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Principles of Islamic Aesthetic in Modern Mosque Architecture

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ABSTRACT

The mosque is a core element of Islamic architecture and the physical embodiment of the rich spiritual, artistic, and cultural heritage that defines Islamic tradition. The architectural expression of mosques has evolved dramatically, reflecting the dynamic relationship between tradition and modernity. This study critically examines the architectural designs of three mosques by categorizing them into "Traditional" and "Modern" approaches: the Sheikh Zayed Grand Mosque in Abu Dhabi, the Nasir al-Mulk Mosque in Shiraz, Iran, and the Süleymaniye Mosque in Istanbul, Turkey. Classical Islamic architectural ideas are reflected in traditional mosques, while modern mosques include modern materials, techniques, and aesthetics. The study examines how Islamic aesthetic elements, such as geometric shapes, harmony of proportion, and use of patterns, are incorporated into modern designs, evaluating their success in preserving the essence of Islamic aesthetics. Furthermore, the study offers a comparative analysis of the three mosques through the lens of Islamic aesthetic principles, identifying similarities and differences in their application and interpretation across different cultural and historical contexts. Field observations and architect discussions inform the analysis, offering practical suggestions for future mosque designs that balance traditional values with modern cultural and technological demands. This research aims to advance scholarly discourse on the historical and modern development of Islamic architecture by critically clarifying the complex interplay between enduring traditional values and modern innovative techniques.

1. INTRODUCTION

Mosques are essential spaces for worship and prayer, serving as the cornerstone of Islamic spiritual and communal life. They are not only places for fulfilling religious obligations but also serve as centers for religious education, cultural enrichment, and social interaction. Mosques also foster a sense of community by providing venues for gatherings, celebrations, and intellectual discourse, strengthening the bonds within the Muslim ummah. To effectively support these functions, mosques must be meticulously crafted to align with the needs, comfort, and spiritual aspirations of their users. There are two main types of mosques: traditional and modern. Traditional mosques are deeply rooted in Islamic architectural heritage, characterized by historical styles, intricate aesthetics, and conventional materials and techniques. These buildings frequently serve as enduring reminders of Islamic culture while maintaining the fundamentals of classical architecture. Modern mosques embrace contemporary materials, advanced construction technologies, and innovative architectural expressions, often challenging traditional stylistic norms while retaining the spiritual essence of Islamic architecture. Islamic aesthetics hold profound spiritual, cultural, and historical significance, deeply influencing the design and function of mosques across generations. Through elements such as intricate calligraphy, geometric patterns, arabesques, and harmonious proportions, Islamic aesthetics aim to evoke a sense of divine presence, spiritual reflection, and appreciation of the Creator's infinite wisdom and beauty. This study examines mosques categorized into traditional and modern typologies, focusing on their spatial organization, interior furnishings, material usage, and aesthetic principles. This comparative evaluation highlights the interplay between historical continuity and modern innovation, emphasizing how mosque architecture serves as a dynamic reflection of the spiritual, cultural, and technological aspirations of the Islamic world [1].

2. METHODOLOGY

This research paper employed an interpretive and comparative analysis of three mosques from the classical Ottoman period, the late Qajar era, and the contemporary 21st century. Data were collected through field observations and architectural analysis. Key architectural and aesthetic elements were evaluated against established Islamic design principles including geometric shapes, harmony of proportion, and use of pattern, and incorporation of calligraphic ornamentation. A comparative framework was used to identify similarities and differences in the application of these elements across historical periods, highlighting the continuity and transformation of Islamic architectural aesthetics.

3. THE PRINCIPLES OF ISLAMIC AESTHETICS

Islamic aesthetics, grounded in cultural, religious, and historical traditions, have significantly influenced the development of Islamic architecture. These aesthetic principles guide the design of buildings and spaces to create harmonious, balanced, and spiritually uplifting environments. Understanding these principles is essential to appreciating the unique visual and functional qualities of Islamic architectural heritage [2].

These principles include **proportionality, scale, symmetry, repetition, equilibrium, harmony, similarity, contrast, order, and order in its design**. **Proportionality:** refers to the proportions of architectural features on a historic building's facade and plan, such as room length, width, height, columns, windows, doors, hallways, and entrances. **Scale:** deals with comparing monuments' sizes to nearby residential structures, with different meanings depending on the size. **Symmetry:** is essential for mosques and holy places, as it helps people relax and pray more effectively. It is observed on the exterior of every Islamic building, including those facing the street and courtyards. **Repetition:** is common in Islamic architecture, with arches, windows, and columns repeated multiple times. **Equilibrium:** is related to an architectural form's visual equilibrium, with balance between left and right sides being essential. **Harmony:** emphasizes the importance of achieving harmony among architectural elements, with varying proportions and forms coexisting harmoniously. **Similarity:** applies only when elements cannot be directly compared, with a small and large arch sharing a similar technique in their construction. Modern Islamic architecture often reflects both principles, with their application varying depending on the context. **Contrast:** is used to create a nicer form by following a series of rhythmic elements. **Order:** is evident in the structure, ornament, facade, and plan of Islamic architecture, with modules used to achieve a general order in the entire design. Islamic gardens (parks) exhibit a strong geometrical realization of this principle, while order in disorder, sometimes referred to as order in disorder, is deeply rooted in a harmonious and systematic structure[3].

4. TRADITIONAL ISLAMIC AESTHETIC APPROACH

The emergence of multi-level ornamentation constitutes a defining feature of traditional Islamic aesthetics. This technique involves the enhancement of a central motif through the incorporation of intricately layered secondary elements within the background, resulting in a complex and harmonious visual composition. Tracing its origins to as early as the ninth century, this ornamental approach evolved across the principal domains of Islamic art namely, geometric patterns, (floral) motifs, and calligraphy [4].

The Elements of Traditional Islamic Aesthetic Approach

Traditional Islamic aesthetics incorporate architectural and artistic characteristics that reflect the core tenets of Islamic philosophy, spirituality, and cultural identity. Although these elements have undergone transformation throughout history due to regional influences and evolving techniques, they continue to be grounded in enduring principles that emphasize harmony, unity, and the cosmic order established by the divine [4].

Geometrical patterns: Connectivity between various building sections is facilitated by geometrical patterns. Additionally, they enhance the structure's aesthetic value. Geometric tessellations represent order and unity in creation, the use of symmetrical shapes such as stars, polygons, and circles (figure 1), and the integration of mathematical precision to achieve harmony. Abstract ideas of pattern symmetry naturally follow from geometrical pattern and symmetry, which make up the majority of Islamic art that is visible. These two concepts are the most profound and all-encompassing that the human brain can generate. Islamic art has the capacity to provide this kind of experience because it mostly depends on geometry and investigations of symmetry and pattern [4]. Through this intricate relationship between geometry, symmetry, and pattern, Islamic architecture and art create an enduring legacy of beauty and spiritual depth.

Figure 1. The Geometric Patterns of Alhambra [4].

Floral ornament: Floral decorations are so stylized that they no longer resemble anything found in nature and only follow rhythmic rules. With each surface having its inverse counterpart and each line flowing in complementary phases, it is a true graphic of rhythms. The arabesque, especially, reflects the spirit of Islam in its harmony of appreciation and intellectual sobriety, being both mathematical and melodic, logical and rhythmic. However, the space for a smaller, secondary floral device with a nearly identical style can be added to the background of the main floral ornament. Branches were combined with leaf and flower motifs to create this kind of ornament [4].

Calligraphy: Arabic calligraphy is an attractive art form that inspires expressions that blend aesthetic beauty with spiritual significance. Throughout history and the present, calligraphic expression has been widely employed as a basic decorative element in all forms of Islamic art, from architecture to ornamental designs Commonly used styles include Kufic, Naskh, Thuluth, and Diwani. The beauty, harmony, rhythm, and flow of calligraphic forms that have surrounded Muslims in traditional Islamic society and revealed their beauty on the pages of Qurans, mosque walls, domes (figure 2), minarets and other architectural forms have revitalized the heart and soul of every Muslim. As the primary sacred art of Islam, traditional calligraphy is a gift from the truth at the core of the Islamic revelation, which is where this art form originates [4] [5].

Figure 2. the dome of the rock with calligraphy [5].

5. THE MODERN ISLAMIC AESTHETIC APPROACH

A contemporary architectural and artistic methodology that revitalizes Islamic cultural and spiritual values by reimagining traditional design principles through modern forms, materials, and technologies. It is not merely a stylistic update but a conceptual and philosophical evolution—one that seeks to maintain a dialogue between the Islamic past and the modern global present [6].

The Elements of the Modern Islamic Aesthetic Approach

It integrates core Islamic values such as unity (Tawhid), spirituality, modesty, and symbolism while adapting them to modern materials, forms, and functions. Central to this approach are elements such as geometric abstraction, the innovative use of light, the integration of Arabic calligraphy in modernized forms, and Geometric patterns [6].

Contemporary Arabic Calligraphy: plays a vital role in the Modern Islamic Aesthetic Approach by preserving the spiritual and cultural essence of Islamic art while adapting it to current artistic and architectural expressions. Traditionally, Arabic calligraphy was used to transmit the sacred text of the Qur'an and to embellish mosques, madrasas, and manuscripts with divine messages. In the modern context, this calligraphic tradition continues but is often reimagined through abstract forms, new materials, and digital technologies [7].

Figure 3. The dome of the Zayed Grand Mosque with Contemporary Arabic Calligraphy [8]

Integration of Modern Materials and Technologies: Enhance functionality while preserving spiritual meaning. Materials like glass, steel, and reinforced concrete allow for open, light-filled spaces and innovative structural forms. Technologies such as smart lighting, acoustic systems, and climate control improve user comfort and sustainability. Digital tools like parametric design enable precise creation of abstracted Islamic patterns (figure 4). This integration reflects a balance between tradition and innovation, aligning spiritual values with modern architectural needs [9].

Figure 4. Interior View of Zayed Mosque with modern materials [9]

Minimalism and Abstraction: reflecting the Islamic principle of tawḥīd (divine unity) through simplicity and purity of form. Unlike traditional Islamic architecture, which often relies on intricate ornamentation, modern designs emphasize clean lines, geometric clarity, and open, contemplative spaces. Ornamentation, when used, is often abstracted or stylized, drawing on classical motifs in a restrained, symbolic way. This approach fosters spiritual focus by removing visual distractions, allowing architecture itself to guide reflection and reverence [10].

Figure 5. Geometric Abstraction in the Sheikh Zayed Grand Mosque [11]

Symbolic Use of Light and Space: In modern Islamic architecture, light and space are employed not only for functionality but also as profound spiritual symbols. Light, in particular, is deeply rooted in Islamic theology, inspired by the Qur'anic verse known as the Verse of Light (Ayat an-Nur, Qur'an 24:35), which metaphorically equates God's guidance to divine illumination. Contemporary architects translate this symbolism into design by using natural light as a sacred medium, allowing it to shape the spiritual atmosphere of a space. Light filters through skylights (figure 6), perforated screens, and domes to create shifting patterns that evoke the presence of the divine and guide worshippers into states of contemplation [12].

Figure 6. The use of natural lighting in the Prophet's Mosque (Al-Masjid an-Nabawi) in Medina (photography by author).

Natural light in the Prophet's Mosque reflects the Islamic concept of divine light (Qur'an 24:35, Ayat an-Nūr), a metaphor for God's guidance and presence. By allowing sunlight to penetrate the sacred space, the design evokes a sense of spiritual clarity and elevation, helping worshippers feel connected to the divine. Light enters through open courtyards, high clerestory windows, and ornamental perforations, creating a dynamic play of shadow and light throughout the day fostering contemplation and reverence[13].

6. EXAMPLES OF TRADITIONAL APPROACH

Historic mosques fall under the category of "traditional approach," which refers to designs that have their roots in classical principle. The discovery of how the essential principles of Islamic aesthetics geometric shapes, harmony of proportions, and the use of patterns were achieved will be made through an evaluation of traditional mosques [1].

6.1 Süleymaniye Mosque, Istanbul, Türkiye

The Suleymaniye Mosque (1550–1557) is the most important Ottoman building in Istanbul and the largest of architect Sinan's designs. Sultan Suleiman the Magnificent wanted a mosque that was larger than and had a similar style to Istanbul's previous large mosques. Architect Sinan finished the Suleymaniye Mosque at the age of sixty, and on the day of its inauguration, its dome was the widest (26.5 meters) and tallest (53 meters) of all the Ottoman mosques [1].

6.1.1. Geometric Shapes: At the heart of the mosque's design is a monumental central dome, symbolizing the heavens. It is supported structurally and visually by two semi-domes on either side and four smaller domes in the corners, creating a cascading composition that elevates the viewer's gaze. This configuration not only stabilizes the structure but also reinforces its spiritual symbolism. Semicircular arches, both interior and exterior, enhance the architectural expression of strength and elegance. These arches, especially the triumphal central arch, which is the largest and tallest, were key to supporting the domes and showcasing architect Sinan's mastery. This specific arch acted as a visual and structural centerpiece, reflecting Sultan Suleiman's magnificence and the mosque's prominent stature. Architectural elements such as the cornice and perforated tympanums, featuring three-tiered window arrangements, contribute to the mosque's horizontal openness. Unlike the Hagia Sophia, the absence of balconies and the brightness of the tympanums further accentuate the vastness and illumination of the interior. These features demonstrate Sinan's innovative approach in redefining Islamic spatial aesthetics [14].

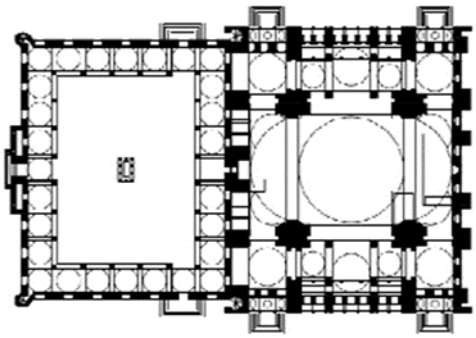


Figure 7. Suleymaniye Mosque, plan [14].

Figure 8. Suleymaniye Mosque, Interior [14].

6.1.2. Harmony of proportion: The central dome's proportions reflect a deep understanding of balance and spatial harmony. With a height equal to half its diameter, the dome maintains a mathematically pleasing ratio that conveys majesty without overwhelming the interior. This measured approach contributes to the serene yet awe-inspiring atmosphere of the prayer hall. The mosque's overall layout adheres to strict symmetry, with the central dome flanked by two half-domes and four smaller corner domes, creating a well-balanced spatial cascade. This configuration distributes structural weight effectively while enhancing aesthetic unity. Sinan's system of proportion relies on geometric principles rooted in modular design. The spatial arrangement uses a basic grid unit, which is multiplied by various ratios to define key architectural dimensions. For instance: The first ratio defines the middle dome space adjacent to the central dome. The second ratio governs the domed zones beyond the middle minarets. A heptagon and hexagon are constructed using diagonal lengths and chord measurements, guiding the dimensions of the courtyard and facades. These calculated ratios such as 7X for the courtyard length and 9.2X for total proportional relationships ensure that each architectural component is intricately interrelated (figure 9). This meticulous attention to proportion strengthens the mosque's overall sense of unity, order, and spiritual elegance [15].

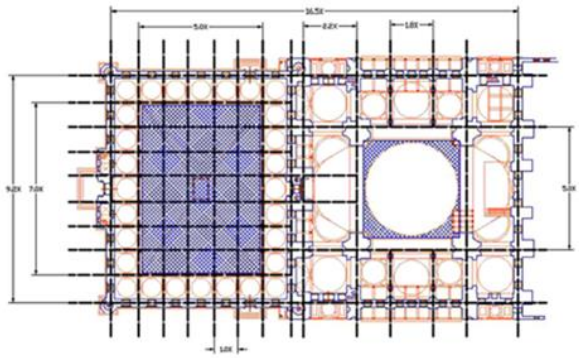


Figure 9. The regulatory planning and proportional systems of the mosque [15].

Interior Space, the diameter of the dome and the prayer hall's central square line up proportionately. A grid-like structure that balances spatial elements is produced by the longitudinal, transversal, and vertical axes. Courtyard and Minarets, two larger minarets in the foreground lend vertical emphasis, while the other four minarets are proportionately scaled to the mosque and courtyard. The mosque's dimensions are reflected in the rectangular courtyard, which unifies the design [14].

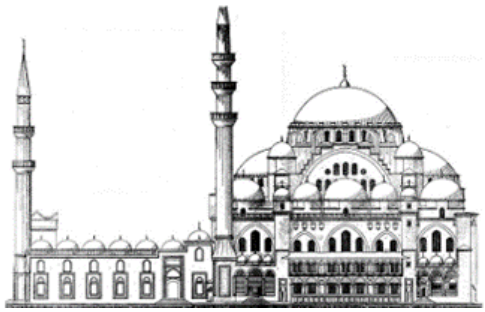


Figure 10. Suleymaniye Mosque, Side Elevation [14].

The durable dome, which is placed atop the attractively raised central structural system, was expertly constructed by architect Sinan. Its height is half of its diameter, giving it a spherical appearance. The most efficient structural solution for raising

and supporting the dome is the box system, especially since the pendentives are readily available. Actually, because the physical nature of the dome's core does not respect the architects' desires, the twofold boundary system is an inevitable structural solution. In the Süleymaniye Mosque, architect Sinan truly succeeded by releasing the structural system and splitting it into three parts: the bridging system, the external box, and the core box (figure 11), enabling both architectural flexibility and aesthetic harmony. The central dome is being raised in large part by the central box component, the main four piers, the main four arches, and the four pendentives. This objective has been verified by lowering the central square's column count to just four and by making the four arches and four pendentives visible from both the inside and the outside. Although architect Sinan attempted to conceal its features by blending it with the prayer hall's walls, the outer box's structural system is still independent and serves its own distinct purpose the construction is not supported or carried by these walls [14].

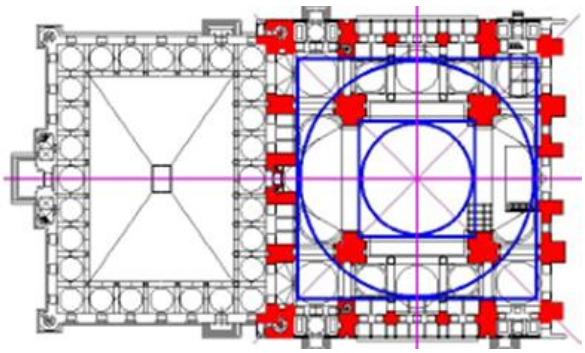


Figure 11. Suleymaniye Mosque, plan [14].

6.1.3. The Use of Pattern: The Süleymaniye Mosque exemplifies the sophisticated use of pattern as both an aesthetic and symbolic device, deeply rooted in Islamic cosmology and spiritual ideology. A focal element of this design is the central dome, which features the 41st verse of Sūrat Fātir (figure 12). This Qur'anic inscription underscores Allah's omnipotence in sustaining the heavens and the earth, concluding with a reminder of His boundless mercy. By incorporating this verse, the dome transcends its architectural function, becoming a symbolic celestial canopy that reflects the divine order and harmony of the universe. Complementing the calligraphic ornamentation, the mosque's interior surfaces are adorned with a wide array of repeating geometric and floral patterns notably on tiles, arches, walls, and window grilles. These motifs, often based on arabesques and symmetrical star forms, illustrate the Islamic aesthetic concept of unity in multiplicity, where complex configurations emerge from the repetition of fundamental shapes. The application of muqarnas, or stalactite-like vaulting elements, beneath domes and within transitional zones, enhances the interior's visual rhythm and guides the viewer's gaze toward the central dome. Collectively, these patterned elements generate a spatial composition characterized by both formal equilibrium and spiritual elevation. Just as the cosmos is governed by divine will, the mosque's proportional harmony and ornamental coherence reflect a metaphysical structure centered on divine unity and control. Each decorative component, from carved inscriptions to patterned stonework, serves to reinforce this theological worldview. Thus, the Süleymaniye Mosque functions not only as a masterpiece of Ottoman architectural innovation but also as a material expression of Islamic metaphysical and aesthetic principles [16].

Figure 12. The 41st verse of the Sūrat Fātir in the dome of Süleymaniye Mosque [16].

The southern semi-dome of Süleymaniye Mosque is adorned with the 79th verse of Sūrat al-An'ām (figure 13). This verse can be interpreted as an attempt to confirm God's might and glory as well as an expression of God's creative power. seen within the space. This verse's placement within the semi-dome is consistent with the notion that facing the divine in a mosque is convenient when one is in the semi-dome, which flanks the central dome on the east and west [16].

Figure 13. The 79th verse of the Sūrat al-An'ām in the center of the southern semi-dome of Süleymaniye Mosque [16].

Sūrat al-Tawba's 112th verse is used to adorn the façade above the northeast and southwest arches of the arcades facing the center of Süleymaniye Mosque. In addition to reminding believers to fulfill all of their duties outside of their faith in Allah, this verse offers good tidings to Muslims who participate in prayer and other required acts of worship. It also honors the priceless deeds of the believers who act in this manner. The pediment of the northern gate that leads to the inner court of Süleymaniye Mosque is decorated with the 103rd verse of Sūrat al-Nisā. The scripture warns Muslims about this issue and declares that salaah is required for believers at specific times. The west lateral gate pediment of Süleymaniye Mosque is decorated with the 54th verse of Sūrat al-An'ām. This scripture implies forgiveness as it greets Muslims and calls them to worship [16].

6.2 Nasir Al-Mulk Mosque, Shiraz, Iran

The Nasir-Al-Mulk Mosque, one of the historic mosques in Shiraz, is situated in the Goodarban neighborhood along Lotfali Khanzand Street. Built in the Qajar period, this mosque has faint Ottoman architectural influences. On Hassan Ali Nasir-Al-Mulk's behalf, it was constructed between 1876 and 1888, or 1293 and 1305 (Islamic calendar). With a total area of 2,980 square meters, the mosque takes up 2,212 square meters of foundation space. A prominent arch mark the entrance, which is located on the northern side. within the expansive courtyard, two prayer halls are present. Among them, the western prayer hall, covered in brickwork, holds greater artistic significance. This hall, used as a summer prayer space, showcases remarkable architectural features [17] [18].

6.2.1. Geometric Shapes: The Nasir-Al-Mulk Mosque comprises two sections, the mosque itself and the Imamzade Zanjiri building and a large northern courtyard with a shallow pool measuring 16.5m by 4.5m at its center. The northern and the southern arch, though smaller, are adorned with similar intricate painted tiling. The western harem, the main section of the mosque, spans 13m by 28.5m [18].

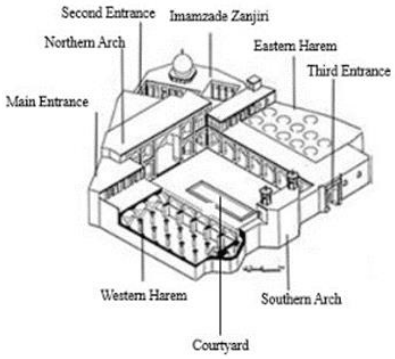


Figure 14. Isometric perspective of Nasir Al-Mulk Mosque [18].

It is richly decorated with colorful tiling, turquoise floor tiles, floral and arabesque ceiling patterns, and Quranic verses. Inside, two rows of six columns create smaller sections, enhancing the architectural elegance. Sunlight filtering through stained-glass windows produces vibrant patterns of red, azure, yellow, orange, and green, creating a mesmerizing interior display. The eastern wall has seven wooden gates with colored glass featuring Girih (trelliswork). The smaller eastern harem contains seven simple columns and connects to a water supply chamber through a rear door [9]. The building's entrance portal, which combines stonework, Muqarnas, and tiles, is its only decorative external face. It is situated at the western end of the mosque's northern side. The dense urban fabric surrounding the mosque restricts our view of its overall external structure [10]. The complex layout of the mosque can be divided into two main sections based on their shape, the southern section (represented in green) and the northern section (represented in blue) (figure 15). The northern part is larger and features a relatively regular, rectangular geometry, while the southern section is smaller and has a more irregular shape. This division appears to have been a deliberate consideration by the architect during the design process, as it addresses various design challenges effectively. If one revisits the layout and exclude the Emamzadeh structure, which predates the mosque, one sees the land as it might have originally presented itself to the architect. It is reasonable to assume that the primary components of the mosque the courtyard and the prayer hall (harem) were strategically placed in the more regular, rectangular southern section. This southern area also includes elevated sections, chambers located to the north, and minarets with their connecting pathways to the south [19].

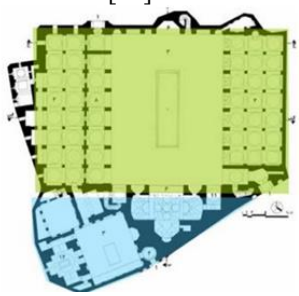


Figure 15. Plan of Nasir Al-Mulk Mosque [19].

The absence of a dome, minaret, or other prominent external elements reduces its visibility. As a result, the entrance portal acts as the building's main façade, providing a compact and symbolic representation of the entire mosque. The central recessed arch resembles the mosque's porch, while the smaller side arches echo the shape of the altar. The intricate tiling on the portal resembles the tiling throughout the mosque, creating a miniature representation of the building's architectural elements. Thus, the portal acts as a "window" through which the essence of the mosque can be briefly perceived. The entrance portal invites viewers into a space distinct from the exterior environment. It comprises three main sections: a central portion, which dominates the design, and two symmetrical side sections. Verticality is a prominent feature, emphasized by the upward orientation of the twig-like arches. The central section includes a large arch, approximately two meters deep, housing the entrance portal. Beneath this arch, detailed Muqarnas adorn the surface (figure 16), while the rest of the portal, except for the stone doorframe, is entirely covered in tiles. From a distance, the portal's ornamentation presents a play of light and shadow created by the Muqarnas and its layered volumetric design. As one approaches, the intricate details of the decorations become progressively more apparent, revealing layers of tiling with increasing precision. The entrance features a wooden door, approximately two meters wide, framed by a rectangular stone-cut border. The warm tone of the wood contrasts with the neutral white stone, highlighting the door. Interestingly, the upper section of the stone arch above the door is left unornamented, while stone platforms flank the entrance on both sides. The walls supporting these platforms are clad in stone to a height of approximately 120 cm, reducing wear and tear in this area [19]

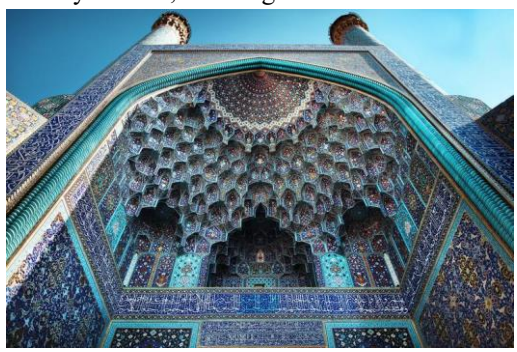


Figure 16. Entrance portal (the Muqarnas) [19].

The mosque courtyard is a dynamic, open area that constitutes the structural center of the building. It is not merely an empty void; rather, it is a focal point where visual forces from the surrounding spaces converge and interact. The courtyard acts as a lens through which the essence of the mosque is accessed and understood. Here, visitors first experience the building’s interior, take in its views, identify its zones, and determine their pathways. The courtyard is especially significant because of the mosque's modest exterior presentation and introspective design. Our impression of the courtyard is strongly influenced by the buildings around it. Its square shape, with sides directly opposing one another, naturally encourages comparison between these sides, even if done unconsciously. The courtyard's spatial harmony and significance are enhanced by this innate symmetry. In essence, the buildings that enclose the courtyard are inward-facing facades of the surrounding areas. While these facades share a cohesive relationship, each possesses unique characteristics that independently contribute to the overall ambiance of the courtyard [19].

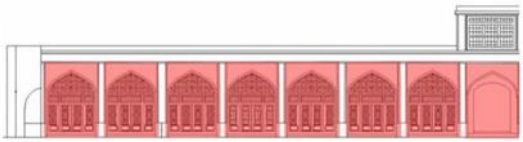


Figure 17. The courtyard western façade [19].

Figure 18. The courtyard eastern wall [19]

6.2.2. Harmony of proportion: The mosque's design highlights symmetry (figure 19), especially in the layout of the courtyard and its surrounding facades. The square courtyard, with its sides reflecting one another, creates a strong sense of balance. This symmetrical approach is also evident in the arrangement of arches, columns, and decorative details, contributing to the overall visual harmony of the structure [20].

Figure 19. Proportions of the mosque's design [20].

The entire western façade is defined by distinct edges at its top and bottom. The bottom edge consists of a single step leading to the harem entrance, while the top edge features a row of bricks from which the corbels extend. These edges have nearly equal thickness, marking the upper and lower boundaries of the façade. Additionally, the design and composition of this façade adhere to specific proportions. For instance, the openings to the harem are framed within rectangles with proportions approximating the golden ratio, with one and a half openings fitting into a single square. These harmonious proportions can also be observed in the other openings along the façade. The proportions of the arches and doorways frequently embody the golden ratio (figure 20), promoting a sense of visual harmony. For instance, this ratio is precisely matched by the main entry arch's height and width [19].

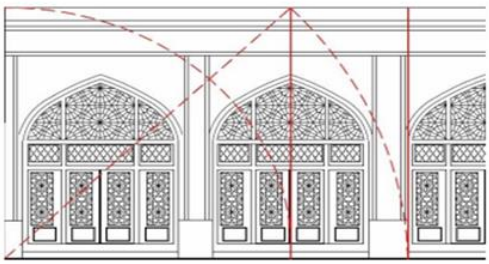


Figure 20. Proportions approximating the golden ratio of the courtyard western façade openings [19].

In the Nasir al-Mulk Mosque, local symmetries are visible on every surface (figure 21), as depicted by axes A, B, and C The foundational elements of each pattern [21].

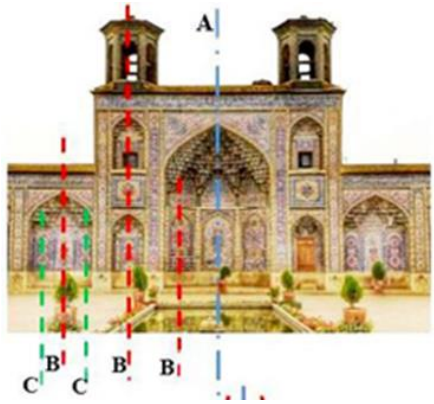
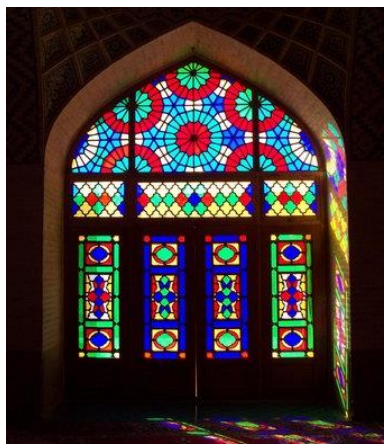


Figure 21. Local symmetries [21].

6.2.3. The Use of Pattern: Windows often feature intricate patterns that create a dynamic interplay of light and shadow (figure 22), resulting in vivid and lively imagery. At the same time, these windows provide a perspective as if viewing the world from behind the scenes. Such designs, like many decorative patterns, are influenced by Islamic views on human perception of reality. They produce visual effects where reality blends with fantasy, giving the impression of faces observed through a veil and dissolving the boundaries of the tangible world through the repeated repetition of a single motif. Lattice windows, in particular, strike a harmonious balance between external and internal lighting. From the interior perspective, they regulate intense sunlight, reducing eye strain caused by excessive brightness. The intricate designs of these windows are crafted to control the amount of light entering the space. They diffuse and soften harsh external light, while also allowing full illumination during less intense lighting conditions. These carefully crafted elements not only enhance visual and spatial harmony but also integrate the practical needs of daily life with the timeless spiritual ideals of Islamic



culture [17].

Figure 22. Windows of Nasir Al-Mulk Mosque [17].

In Islamic tile art, the interplay of positive and negative spaces symbolizes the interconnected relationship between the soul and the body. Geometric patterns and plant motifs are commonly featured in tile art (figure 23), often based on circular shapes, which are considered a symbol of "perfection" in Islamic art and serve to direct the viewer's attention toward the "center," a point that is always present. Islamic tile work

creates a calm and harmonious atmosphere, fostering a sense of inner peace. [17].

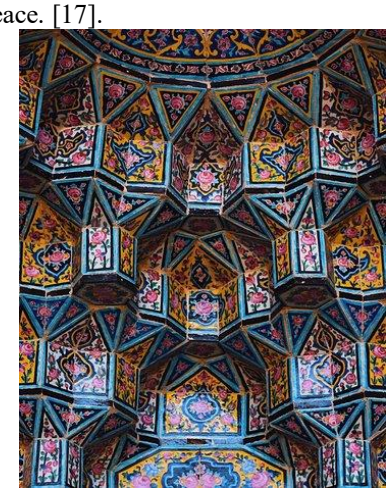


Figure 23. Tiling of Nasir Al-Mulk Mosque [17].

The Nasir Al-Mulk Mosque, much like the intricate craftsmanship of a Persian carpet, intricately weaves Persian design, geometry, and symbolism into its architecture. The detailed patterns within the mosque's interior echo the elaborate motifs found in Persian carpets, creating a timeless and culturally rich visual harmony. While the mosque is celebrated as a masterpiece of Persian and Islamic architecture, it takes a distinctive approach by diverging from traditional norms. Unlike most mosques, which prominently feature geometric patterns and calligraphy, the Nasir Al-Mulk Mosque introduces a unique artistic element with its vibrant stained-glass windows, which resemble vivid brushstrokes on a canvas. These windows infuse the mosque's interior with a dynamic interplay of colors, casting beautiful light patterns that evoke a deep spiritual connection for worshippers (figure 24). This innovative design feature sets the mosque apart from others, enhancing its role not only as a sacred space for worship but also as a symbol of architectural creativity. The Nasir Al-Mulk Mosque serves as a striking example of how traditional Islamic architectural principles can be fused with modern innovation, resulting in a harmonious blend that leaves a lasting legacy in the realm of Islamic architecture [17].

Figure 24. Lights in Nasir Al-Mulk Mosque [17].

The mosque has two naves that are both in line with the Qibla axis, one on the eastern side and one on the western side. Brickwork was used to build the western nave, which stands out for its spiral-patterned stone pillars. To represent the twelve imams, these columns are organized in two rows, with six in one row and twelve in the other. The western nave also includes seven wooden doors fitted with colored glass, providing access to the mosque's main courtyard. The mosque's intricate tilework showcases stunning designs, including floral patterns, Islamic motifs, and Qur'anic verses written in elegant calligraphy. Both the arches and walls of the nave are beautifully decorated with these tiles. The eastern nave's floor is covered in turquoise tiles, which enhance the mosque's charm. The altar, located slightly lower than the surrounding floor, is skillfully crafted from marble, further enhancing the structure's aesthetic beauty. Color, along with elements like light, texture, form, and shape, significantly influences how people visually perceive their environment. Through the use of color, spaces can be unified and harmonized or made distinct and easily recognizable. These elements, independent of other environmental and spatial characteristics, cause two spaces with identical designs but different color schemes to evoke varied perceptions and experiences. Iranian architecture has been recognized as one of the most vibrant and colorful globally, according to architectural experts like Arthur Pope and color specialists such as Tom Porter and Louis Sveirnev. In The Architecture of Iran, Pope highlights the exceptional interplay of shape and color in Iranian architecture (figure 25), stating that its designs are generally simple in form yet exude a sense of calm and confidence from afar. He further notes that the use of color in Iranian architecture, particularly through intricate designs and elaborate decorations, has achieved unparalleled brilliance across different historical periods. In interior spaces, color selection profoundly influences emotions, often more so than any other independent factor [17].

It can transform dull, monotonous interiors into vibrant and inviting environments. In interior design, color accentuates form and represents a multiplicity inherently tied to unity. Within Islamic architectural painting, color holds significant spiritual meaning, symbolizing the connection between unity and diversity. As Henry Carbone explains in Iranian Mysticism, colors serve as markers for mystics to gauge their spiritual state. Colors derived from light radiation embody the manifestation of unity within diversity and the interdependence of these concepts. Each color symbolizes a distinct state while simultaneously transcending its specific hue to represent light itself [17].

Figure 25. Color in the nave of Nasir Al-Mulk Mosque [17].

7. EXAMPLE OF MODERN MOSQUE

Modern mosque designs exhibit a variety of typologies characterized by distinct architectural features. The essential principle underlying contemporary mosque architecture is the notion that these structures should be constructed in unique styles and aesthetics, diverging from traditional architectural conventions [1]. By evaluating modern mosques, we can explore how core principles of Islamic aesthetics such as geometric shapes, proportional harmony, and the use of intricate patterns are effectively incorporated into contemporary structures. This examination will reveal how modern mosque designs continue to uphold the essence of

Islamic architectural traditions while adapting to new artistic and functional demands.

7.1 Sheikh Zayed Grand Mosque, Abu Dhabi, UAE

The third largest mosque globally, was constructed from 1996 to 2007 and covers a total area of 412.22 thousand square meters, following the Holy Mosque and the Prophet's Mosque, place of worship. The Sheikh Zayed Mosque has attained a remarkable level of creativity, in the arrangement of the terminology for different architectural features, including minarets, domes and arches that become visible when viewing the vertical perspective from outside the mosque. It was constructed in a location that elevates 11 meters above sea level and 9.5 meters over the terrain level. The consistent pattern among minarets, arches, and domes is visible from the exterior, from above and from the lateral viewpoint. The mosque has the capacity to hold more with over 7,000 worshipers inside, the outer area can hold approximately 40,000 worshipers [22] [23].

7.1.1. Geometric Shapes: The dome of the Sheikh Zayed Grand Mosque is the largest in the world, standing 83 meters tall with an inner diameter of 32.8 meters. The mosque features four minarets at the corners of the outer nave, each designed in the traditional Arabic style, with a height of 107 meters and a complete white marble covering. Inside, the main prayer hall is supported by 24 columns that bear the weight of the large ceilings and domes. These columns are divided into four sections, each supporting the arches of the domes. They are adorned with white marble, decorated with pink shell and vegetal motifs, enhancing the beauty of the inner gallery. The interior of the mosque spans 50 by 55 meters, with a ceiling height of 33 meters. The circular form of the domes creates harmony and balance, symbolizing the unity and perfection of God (figure 26). which is consistent with the symbolic representation of the godly and unity. The mosque's design follows a symmetrical grid system, with domes, columns, and archways showcasing repetitive geometric shapes. The Sheikh Zayed Grand Mosque seamlessly blends traditional artistry with contemporary engineering, standing as an enduring symbol of Islamic heritage and architectural excellence and innovation [23].

Figure 26. The dome of Sheikh Zayed Grand Mosque [24].

There are 85 additional domes of various sizes that cover the main and lateral entrances as well as the exterior galleries. The mosque's exterior courtyard floor was designed as a monumental system of concrete tiles set on concrete sections, and it was embellished with the finest marbles and vibrant vegetation. One of the biggest open areas in mosques in the Islamic world, the entire nave, which is 17,000 square feet, was covered with mosaic. There are 1048 columns supporting the outer courtyard in the corridors encircling the nave, each covered in marble and embellished with semi-precious stones, floral decorations, vibrant flowers, and gold-plated metal crowns (figure 27) [22].

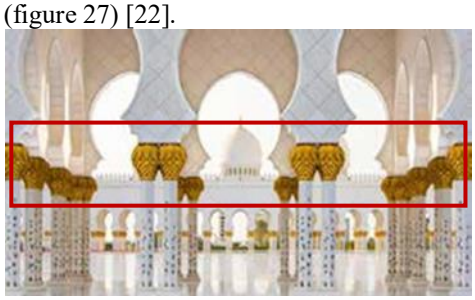


Figure 27. The gold-plated metal crowns [24].

The minarets of the Sheikh Zayed Grand Mosque incorporate elements from traditional Ottoman, Mamluk, and Fatimid architectural styles. Situated at the four corners of the mosque, the minarets are designed with a square base that transitions into an octagon and ends in a circular shape. The mosque has three prayer halls, one large and two smaller ones. In the center of the largest prayer hall is a design in the shape of an eight-pointed star (figure 28), which represents the sacred throne being carried or supported by 8 angels. This symbolic feature reflects deep Islamic spiritual concepts and architectural sophistication, enhancing the mosque's grandeur and reverence [23].

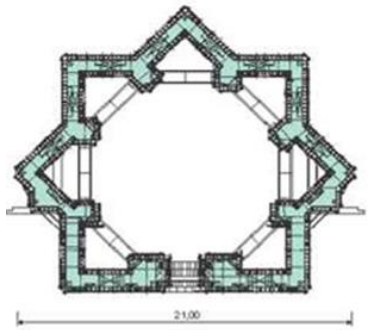


Figure 28. Plan of central space in Sheikh Zayed Grand mosque's large prayer hall [23].

7.1.2. Harmony of proportion: The Arches and the Value of Rhythm, the rhythm in the outer spaces of the Sheikh Zayed Mosque is expressed through a distinct and endless repetition, highlighting the relationship between the arches and other architectural elements. This regular rhythm enhances the depth and harmony of the mosque (figure 29), similar to a musical composition, with symmetry emphasizing the tight arrangement of the arches. This rhythm creates a sequential depth both inside and outside the mosque, which is unique to this architectural style. The design showcases the value of rhythm in various forms, linking the architect's philosophy with the structure. The Arches and the Value of Balance, the architectural balance of the arches in the Sheikh Zayed Mosque is achieved through a careful relationship between mass and space. The architect's keen understanding of composition has led to the creation of arches that convey stability and steadiness. This balance, in turn, fosters a connection with the place, as the movement of the arches, minarets, and domes evokes a sense of luxury and spirituality. The refined use of color and intricate decorative elements surrounding the arches particularly the golden capitals heighten the aesthetic experience. These artistic touches evoke feelings of joy and contentment, amplifying the mosque's elegance and reinforcing its overall harmony. This balance not

only underscores the grandeur of the mosque but also reflects its spiritual and cultural significance [22].

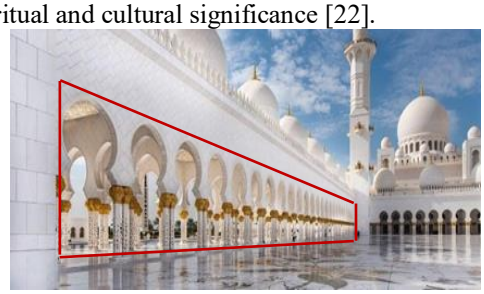


Figure 29. The aesthetic of external arches at Sheikh Zayed Mosque [22].

The use of arches reflects the architect's application of ratio and proportion in three ways, through quantity, through quality, and through a blend of both. Quantity refers to numerical ratios, while quality pertains to geometric ratios. When combined, these create a musical composition ratio. This concept is reflected in the relationship between the arches and other architectural elements, where the quantitative ratio governs the sizes of the masses, from the base of the arch column to its key. The quality proportion is seen in the geometric forms, with fixed and variable ratios that bring about a sense of musical harmony between the masses and spaces within the Sheikh Zayed Mosque [22].

The Arches and the Value of Artistic Unity, the architect achieved artistic unity by incorporating rhythm, balance, ratio, and proportion among the arches, each with a distinctive character. This approach preserved the unity of the architectural design over time, symbolizing the unity of faith. The design achieves a harmonious blend of diversity, dividing the facade into successive geometric arches, with a seamless transition from one surface to the next. This unity is achieved without any additions or deletions, guided by religious thought and spiritual depth. The arches form a cohesive design that balances classicism with modernity, reflecting both wealth and luxury in contemporary architecture, the Sheikh Zayed Grand Mosque's arches, therefore, stand as a testament to timeless design principles, blending tradition with innovation while reflecting both opulence and spirituality [22].

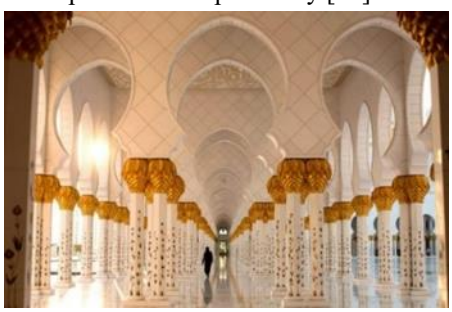


Figure 30. The aesthetic of internal arches at Sheikh Zayed Mosque [22].

7.1.3. The Use of Pattern: Every surface of the Sheikh Zayed Grand Mosque is covered with intricate geometric and arabesque designs. The most prominent pattern features floral and vegetal motifs (figure 31) crafted from semi-precious stones, hand-painted elements, reliefs, and gypsum friezes showcasing arabesque artistry. The capitals of the external columns are decorated with palm tree-shaped, gold-plated muqarnas (figure 32), while the galleries beneath the minarets are adorned with simpler muqarnas. Patterns are abundant throughout the mosque, both inside and out, extending from the floors to the domes' interiors, all presented in a stunning array of vibrant colors [23].

Figure 31. Sheikh Zayed Interior floral patterns from floor to wall [23].

Figure 32. Sheikh Zayed Exterior columns with palm muqarnas [15].

Calligraphy plays a significant role in enriching the interior design of the Sheikh Zayed Grand Mosque, gracing its domes, recessed wall niches, doorways, and various architectural elements. The mosque proudly showcases three exquisite and historically important script styles Kufic, Thuluth, and Nasikh each contributing to the aesthetic and spiritual atmosphere of the space. A remarkable highlight is the qibla wall, where the 99 beautiful names of Allah (figure 34) are intricately engraved in the timeless Kufic script, enhanced by elegant lighting effects and floral patterns that emphasize their sacred meaning [23].

Figure 33. View of calligraphy above a decorative wall recess of Sheikh Zayed Mosque[23].

Figure 34. View of qibla wall featuring the 99 names of Allah in Sheikh Zayed Mosque [23].

The Sheikh Zayed Grand Mosque features seven grand chandeliers from Germany, made of gilded steel, brass, 24 carat gold, glass, and Swarovski crystals (figure 35). These traditional fixtures are complemented by modern lighting innovations, such as optic lights illuminating the qibla wall and lunar lighting that changes with the moon's phases. The design blends advanced lighting technology with Islamic and floral motifs, creating a visually striking and spiritually enriching experience that harmonizes tradition and innovation [23].

Figure 35. One of the chandeliers of Sheikh Zayed mosque [23].

8. COMPARATIVE ANALYSIS OF TRADITIONAL AND MODERN ISLAMIC ARCHITECTURAL ELEMENTS.

A Comparative Study of the Süleymaniye Mosque (Istanbul), Nasir al-Mulk Mosque (Shiraz), and Sheikh Zayed Grand Mosque (Abu Dhabi) (table 1). This comparative table evaluates three iconic mosques representing different eras and styles of Islamic architecture: the Süleymaniye Mosque (16th-century Ottoman), the Nasir al-Mulk Mosque (19th-century Persian), and the Sheikh Zayed Grand Mosque (21st-century UAE). The comparison is structured around six architectural criteria Typology, Style, Geometric Design, Proportion, Pattern, Calligraphy, and Materials chosen to reflect the intersection of tradition, aesthetics, and symbolic expression in Islamic architecture. This framework enables a nuanced understanding of how Islamic architectural values have been preserved, adapted, or reinterpreted across historical and cultural contexts. (By author)

Criterion	Süleymaniye Mosque (Istanbul)	Nasir al-Mulk Mosque (Shiraz)	Sheikh Zayed Grand Mosque (Abu Dhabi)
Typology	Traditional Ottoman Mosque	Traditional Persian Mosque	Modern Mosque with traditional elements
Architectural Style	Classical Ottoman with Byzantine influences.	Late Qajar Persian with vivid ornamentation.	Contemporary fusion of Islamic traditions.
Geometric Shapes	Reflects the mathematical and spatial order of traditional Islam by using precise and harmonious geometric forms in floor designs, domes, and ornamental components.	Emphasizes aesthetic complexity and metaphysical symbolism through the use of symmetrical compositions and extremely intricate geometric motifs in stained glass and tilework.	Reinterprets traditional Islamic geometric patterns using advanced materials and fabrication methods, creating visually coherent and symbolically rich forms.
Harmony of Proportion	Symmetrical spatial organization reflecting Ottoman proportional ideals.	Persian style is characterized by its use of the golden ratio and its rhythmic and balanced spatial composition.	Grand, harmonious proportions enhanced by modern techniques
Use of Pattern	Rich arabesques and muqarnas patterns creating layered decorative effects.	Rich and colorful floral and geometric tile patterns that enhance sensory and spiritual engagement.	Luxurious marble inlays, mosaics, and integrated lighting producing sophisticated repetitive motifs.
Calligraphy	Prominent Ottoman-style Quranic inscriptions in domes and mihrabs emphasizing spirituality.	Incorporates elegant Persian calligraphy in tile panels and domes, harmonizing textual content with architectural ornament.	Integrates classical Arabic calligraphy throughout, using contemporary media and scale to enhance legibility and spiritual ambiance across vast spatial expanses.
Materials	Constructed using cut limestone and granite, with lead sheets covering the domes. Interior decorative elements include Iznik tiles. Reflecting Ottoman structural clarity and spiritual restraint.	Richly decorated with colored glass, painted stucco, glazed tile mosaics, and carved wooden elements. Known as the "Pink Mosque," its vibrant materials create an immersive and sensorially rich interior that changes with daylight.	Features white Sivec marble from Macedonia, gold-plated detailing, semi-precious stones, and mother-of-pearl inlays. Advanced materials such as fiber optics, crystal chandeliers, and marble mosaics reflect a contemporary luxury.

Table 1. Comparative analysis of traditional and modern Islamic architectural elements (By author).

Conclusion

The comparative analysis reveals a continuity of Islamic aesthetic principles such as symmetry, pattern, and calligraphy across all three mosques, regardless of their historical period or geographic origin. However, each building reflects its cultural and technological context: the Süleymaniye Mosque exemplifies structural grandeur and Ottoman unity; the Nasir al-Mulk Mosque emphasizes sensory richness through chromatic tilework and symbolic geometry; and the Sheikh Zayed Grand Mosque reinterprets traditional forms through modern engineering and luxurious materials. This study underscores how Islamic architecture adapts over time while maintaining its core spiritual and formal values. (By author)

9. FINDING AND CONCLUSION

The study examined the evolving relationship between tradition and modernity in Islamic Mosque architecture through a comparative analysis of three prominent examples: the Süleymaniye Mosque (Istanbul), the Nasir al-Mulk Mosque (Shiraz), and the Sheikh Zayed Grand Mosque (Abu Dhabi). The analysis highlights how core Islamic architectural principles such as geometric shapes, proportional harmony, the use of pattern, ornamentation, and calligraphy have been preserved, adapted, or reinterpreted across different historical and cultural contexts. The Süleymaniye Mosque exemplifies the classical Ottoman synthesis of Byzantine spatial frameworks with Islamic symbolic geometry. Its symmetrical arrangement, proportional precision, and structural clarity express a theological order that translates into architectural form. Sinan's use of domes, arches, and muqarnas creates a sense of balance and transcendence, reinforcing the metaphysical ideals embedded in traditional Islamic architecture. In contrast, the Nasir al-Mulk Mosque demonstrates the richness of Persian architectural tradition during the Qajar period. Through its elaborate tilework, vibrant stained-glass windows, and intricate floral and geometric motifs, it transforms natural light into a spiritual medium. The mosque's visual complexity reflects the Persian emphasis on metaphysical symbolism, where aesthetics serve both ornamental and spiritual purposes. The Sheikh Zayed Grand Mosque represents a contemporary reinterpretation of Islamic architecture. It integrates classical architectural vocabulary such as domes, arcades, and calligraphy with cutting-edge construction techniques and modern materials. While it succeeds in creating a monumental and spiritually resonant space, the mosque also illustrates challenges faced by modern Islamic architecture, particularly the risk of aestheticizing tradition without fully engaging its symbolic or structural meaning. Across these case studies, it becomes evident that while traditional mosques maintain spiritual and architectural coherence through established principles, contemporary designs must navigate tensions between innovation and authenticity. The Sheikh Zayed Grand Mosque, for instance, achieves a commendable balance between heritage and modernity, though certain symbolic layers remain more representational than integrative. One limitation of this study lies in its primary focus on formal and spatial elements, without a detailed exploration of user experience, environmental performance, or sociopolitical influences. Future research should address these dimensions to provide a more holistic understanding of mosque architecture in diverse contexts. In summary, this research affirms that Islamic architecture is not static but continuously evolving. The enduring relevance of Islamic design lies in its adaptability its ability to reflect spiritual truths through evolving materials, forms, and techniques. For future mosque architecture, the challenge remains to preserve the symbolic and spiritual depth of Islamic traditions while embracing contemporary needs and technologies in meaningful, context-sensitive ways.

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