



Technical Harmony and its Functional and Aesthetic Reflection in the Designs of Interior Spaces

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Article Info.	Abstract
<i>Article history:</i> Received 01 December 2024 Accepted 02 January 2025 Publishing 16 January 2025	Harmony in design represents a method of innovation and creativity in the design process through (lines, colors, and movement) within the design environment related to the organization and arrangement of the elements in the design, specifically the interior spaces. Each case or design has its beauty, which is related to its design, and its content. A specific and distinctive content that gives it its value the special harmony in the space, this does not mean that the recipient judges the design in harmony, and every work in which beauty is an essential element is considered a harmonious art, but the design mainly aims at a basic function that arises to occupy a specific function and meet vital necessities within a specific field. The function of interior design is mainly to create a harmonious internal environment that primarily serves the human sense and the formation of an internal world in which the user feels comfortable. And in the third chapter, the topic of analysis was achieved by relying on what came from the theoretical framework to establish the process of aesthetic construction according to technical harmony, in addition to dealing with the topic of the actual achieved in the fourth chapter through the results, conclusions and recommendations to conclude the research with future proposals.

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1- Introduction

Technical harmony extends comprehensively through quantitative and qualitative production in the design industry, yielding results in employing technical tools and means to achieve a formal connection between creative media and interior design outputs. This is based on characteristics of modern industrial products that have effectively contributed to bringing the intellectual vision closer to using more precise tools and models with easier methods and quality effectiveness. This is a functional outcome that relies in its performance on technical harmony, which derives its elements from the formal harmony of interior design elements and principles in treating spaces, including museum spaces. These are characterized by features of biological, environmental, and climatic diversity, which necessitates that the interior designer focus on their inputs on technical harmony within a combination of compatible and interconnected relationships with the appearance of the performative design achievement.

1.1. Research problem

The components of interior space vary through many treatments that are always characterized as subject to the designer's subjective vision according to functional and performance dimensions related to the user and occupants of interior spaces. This is especially true for those spaces that are mainly characterized by technical diversity within museum spaces, distinguishing them from other spaces as a diverse environment according to the subject and content on which they are founded. Therefore, there must be a compatible relationship to transfer those natural and artificial environments that immortalize a specific time and place within the scope and specialization of the museum. From here, the researcher generated a study of technical diversity and its aesthetic treatments that are built on spatial formation materials in interior design. Through an exploratory view of the World Wide Web of interior museum spaces in the Arab Gulf region, with their artistic and creative transformations and scientific openness towards development and advancement in the Arab region in particular, and in light of these paths, the researcher found the scientific justification for her research problem through the following question: How is technical harmony achieved in interior space designs?

1.2. Importance of the research

The importance of the research is embodied through emphasizing the focus on technical harmony with its materials, elements, and principles and its impact on interior spaces. It also enhances the design vision by enriching the interior space functionally and aesthetically, taking into consideration the abstract reflection of interior space designs. Additionally, it contributes by providing designers and specialists with fundamental bases and aesthetic reflections in space designs.

1.3. Research aim

The research aims to reveal the requirements of technical harmony and its functional and aesthetic reflection to create suitable designs for interior spaces.

1.4. Research limit

1.4.1. Objective limit

Study of technical harmony and its functional and aesthetic reflection in interior space designs

1.4.2. Spatial limit

Interior spaces of Arabian gulf museums.

1.4.3. Temporal limit

The research is temporally limited from the opening date of 2017 - 2021

1.5. Definition of terms

Harmony (linguistically): In the Comprehensive Dictionary of Meanings - harmony (noun), and harmony: It is the source of the verb: harmonize, (verb) harmonize, harmonizing, harmony, so it is harmonious, and colors harmonized, meaning they blended and homogenized.

Harmony (terminologically): An organized arrangement pleasing to the eye in visual experiences, engaging the viewer and creating an internal sense of balance and order in their visual experience.

Harmony in the general sense - It is the organization of parts of a thing and the harmony of its various functions so that they do not conflict or clash but rather agree and move towards one goal. It is unity in multiplicity or compatible harmony and beautiful composition and consistent arrangement.

Technology in design is "the set of materials, tools, machines, methods, means and systems that enter the design process in order to perform a human service. It is obvious that modern technologies are multiple and differ among themselves according to the functional objectives they seek to achieve, and their final output differs according to their components and the extent of the impact of these components on the overall design process".

Reflection (linguistically): It came in Lisan al-Arab ... ((reflected / AKASA the thing reflects it reflection, so it reflected: returned its end to its beginning.

AKASA - a reflection of speech: and the like: flipped it - the thing returned to its first.

Reflection: A transformation in the direction of the light beam falling on some surfaces.

Reflection (terminologically): It is to make the proposition's predicate a subject and the subject a predicate while preserving the quality and maintaining the truth and falsehood and in a copy of the phrase and falsehood as it is.

Reflection: (procedural definition) - The researcher believes that the concept of reflection is centered in the basic structure of abstract reflection within its multiple units revealed by the functional and aesthetic act of interior design as a qualitative need task representing part of the general human need reflected on the spirit of the age adopted by the designer.

Function (linguistically): The function of everything, what is estimated for it every day in terms of livelihood, food, fodder or drink and its plural is functions and function and functioned the thing on himself and functioned it functioning obligated it to him.

Function (terminologically): (External manifestation of internal descriptions of things, in a certain pattern of relationships). It is "what relates to a function or what constitutes it - the link between two parties, one of which can be considered an independent variable, and the second a function of the first".

Aesthetic (linguistically): "Its source is from beautiful and the verb JAMULA, meaning (splendor and beauty) ... and it is said the man has become beautiful, beauty so he is beautiful ... or saying (may God beautify you beautifully), and this is if you pray for him that God makes him beautiful and good".

Aesthetic (terminologically): "JAMULA - JAMALAN: meaning became good in his attributes and meanings and in his creation, so he is beautiful", and beauty, and she is also beautiful". An expression of "the harmony between coordinated parts, within relationships characterized by precision so that there is no room to add something else or change it) as it represents (an expression of order, arrangement, and proportions".

Interior spaces (linguistically): (Space) The courtyard and what expanded from the land and has led out to space and led with his hand to the ground touched it with the inside of his palm in his prostration.

It is also defined in language as the wide place of land and from the verb FADA YAFDU.

Interior spaces (terminologically): It is defined as the basic unit in the interior design process that reflects a set of perceived and physically embodied relationships with a specific form and meaning, defined by systems expressing functional, aesthetic, and psychological goals.

It is also defined as spaces that can be formed to express how humans interact with the environment and its natural, social, and cultural givens.

Interior spaces (procedural definition): They are systems that include several sensory and aesthetic aspects of elements within a field limited by horizontal and vertical determinants. Knowing the interior space and its type from the elements it contains determines its identity.

2 .Theoretical Framework

2.1. Technical harmony and its performative role in design

The harmonious design process is considered the mature means to enrich the interior space, which means the recipient's thought to look for a wide imagination in the field of life. Therefore, harmony in design is achieved through the following:

- Considering aesthetic and functional elements.
- Considering the technical aspect, which includes the engineering aspects based on the economics of architectural solutions.
- Considering the behavioral aspect, which means the task of using the building efficiently

The harmonious design process includes three important intellectual processes: Imaging, Presenting and Testing. See Figure 1.

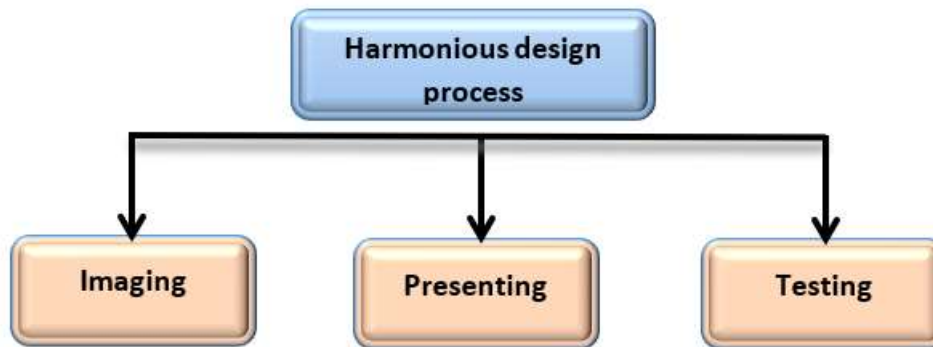


Figure 1. Illustrates harmonious design intellectual processes

It should be noted that these processes have interconnected features throughout all their stages, and they are limited to a specific time to complete the design process. Multiple approaches can be used in a single stage or in each stage depending on the design problem. Harmony in design is characterized by diverse qualities such as clarity of meaning and significance, and the strength of the idea that gives design harmony its power and aims to influence the recipient (visitor). Beauty and creativity interact to achieve harmony in the design style, which is evident through the clarity of the idea, fertile innovative imagination, and through the interaction between design elements through their relationships, which are the cause of creative and aesthetic harmony based on the studied selection of design methods.

From the above, it is clear that harmony is the organization of parts of something and the compatibility of its various functions that do not conflict or contradict. It is unity in multiplicity, agreeable combination, beautiful composition, and coordinated arrangement that can achieve visual pleasure and enjoyment in the design of interior spaces of museums through techniques, construction methods, and materials in interior design. Through this, harmony in design is characterized by various qualities such as clarity of meaning and significance, strength of idea, which add power to design harmony and aim to influence the recipient. This may be clearly manifested through the idea and innovation in interior design.

Harmony always relies on change due to the instability of design specificity built on user needs and requirements, which indicates that the harmonious design process is always characterized by some complexity, especially when designing special spaces for museums. The design is first used by consultants to make decisions in the process of designing museum spaces, but achieving harmony is considered a difficult process. It is rare to have a broad knowledge of all elements and foundations to reach technical harmony within the levels of interior spaces. Through this, technical harmony (means the method or style of expressing the human idea that one wishes to embody visually through development).

It is clear that the scientific concept of technical harmony is improving design performance in interior spaces to reach more advanced designs and ideas that help society and humans adapt to interior spaces with all fluidity in order to achieve one goal, which is to develop design implementation and production practices in interior spaces. This is fundamentally based on the study of: (function, technology, structural durability of design) on which many scientific trends were based to reach a technically harmonious design production, which forms the basis for many initial ideas for building the required design by adapting them in line with the content and purpose of the harmonious design to embody an idea with a specific subject. Modern techniques in interior design also rely on choosing new vocabulary at the level of design language such as lightness, transparency, flow in movement, or flexibility for the design work, which achieves harmony in the design process. The processes in design are primarily related to the designer's experience and in the design processes for formal harmony in interior spaces that achieve the effect of technology in presentational aspects. As shown in Figure 2, the effectiveness of function, material technology, and construction strength include output trends that reach the level of technical formal harmony.

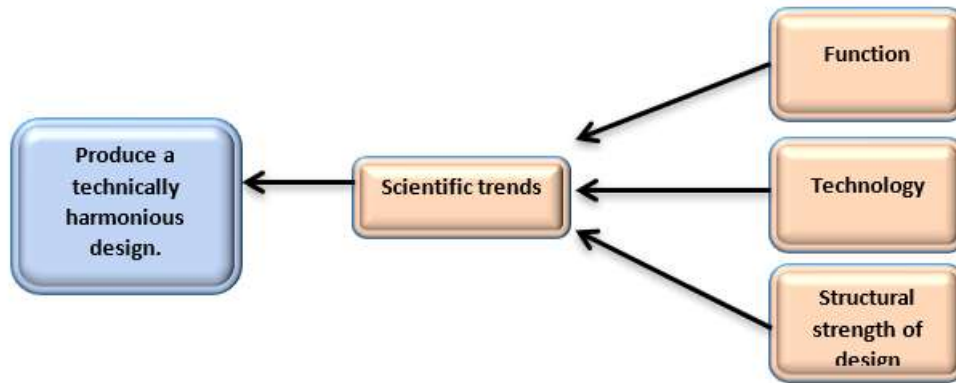


Figure 2. Shows how to produce a technically harmonious design according to the scientific concept

2.2. Diversity in the system, formal organizations, and space

Diversity in interior design comes through the structural composition of the executive design idea summary at the moment of starting to place the effect within the interior spaces with formal variations that appear within the general idea system that is characterized by its strength in the distribution and organization of the construction bodies of elements and vocabulary that are the basic foundations for creating the technical action in the design space, as the system is what expresses "the totality of the planning and implementation processes of a system that is not satisfactory from a functional point of view, but is compatible with sight and touch, meaning that it returns satisfaction to the recipient due to its benefit and beauty"[23] Thus, it is a plan for technical implementation that occurs as a result of the performance and optimal employment of the work vocabulary to achieve function and beauty through arranging "and organizing the visual elements of the design bodies and what is achieved from the connection of the necessary elements such as line, shape, color, space, light and surface textures, as they all fit to serve the shape, color, space, light and surface textures, which increases the strength of their compatibility with the general form"[24] Here, this organization is subject to a system in which thinking turns into a performance action with a special system in a general system that forms the structure of the design product within the spaces including Formal bodies that enter the entire space and are distinguished (bodies) by their own systems that move in the design space and give an impression of it with an influential specificity through technical design and display variations and they need these variations as a necessity to achieve formal harmony since "the visual combination in its overall system depends on the technology in processing visual variables which is the second factor after the organic unity" [25] which is based in its components on the formal cohesion unity. The design system of diversity (a) foundation formulated on the basis of the result as much as possible)[26] so the vocabulary in interior design is placed within a general design system that is the first plan through which it is established and reinforced by the design construction relationships to reach the goal of the idea and the action that is achieved and "this system is technically conditioned by the reasons for its formation first and then by the output reasons that cannot be achieved without the union and harmony that is built on the basis of the system of proportion and compatibility"[27].

2.3. Diversity in vertical and horizontal levels

- Level variation

Levels come as vertical and horizontal determinants to define and divide spaces. "The effect that results from achieving the placement of vocabulary at levels of varying height and then decrease within the design space produces a sense of different imaginary spatial depths."[28].

- Convergence of parallel lines

Convergence and its opposite of opposition or contradiction of separation come through the formation of parallel line convergences as a technical act used by the designer to establish the illusion of spatial depth (because it is an indication of the indications by which a person perceives things in depth, the apparent narrowness of the parallel formation in a view of the sides of a road or the wall of an ancient building from the side or the corridors or passages indicates its distance and not its proximity)[29].

- Variation in contrasting color values

The color values of diversity are a continuous incentive in achieving attraction and attention within any designed space and its components, and diversity can be created in the design space through (variance in the color values between objects, close objects appear clearer and their colors are more saturated than those distant objects that often tend toward neutral colors, so the details fade as the shapes move away)[30], and the difference in color values here is to give the illusion of spatial depth, as it is achieved by the difference in the imaginary spatial depths, as distance and proximity become clear due to the color and its gradations and the multiplicity of textures from rough to smooth, and this appears clearly in the many technical variations used by the designer.

- Contrast and gradation in spaces

Resorting to adopting contrast in shapes and consistency in spatial distribution is a state of diversity based on factors of the cognitive process, and contrast is one of the factors that help in creating real and sometimes imaginary spatial diversity (when the factor of stability between the elements in the composition declines, whether through design or photographing a shape, the contrast and gradation of spaces will be interpreted in this case as indications of space)[31] Here this contrast and gradation can appear through the act of technical diversity that is achieved by the ability to employ design techniques.

- Light and dark color degree "light and shadow"

Color values represent a renewed phenomenon to achieve the dimension of visual harmony, whose effect extends to openness and closure through shadow and light, and it is one of the important technical uses through which diversity can be achieved in design spaces due to the possibility of achieving spatial illusion and the lights that fall on objects in nature, as they create shadows and these shadows vary from light to

dark (when light falls on an object, it illuminates one side and leaves the other sides in varying shadows according to their direction relative to the light source) [32].

- Transparency

Transparency is a characteristic of the levels through which it is possible to see and view what is behind them of things, as it is another design action and a result that suggests overlap, indicating the space connected or continuous with what (transparency is characterized by the dual nature of the overlapping space, as the degree of brilliance in which transparent properties are available for both surfaces is bivalent, or it has two or more descriptions in space) [33] That is, the illusion of transparency if the color spaces of ceilings or walls or other uses carry the characteristic Equivalence with the other transparent space, so the details of the two spaces appear at the same time, but with a contrast that shows the retreating and the advancing, and through this process (the illusion of space is clear where the difference is in depth)[34]. Transparency is important in visual communication and the sense of openness between the inside and the outside, and it has the advantage of diversity.

- Texture

Texture comes in the basic truth from the nature of materials, some of which are polished, others rough, and others smooth. All of these textures play an important role in the design process, as they give the user visual comfort, as the recipient often tends towards smooth, shiny textures with a beautiful shine and reflection. Also (texture has emotional and expressive effects, so the perception of similar shapes differs according to the diversity of their texture). [35]

The technical realization of diversity generates the reflection that occurs in the structures of interior design through the multiplicity of spaces in the diversity of the use of those spaces and their contents, which stems from the action of technical diversity, which is based in its components on the forms of diversity outputs that play a role as multiple options open to visual formal variation, and results in two important factors, which are [36].

- Contrast of elements
- Contrast of designed units.
- These two factors achieve the type and characteristics of diversity and are as follows³⁷:
- Implicit technical diversity: is a diversity based on partial formations deriving its visual characteristics from partial determinants of the structure of the formal formation.
- Absolute technical diversity: is a comprehensive diversity that includes all specifications and characteristics, including visual, performance, and material, of the formal formation of the formation of materials.
- Spatial technical diversity: is the diversity that possesses the properties of the place such as spaces and their treatment.
- Temporal technical diversity: this type is closely linked to temporal determinants and characteristics according to changes and transformations according to circumstances and climate and may include natural lighting.
- These classifications are diverse options for the interior designer in dealing seriously with those materials used in designing museum spaces, and thus they are at a degree of accuracy and clarity when dealing with them.

2.4. Internal spaces and their technical diversity

Internal spaces vary according to buildings of different shapes according to their multiple functions to meet basic human needs. There may be a dialectical relationship between form and function, and the role of technology and its diversity. This relationship is not a direct relationship, but rather a relationship that depends on the structural connection of these two concepts, which are man and the environment. Buildings in all their classifications (general and private) with different functions are nothing but the result of multiple human decisions that were taken to suit meeting specific goals. Therefore, the functional structure of most buildings or places is subject to constant change under the influence of changing values, social needs, circumstances, and technical and cultural determinants. The purpose of buildings is formed, as it refers to the characteristic of our perception of what we see as a form, regardless of whether it is an external or internal space [38].

Any attempt to address the effectiveness of two-dimensional design is due to the recipient's perception system, which the designer achieves in addressing the integrated unit in expressing the essence of the design, the nature of the content, and the goal on which the idea is based in a logical construction of the interconnected relationships between the design structurally and the organization of the formal formations with their visual conditionality. Accordingly, we find three distinct elements that make up the artistic design work [39].

- First: Formal elements related to dimensions and proportion, which have a direct appeal to the senses.
- Second: Elements of emotional or mental expression, which merge with the formal elements.
- Third: Elements of an intuitive or semi-conscious nature, and these elements naturally participate in building the form of the shapes and their organizations that achieve the expressive function with spatial distribution relationships.

2.5. The functional and aesthetic discourse of abstraction in interior design

The language of discourse in interior design is represented through the diversity of structural and complementary techniques, which are as follows:

- Treatments that express the mental perception of the visual sense, often including the shape of the building, the site it occupies, color, mass size, decorations adorning the building facade, and the design elements and vocabulary used.
- Expression of the sensory aspect of interior space, including psychological aspects that involve the principle of space containment or feeling it through the amount of light or shadows, or reflection of psychological impact through the dominance of components or view of its elements .
- The composition and organization of the spatial space itself includes ease of movement from one space to another, whether this transition is vertical or horizontal, as it reflects the coherence of the building and its parts on one hand, or its connection to neighboring areas on the other.

- The climatic environment of the space, which includes orientation, flow of air currents or solar radiation, and thermal control inside the building.

Those points above, collectively or separately, are what give the interior space of the building its special identity as museum spaces. The sense of aesthetics of those spaces, which is both conscious and unconscious according to our perception of its components - the principle of awareness comes from adopting proportions, finishing materials, color harmony, the overall shape of the space, and relying on interior design elements and their compositions in creating technical diversity - all represent the functional aesthetic discourse in the synthesis of interior space components. The designer has been able to establish appropriate rules and principles for technical diversity and methods to follow in analyzing, synthesizing and evaluating any design achievement. Moreover, he was able to establish a language of understanding related to specific aspects of museum spaces with specific characteristics. The designer also created methods for evaluating the site or space, size, shape, colors, and lighting values, followed by different finishing methods. The choice of finishing materials and their harmony with the use of shadow and light from an environmental and aesthetic perspective reflects a communication discourse to the user, visitor or viewer in general. The essence of the design process depends on the design objectives and their compatibility with the design idea according to the determinants of the interior design of spaces into a visible and tangible reality.

Based on the above, the vocabulary of communicative discourse language in interior design can be classified as follows:

First-class: Relates to visual issues or everything related to the spatial space itself, which is controlled by issues of human sensory perception and what surrounds him inside the space.

Second class: Determined by the structural aspects of the building and its spatial construction, most of which are geometric including natural elements such as gravitational forces and environmental elements specific to museum spaces [42].

Beauty is characterized Beauty is characterized by the consistency of all the components of the form and the relationships between these components to reach perfection, so that any addition or deletion has a negative impact on the aesthetic and visual considerations of perceiving the form. The elements that make up beauty consist of two patterns: an internal element which is the content, and an external element that benefits in indicating this content and distinguishing it. The internal element appears in the external, making itself known through it, and the external in turn removes the curtain from the internal and reveals it to us.⁴³ Technology has contributed to enriching the basic aspect of addressing the senses of the recipient and building a communicative relationship through the components and content of the design space according to a technical connection supported by technology [44].

The aesthetics of formal discourses include the study of forms, proportions, rhythm, scales, degree of complexity, color, lighting and the effect of shadows in space. They are considered the language of communication between the designer and the recipient through these diverse techniques. The study of formal aesthetics begins with the basic elements of design, which are (point, line, direction, shape, size, texture, light value and color). Any element means nothing on its own unless it is associated with relationships with other elements. It is mentioned that aesthetic communicative discourse does not exist outside the principle of relationships, taking into account the existence of starting points for determining aesthetic discourse in the design of interior spaces represented by three types of judgments, which are as follows:

- Objective judgment: It is the connection of beauty with functional and utilitarian specifications, and these specifications have performance standards that cannot be accepted by all people, meaning that they are related to the technical and functional aspect and the nature of the material and methods of treating it. Thus, judgments are objective in the first degree, i.e. the extent of human need or the recipient and user for that design and the extent of the utilitarian and performance value achieved from it.
- Subjective judgment: It is judging the aesthetics of design from the person or recipient themselves, i.e. it depends on the mood of the soul and not nature as Kant explained. Where the basis of judgment is the feeling of satisfaction with the design and according to mental perception and imagination, meaning that the beauty of design is a psychological phenomenon associated with the interpretation of the recipient.
- Consensual judgment: At the same time, based on the principle that beautiful design is the beautiful thing and the mind that perceives it and the interaction between aesthetic values and the experience possessed by the recipient.

2.6. The aesthetic reflection between formation and perception of museum spaces

The recipient's perception is affected by what attracts his attention in the surrounding environment, and the recipient's mind is stimulated by what he can see, attracts his attention and excites his feelings. These stimuli can be studied in terms of characteristics and attributes carried by the perceived environment, which are three characteristics that can be summarized according to formal description as follows:

- Formal characteristics: The design form is considered the point of contact between mass and space, as the characteristics form the space and give it spirit and value.
- The formal characteristics are considered one of the most important characteristics that affect the perception process and help to comprehend and understand the surrounding environment through studying these characteristics.
- Characteristics: It is the (image) through which the shape can be classified and recognized. The physical characteristics related to the features of the shape itself, such as the of a human, animal or plant.
- Size characteristics: The characteristics of the shape are determined by the three dimensions (length, width and height) that represent the size and determine its importance and prominence from what surrounds it within the interior design environment, as the shape is the first characteristic of knowing the size. It is formed by according to the interconnected relationships of the levels that describe the boundaries of the size.
- Visual texture characteristics: The difference in texture within the visual scene contributes to achieving visual diversity for interior designs within the space or scope of the space. Smooth painted surfaces reflect the color and shape of things around them and completely lose their color, while the rough surface spreads shadows on itself to an extent that affects its perception and it is difficult to estimate the color of the rough surface or its light value and even its degree of roughness because it depends on light to show these qualities as perception changes with changing the quality of light falling on it.
- Color formation characteristics: Color refers to the light that the surface reflects from the visible spectrum waves emitted from the light source. White reflects all colors of the visible spectrum while black absorbs most of the light, producing theoretically a state of absence of

light or darkness. Distinguishing one of the two colors black or white in the early stages of perception depends on lighting conditions and colors used in the external environment.

- Light effects characteristics: The difference in type and intensity of lighting leads to referral of vision, which affects the appearance and shape of visible things. For example, masses exposed to more lighting show more details and the pattern of lighting used (natural or artificial) affects attracting attention towards it, giving additional excitement to the scene.
- Formation materials characteristics: Changing the use of materials affects changing the characteristics of the design scene of museum spaces. It indicates that changing local materials with foreign materials leads to losing some cultural and social characteristics and even cultural ones and weakening the sense of identity and extension to the real environment. However, modern materials were more influential and attention-grabbing on the recipient and create visual and expressive changes to the scene that were not composed before in local scenes.
- Visual value characteristics: It is affected by the viewing angle through distance and proximity to the shape represented by the surrounding visual field.

These visual characteristics interrelate with each other to ensure a successful design that is compatible and suitable with the requirements of function and performance.

2.7. Theoretical framework indicators

- The principle of harmony is based on organizing and arranging parts through (compatible harmony, beautiful composition, and coordinated arrangement) which in turn achieves clarity of idea and fertile innovative imagination for interior design.
- The disparity in values represents a continuous stimulus for space diversity according to technical diversity between embodiment and two

3. Research Procedures

3.1. Research methodology

The researcher adopted the descriptive approach for analysis to describe and analyze the research models in a manner consistent with the research objectives.

3.2. Research community and sample

The current research community consists of the interior designs of the museum spaces of the Arab Gulf countries. From this standpoint, and during the researcher's field survey through the World Wide Web sites for information and official sites of museums in the Arab Gulf region and what is published in media reports about those museums and the antiquities they contain, the interior designer was able to find multiple ways to address the technical diversity of those spaces according to an unspecified specialization for those museums, including according to Table 1.

Table 1. Shows the research community and some important details

No.	The name of the museum	the country	the year of establishment,	the year of opening
1	Louvre Museum	The United Arab Emirates	2007	2017
2	the National Museum	Oman	2013	2016
3	Bahrain National Museum	Bahrain	1993	1993
4	the National Museum	Saudi Arabia	1999	1999
5	the National Museum	Qatar	2016	2018
6	Kuwait National Museum	Kuwait	1957	1957

3.3. Research sample

A- purposive sample was adopted for having specifications that can be analyzed and matched with the research problem in its technical aspects, and for objective reasons in line with the temporal boundaries (2017-2021) in Doha, Qatar and Abu Dhabi, United Arab Emirates, to achieve the research objective at a rate of 33.3%, according to the following justifications:

- The selected models were thoughtfully designed for their interior space design level.
- The designs of their interior spaces are subject to functional performance diversity.
- They rely on implementing their interior designs to execute technical diversity with international specifications.
- They possess some characteristics and specifications of international museum space designs in terms of engineering dimensions, advanced technical treatments for sound and thermal insulation, diversity and distribution of modern lighting, and advanced safety and security means in digital control. See Table 2.

3.4. Validity of the research tool

The analysis form was presented to specialized professors, and the researcher took their sound observations. Accordingly, its items were modified to suit the research objective.

3.5. Description and analysis of the first model: louvre Abu Dhabi

3.5.1. General description

Louvre Abu Dhabi, designed by architect Jean Nouvel, is the result of collaboration between the United Arab Emirates and France. It presents a historical narrative of art that opens the doors of human civilization, highlighting the importance of shared human experience.

Louvre Abu Dhabi opened its doors in November 2017 on Saadiyat Island with 23 permanent exhibition halls displaying a wide range of cultures, civilizations, and historical eras in a unique style. This exhibition method allows visitors to discover the shared influences and unique links between different cultures.

Table 2. Shows details of the areas of the research sample in square meters

No.	Name of the museum	Classification of the museum	Sizes in meters
1	Louvre	big size	2000M2
	24 thousand square meters	medium size	M2 200
		small size	180 M ²
2	Qatar National	big size	2000 M ²
	thousand square meters 40,000	medium size	1000 M ²
		small size	500 M ²

3.5.2. Analysis

- Harmony and display characteristics of the design: The formal treatments of the forming materials appeared through the internal space configurations distinguished by the dome with its convex shape and size extending over most of the large, medium, and small interior spaces. This formal composition extends as a treatment for ceiling levels that share in forming surfaces with interlocking textures as if they were shapes of branch ramifications in a tree formation characterized by its light and color values, evoking degrees of white lighting along with the designs' horizontal and vertical levels in white. The display characteristics varied through that formal relationship between surfaces and lighting values and degrees as a visual formation of harmony, see Figures 3 and 4.
- The achievements of the design act came to organize a formal relationship as an idea derived from the local environment of the UAE and its formal proportionality with the organizational dimensions of innovative imagination embodied in creating interior spaces that accommodate diverse formal components capable of moving from one space to another smoothly and fluidly through formations for large, medium and small spaces together. This represents the case of formal treatment as a harmonious organizational relationship of elements. See Figure 5.
- Diversity in the system and formal organizations: The achievements of the constructional act emerged through the harmony that was based in its designs on organizing and arranging structural relationships characterized by the interconnection of walls and wall partitions for transition between one space and another, taking into account the formal compatibility created by the formal treatment of the ceiling and some relationships that resulted from an accurate calculation of architectural void spaces contained within the museum's main space, representing movement and mobilization of the recipient's activity. This is due to arrangement processes according to diversity achieved by the proportion in the wide spatial openness, which is sensed by the recipient, as the wide interior spaces give a perception of openness and expansion. This is due to creative treatment methods for the compatibility of design elements, giving a relational principle of union as a structural organization that fits with the museum's activity. See Figures 6 and 7.
- Structural relationships of interior space components: Structural relationships appeared according to the contrast and distinction of elements, which gave strength to the cohesion of those relationships between formal and volumetric gradation, as well as the achievements of the theoretical relationship of the role of transparency in parts that contain display components as exhibits of importance, along with those relationships embodied by some structural components of transparent windows and doors to overlook through them the recipient's viewing levels on the surroundings of the museum, as it is located in the water center of the island on which the museum was established.
- The formal structural relationships came according to expressive relationships with connotations related to life through the representation of the museum's large ceiling resembling branches to give an impression of the tree of life from which the features of history and civilization are derived, while intuitive relationships produce secondary perceptions for the recipient that this space represents the spectrum and human components harmonious over generations for what the museum achieves of periodic action and activity from fixed and changing exhibits. See Figure 6.
- Technical harmony relationships of interior spaces: The outputs of the illusory achievement are related to what those kinetic formations of some areas of vertical and horizontal interlocking surfaces suggest to define a temporal dimension through which historical depth extends with the real geometric depth to represent the visible formal, which is directly perceived with the intensity of the relational component of technical harmony as levels of interlocking relationships that appear in the main ceiling of the building that covers most spaces and forms a shape resembling a large tree intertwined in its branches. The formal harmony of horizontal and vertical levels varies from the effectiveness of contact and adjacency of some geometric components that represent places to display materials, exhibits and antiques and everything that can be described as carrying a historical dimension and identity in which the varieties of technical action converge from formal treatments structurally. See Figures 5 and 6.
- Visual communicative discourse according to reflections of technical diversity: The visual discourse stems from formal, color and volumetric display processes as an organic unit that fits with a realistic pattern and style in some spaces as if they were components within a mountainous environment, and abstractly as they are based in most of their components on renewable and sustainable materials that are compatible with the environment of materials preserved in the museum. This represents a communicative discourse between the exhibits and components of the interior space on one hand, and on the other hand the recipient's interest and psychological dimensions and feeling towards what is displayed in the museum. In this case, two basic dimensions of communication are formed, one direct through providing the formal display environment for subjects and indirect for some materials and exhibits that achieve a fundamental role without using their environment.
- While the visual discourse for functional communication that depends on the components of the objective action by collective agreement comes, another functional factor comes that determines the self-dealing of components and materials that represent the visual optical synthesis of the self. Also, the aesthetic discourse extends to those display tones of shapes and their spatial proportionality and locations in

relation to interior spaces according to the objectivity of total and relative beauty, while the subjectivity of things and their vocabulary gives a proportional output in which the dimensions of formal beauty are consistent for the formal coordination of exhibits within the interior space. See Figures 7 and 8.



Figure 3. shows the interference, overlap, and diversity of treatments in a way that is compatible with the space in terms of function and performance expression.



Figure 4. The main entrance shows the technical diversity in the use of different materials for horizontal and vertical levels [57]



Figure 5. The main space appear like tree branches covering the spatial texture of the museum e appear like tree branches covering the spatial texture of the museum.

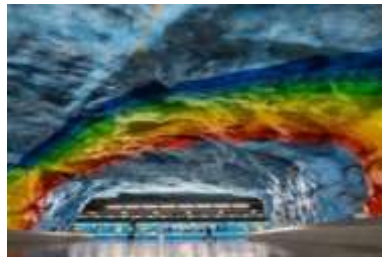


Figure 6. Shows direct and indirect visual discourse and methods of realistic and abstract display, functionally and aesthetically [57]



Figure 7. Spatial diversity and organizational achievements as an idea and innovative imagination, expressive, intuitive and emotional relationships [57]



Figure 8. The formal relationships of space distribution within the larger space, as well as showing visitor movement in the space capacity [57]

3.6. Description and analysis of the second model national museum of qatar

3.6.1. General description

The museum reflects a part of the life of every Qatari citizen, both male and female, and represents an extension of their roots and identity. It also provides all its visitors with an interactive experience, regardless of age or cultural level, about the history of our nation and its people. The story of Qatar is revealed through an amazing exhibition hall, all of which use innovative methods of storytelling. The visitor embarks on a journey through time and then moves from one station to another through history until the present time, exploring along the way amazing contents that combine land and sea. Each hall provides a perspective across time and connects visitors to life that lives between land and sea. The contents vary between historical narratives, archival images, artworks, hearing stories and smells associated with memories, which give the visitor a deep sensory experience that makes him merge with an amazing collection of archaeological and heritage collections. [58]

3.6.2. Analysis

- Harmony and visual characteristics of the design: The formal harmony that was employed in multiple spaces formed formations between the strangeness of the visual and structural design that reflected the content of the apparent and the hidden, including the design of the forming materials that define that three-dimensional form and sizes with rock masses whose visual values extend to those smooth surfaces and materials with a perceptual texture for the visual formal embodiment that vary in different visual systems determined by the realism of the structural design with degrees of light values and color values that determine the scope of vision and viewing of the museum's contents, and in its visual aspect as color formations that are compatible with the Qatari environment to achieve a visual identity for the real environment and preserve that cultural and civilizational heritage of the State of Qatar. See Figures 9 and 10.
- Diversity in the system and formal organizations: The organization achievements appeared through the formal and technical diversity and construction materials according to a formal harmony that is consistent with the function of the museum, as the act of agreement and partial and total composition was achieved in a harmonious arrangement, proportion and union with the distribution of formal elements and components in a visual combination that the recipient (visitor) can sense and perceive its components.
- Also, the achievements for organizing the structural and constructional relationship came according to an unusual geometric diversity as inclined surfaces that take the form of overlapping round discs and as levels of overlapping, which is a renewed idea with a modern outlook that is consistent with the innovative imagination in terms of distinction and uniqueness, according to formations that were processed through three-dimensional blocks. In another field, we find some spaces adopting vertical inclined levels as interactive and digital display techniques for heritage images and shapes as a way to use technical diversity that keeps pace with scientific and industrial development to employ materials in interior spaces, especially museums, due to their specificity in preserving historical and artistic components and cultural heritage. See Figures 11 and 12.

- Structural relationships of the components of the interior space: Formal, volumetric and color contrast appeared through the values of the elements and components that were designed according to theoretical relationships characterized in determining the interior space with the pleasure of viewing for the recipient, which enhances the processes of gradation in sizes, structures and shapes, reaching the exchange of linking relationships as levels that are not similar in their formations, which gave them the specificity of flexibility, uniqueness and achieving coherence. In another aspect, some of the interior levels of the spaces were treated as transparent entrances and outlets for ease of viewing and achieving accuracy in looking, watching and following the displayed elements in the museum components. See Figures 11 and 12.
- While the structural relations come in accordance with expressions related to the Qatari environment, its location and geological components to achieve an intuition in the recipient and compatibility and conformity of the cognitive and cultural stock of the Qatari environment, which achieves a subjective emotion in the recipient and arouses in him the desire to see and learn more, and all of this is due to the nature of the treatment in the formal, qualitative and visual diversity of the objects and vocabulary that were dealt with in the formation of the internal spaces of the museum.
- Technical harmony relations of the internal spaces: Formal harmony relations were achieved through the illusory diversity of movement in the vertical and horizontal levels with the excitement and stimulation of the recipient's thought in subjecting him to remembering the past and the present and embodying the principle of historical depth on the one hand and on the other hand the complex as a measure of the content of the space geometrically, which achieves the force of tension and the relationship of formal coherence and the contribution of intertwining and overlapping between the components of the spaces and levels with the distribution of elements within the space to achieve adjacency and contact, which calls for a state of technical compatibility for the performance function within the internal space of the museum, see Figure 13.
- Visual communication discourse according to the reflections of technical diversity: The visual discourse appeared to achieve communication in terms of formal display diversity clearly through a formal, three-dimensional, color and volumetric multiplicity that distinguished the distribution of the components of the exhibits in the museum and emphasized the membership of objects as stylistic units that show the temporal and spatial environmental reality of the Qatari environment. This is a successful embodiment of what the designer did towards a multiple choice of technical diversity for the use of materials, while some levels appeared that carry local vocabulary for the Qatari environment such as decorations and abstract shapes to achieve cognitive and cultural communication, some of which are direct and some are indirect through technical treatments of the past with a modern and contemporary view such as interactive displays on the walls by displaying pictures and artistic shots of the Qatari heritage. The visual discourse also came according to direct communication processes to enhance the functional and objective performance aspect, especially in the displays of topics and their distribution in a harmonious and appropriate manner with the aesthetic aspect, while the subjective action of designing some spaces was achieved by the interior designer with a different view from other spaces. See Figure 14.



Figure 9. Morphological and size diversity and value effects



Figure 10. Inclined vertical levels and distribution of elements in space with technical diversity [59]



Figure 11. The interference, cohesion, and intertwining between spaces, movement paths, and structural and constructional relationships [59]



Figure 12. The effect of psychological emotion through stimulating the recipient via an environmental formation with diverse elements [59]



Figure 13. shows a completely different space in its treatment method with an intensive and multifaceted design, displaying technical diversity [59]



Figure 14. Color and light values and level treatment to achieve visual openness as a communication discourse [59]

4. Research Results

After analyzing the research samples and based on the indicators reached by the research study within the theoretical framework, and according to the pre-established methodological plan through the analysis form, the researcher reached the following (analytical study results) related to the research objective:

- The formal harmony employed in the museum space reflected a visual and structural formation through the use of smooth surfaces as a soft texture in which the processes of formal perception of embodiment are manifested through those forms within the first and second models in the Louvre and Qatar National Museums at 100%.
- The technical diversity was addressed in both the first and second models between the interior and exterior of the building according to contrasting overlapping formative treatments for each of them at 100%. The Louvre Museum was distinguished by a different technical treatment of the horizontal level represented by the ceiling for the intertwining of branches in the form of a tree from the interior space and in the form of a geometric composition from the outside. While the interior space treatments of the Qatar National Museum appeared through the use of flat inclined flying shapes between the interior and exterior.
- A formal and visual identity was adopted for both the first and second models to express the environment of each country and its unique characteristics reflected in the designer's inspiration of those scenes and attempt to integrate with that technical diversity in designing the interior spaces of the two museums at 100%.
- Organization manifestations appeared through the formative dimension of technical diversity through formal harmony based on the museum's function in the two models with an important difference between the characteristics of employing elements in each model, resulting in the distribution of elements according to each space and its displayed components and vocabulary.
- Emphasis on compatibility and partial and total composition in arranging, proportioning and uniting the distribution of elements in a harmonious manner compatible with the nature of the designed interior spaces as containers for the visual synthesis reflected to the recipient, perceived and sensed in their past and present .
- This gave the relational organization of construction and creation the achievement of completing levels of formal overlap and stimulating innovative imagination, giving distinction and uniqueness to each model at 100%.
- Two-dimensional and three-dimensional embodied masses appeared clearly in the second model (Qatar National Museum) in its technical diversity, which was formed according to a realistic environment of the country at 100%. While the modernity of the first model (Louvre Abu Dhabi Museum) varied by having a renewed view in addressing the components of the interior space, considering the dome shape for the branch synthesis in consideration of the external environment and high temperatures, which required the designer to use those energies as a technical and visual synthesis together at 100%.
- Structural relationships appeared as an actual achievement of formal, volumetric and color contrast for the forms of interior space components in the first and second models to reach the maximum degrees of formal integration to achieve viewing pleasure for the recipient, which enhances processing operations in color and volumetric gradation to achieve an exchange of formal relationships and their interconnection with level compatibilities that gave them flexibility and formal uniqueness, at 100%.
- Technical diversity contributed to addressing transparent levels in vertical and horizontal levels for both the first and second models and achieving a high degree that enabled the introduction of natural lighting to the main space in both models with the basic appearance of some spaces with artificial lighting to achieve a reciprocal compatible relationship for light and color values together. At 50%.
- The illusion of movement appeared in vertical and horizontal levels in the two models at varying rates to achieve visual extension and a sense of spatial openness (wide space) in the first and second models with achieving visual extension for the recipient to the large main space, while achieving a tightening relationship and formal interconnection through intertwining in the ceiling for the first model and overlap for the second model, as well as achieving adjacency and contact in the distribution of furnishing elements as components of exhibits for both the first and second models at 100%.
- The visual discourse was manifested to achieve communication through the technical diversity of shapes, sizes, forms and appropriate distribution in organic harmony as interconnected units to express the environmental and abstract reality style, as well as employing decorations in the second model for ceilings to express the historical heritage of Qatar as a cultural starting point, while in the first model it derived its elements from renewal as a future view of the integration of modern development in employing materials.
- Achieving access to a visual communicative discourse was achieved by enhancing the performance function and aesthetic expression, derived from materials and their compatible formation based on objective aspects in collective agreement that they are functionally and aesthetically distinctive, which reflects the state of subjective action of the designer and his reading of the environmental reality for both the first and second models at 100%.

5. Conclusion

- In light of the research study's adopted goal, the indicators that resulted from the theoretical framework, the procedures and analyses adopted to achieve the goal, and the results obtained, the conclusions emerged to clarify (the mechanisms of technical diversity and its functional and aesthetic reflection in the designs of interior spaces) through the following:
- Interest in the general characteristics of technical diversity provides an incentive for consolidation and continuous production, and this is represented in the building's form and its technical treatments for interior spaces, and the provision of all requirements for functional performance. It also confirms that the expression of those technical diversities that distinguish the museum are subject to the selection of the site, its direction, and the expression of its contents through an internal and external structural and constructional appearance and its mass, for what it achieves from physical treatments.
- The optimal use of establishing direct formal, volumetric, and color relationships with the contents of the space, such as display tools, environmental treatment tools, lighting and illumination. In a way that achieves the effect of its organizational characteristics between the distribution and arrangement that is consistent with the functional performance requirements and its attractive aesthetic appearance.
- The basic factors in the characteristics of the interior space of museums depend on the lighting property and the diversity of its light values and its multiplicity within the designed space, depending on its location, direction, automatic movement and temperature. And how to control it automatically and electronically in a way that facilitates the individual's cognitive abilities and senses that environment according to historical and civilizational components.
- The spaciousness of the interior space gives greater freedom in building shapes and expanding formations towards designing elements, and ease of movement represented by the movement of the recipient (visitors), the movement of people and the optimal performance of the levels of technical exhibits on surfaces with a smooth, polished texture.
- The availability of a variety of special and unique techniques for formal diversity gives an advantage and a feature as an identity through which the elements and components of spaces appear as containers. These features are linked to modern technologies that contribute to

reducing momentum and accelerating production processes by shortening time, accuracy and clarity, and programmed digital automatic control, to eliminate the difficulties and problems facing the interior designer of museums.

- Attempts at renewal that achieve a thoughtful interaction between the components in the internal space with the recipient consolidate the abstract idea and deepen the process of cognitive and cultural communication through reviewing the historical and civilizational legacy of the museums' content.

6. Recommendation

- In light of the research results and conclusions, the researcher recommends the following:
- Emphasizing the use of technical diversity in processing the components of internal spaces in a manner that is consistent with the components of the displayed materials to preserve them as much as possible.
- Paying attention to the historical and cultural identity when dealing with technical diversity in a manner that is consistent with the nature of the containing place as an environment to determine the exhibits that have an artistic dimension and historical legacy.
- The necessity of improving the psychological and psychological factors of the recipient by developing guiding and guidance methods to facilitate movement and ease of sequence and organizational continuity.
- The necessity of having temporary rest areas between one space and another to achieve visual enjoyment when viewing and browsing, as visitors and recipients come from different ages and categories.
- Paying attention to adopting virtual digital technologies to bring ideas closer and emphasize the formal dimensions according to the temporal and spatial determinants of the exhibits in the internal space.
- The fluidity of movement and its completion is an important necessity that must be taken into account when achieving structural and structural formal diversity to achieve order and organization to maintain calm and safety for sound, lighting and color tones.

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