized. So, the architect's work relies on his choices in a set of tangible materials of empty space and of light for a transcendental purpose, and following the same choices the category called "form" is born (Bennet, 1976).





**Diagram 5:** Creation of Concept in Architecture

### 3) Analysis

Proportional mediators in architecture

The architect is not free, as he wants to apply proportions in a building solely on the basis of his own will, and the proportions, in turn, should be in harmony with the principle and reality beyond themselves;

When Palladio posits the necessity of building churches "in a way that gives all parts a harmony in the eyes of the viewer", he does not think of an unimaginable thing for the eye; he mentions a harmonic spatial construction, which is the product of comprehensive relationships of valuable global proportions. In the following, a part of the proportional mediators of the architecture is expressed.

#### 1) Dimensions of visual signs

In the architectural world, the dimensions are one of the three quantitative characteristics of visual signs, equivalent to the height of sound in music. In every architectural building, the visual signs come in a variety of dimensions in defined places, and the circulation of the audience's eye on these signs from inside or outside the body leads to the understanding of architectural space.

#### 2) Distance of visual signs

In architecture, the distance between visual signs and the audience has a direct impact on clarity and on the perception of dimensions. According to the rules of perspective, the closer are the visual signs to the human, larger and sharper they are and vice versa as they move away from the human being, they become smaller.

#### 3) Tension of the visual signs

In architecture, with the help of the mediators like light and shadow, or the adoption of visual signs with features inviting to move or rest, to some extent, the architect can control the speed of the eye's circulation on the visual signs; but this is only one potential possibility, and each audience will have its own unique speed, according to its own mental world.

#### 4) Color and texture of visual signs

Visual signs in architecture have two qualitative features, namely, color and texture, which are directly related to the tool of producing visual signs, the material.

### Proportional mediators in music

Sound in music is considered as an analytical tool. To do this, we may study the height, intensity, time, and sound durability as the most important proportional mediators in music.

### 1) Sound height

Whenever an acoustic wave oscillates at regular intervals in a period of time, so that its height can be measured, it creates a sound that is called musical sound when placed in the human hearing range. In each piece of music, the sounds with varying heights, individually or in the group, pass through a range of time and create melodies. More or less, in all the familiar melodies, there is a central sound called tonic that as if attracts all melody sounds. During the scientific examination of melodic sounds, the height of all sounds is measured compared to this central sound.

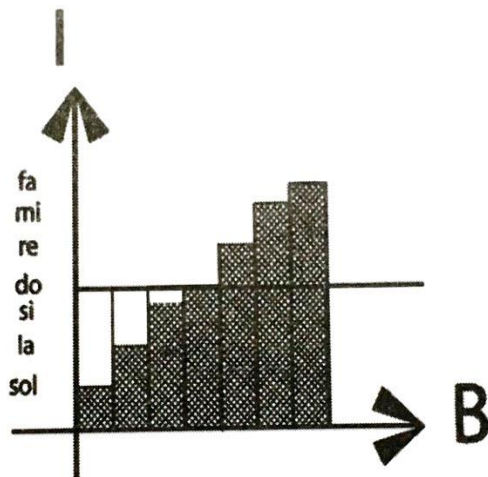


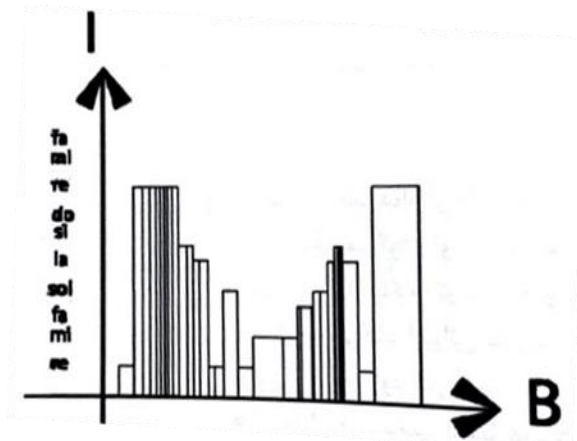
Diagram 6: Attraction of sounds

### 2) Sound intensity

One of the quantitative features of the sound is its intensity that is used by the composers as a tool for giving dimension to the sound. In the creation of the work of music, a sudden and gradual change in the intensity of sounds may awaken a special feeling in the listener.



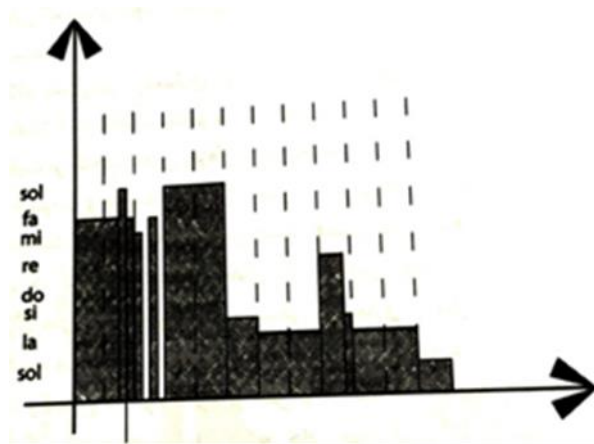
Diagram 7: Sound-Intensity Changes – step-by-step dynamism



**Diagram 8:** Sound-Intensity Changes – Gradual dynamism

**3) Durability time**

Sounds that go on for a long time, their duration is measured relative to the unit that is introduced by the composer as a unit of time. A composer also looks at the tension when choosing sounds, in addition to the height and intensity of the sound. Sounds that last a long time, have the ability to create the feeling of stillness and the transient sounds can stimulate a sense of dynamism.



**Diagram 9:** Time of sound durability

**4) Genre of the sound**

The sound has an unmeasurable but recognizable feature that we call it the qualitative feature of sound, and it is nothing but the genre or color of the sound, which is directly related to the audio device namely the instrument.

**Table 2:** Proportional mediators in architecture and music

Proportional mediators	
Architecture	Music
Dimensions of signs	Sound Height
Distance of signs	Sound intensity
Tension of signs	Time of durability
Color and texture of the signs	Genre of sound

## Conclusion

The continuity of boundless lands that create the art world has always made artists contemplate the characteristics of the artistic territories and compare these territories in pairs and ultimately explore how to integrate them, leading to creating a united world of art.

The comparison of the lands of architecture and music is very difficult without passing through the stages of the process of creating these two precious arts. In this passage, the talk of the creation of concepts and meanings of architecture and music began to come to existence, which, like a huge wave, throws grip on the deepest layers of the sea of the human heart and throws it into thinking in a world of meanings. There were tools and facilities that the architects and music makers created to shape the concepts of their work and put those spiritual concepts into the physical body; these tools and resources are nothing but the fundamentals of the physical creation of these two arts.

Composers, when they want to embody the musical ideas, use a set including repetition of a certain sound of different sounds or different sounds, with a specific tension that is called a motif and has a recognizable identity. In fact, the motif is the smallest musical unit with a concept that, according to a system developed by the composer, using the knowledge of the form, begins in the form of time, transforms, repeats, and ends.

In the architecture, the form as the smallest unit embracing the concept, plays a role like the motif in music. In fact, the form is referred to as a set of visual signs, it has a recognizable identity and is understood by geometry. The forms can also be transformed in the time, repeated, and expanded or reduced.

Now, in a table, the accordions and links of music and architecture, according to what is presented in this research, can be counted as follows.

**Table 3:** Research Findings

Architecture	Music
Space in architecture	Space in music
local architecture	Folk music
Religious Architecture	Religious music
Monumental architecture	Memorable or Monumental Music
Profitable Architecture	Promo music
Use of popular symbols	Utilizing national melodies
Utilizing the natural phenomena	Utilizing the natural phenomena
Imitation	Imitation
Utilizing color in architecture	Coloring in music
Heaviness and gravity	Heaviness and gravity
Tension in the motifs of the building	Tension of sounds and occasionally tune
Height in architecture	Peak and Desolation
Glissando or Hyperbolic Parabola	Glissando in music
Contradiction in motifs	Contradiction in melody and harmony
Repetition of motifs in the building	Repetition of Motifs in Music
Mirroring	Mirroring
Rhythm in the facade and diversified levels	Weight or rhythm in music
Feeling (thanks to the light and shade)	Feeling (thanks to the color in the sound)
Role of math in architecture	Role of math in music theory

Psychological Issues and their Importance in Architecture	Psychological issues and their importance in music
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In the end, the proportions on the basis of which the melodies bring a welcome voice to the human ear are those that fill the human eye and soul with astonishing beauty. This is the same doctrine that remains as the basis of proportions during the Renaissance. The correct interpretation of this is likely to be that the harmonic relationships existing in nature are appearing in music. Architects who use these harmonies do not merely translate the musical proportions in the architecture, but also they apply the global harmony that is manifested in music.

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