

Chapter 2

Adaptive Pattern Language in Ottoman Sacred Architecture

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Introduction

Sacred architecture has long served as a materialization of cosmological and socio-religious order, spiritual aspirations, and social cohesion (Silva Leite et al., 2024). In Islamic traditions, the mosque is not merely a ritual site but a spatial articulation of metaphysical principles such as *tawhīd* (unity), *qibla* (directionality), and *ṭahāra* (purity). From its earliest forms, Islamic architecture has developed a symbolic vocabulary where elements such as domes, mihrabs, courtyards, and thresholds mediate between the earthly and the divine, guiding worshippers through structured sacred experiences (Frishman & Khan, 2002; Necipoglu, 2010; Okasha, 1994; Serageldin, 1996).

Within this broader tradition, Ottoman mosque architecture represents a high point of theological, cultural, and spatial synthesis (Alioğlu & Köroğlu, 2011; Kuban, 1997, 2007; Kuran, 1968; Mustafa & Hassan, 2013; Necipoglu, 2010). The works of Mimar Sinan, chief architect of the Ottoman Empire, are widely recognized for their formal clarity, geometric rigor, and integration of symbolic meaning with functional spatial choreography (Kuban, 1987, 1997, 2007; Kuran, 1968; Necipoglu, 2010). His projects are characterized by centralized plans, axial hierarchies, domical sequences, and an urban-scale vision that situates the mosque not only as a ritual core but as a civic and cosmological center.

Despite extensive scholarship on Ottoman mosque architecture—particularly the oeuvre of Mimar Sinan—existing analyses have predominantly focused on structural innovations, stylistic development, and historical typologies. Much of the scholarship either emphasizes engineering ingenuity or stylistic evolution, under-addressing the interpretive, symbolic, and ritualistic logic embedded in spatial form (Kuran, 1968, 1988; Mustafa & Hassan, 2013). These studies, while foundational, often operate within a formalist or materialist paradigm, thereby under-theorizing the symbolic and ritual dimensions that define sacred spatial experience in Islamic traditions. As such, there remains a critical need for analytical tools that bridge architectural form with religious epistemologies and lived theological practices.

One reason for this gap lies in the limitations of existing spatial frameworks. Christopher Alexander's *A Pattern Language* (1977), though influential in secular design discourse, lacks the theological and symbolic sensitivity required to decode sacred Islamic architecture. While Alexander's system offers transferable spatial archetypes, its universalist orientation overlooks the ritual specificity and metaphysical intentionality that define mosque design.

This conceptual limitation becomes especially apparent in the analysis of Ottoman mosques, where sacredness is not merely symbolized but spatially enacted through orientation, procession, materiality, and symbolic thresholds. Yet few analytical frameworks exist that decode this spatial theology in a systematic, culturally embedded way.

This study thus addresses a twofold research gap:

1. a theoretical gap in understanding how sacred meaning is spatialized within mosque architecture, and
2. a methodological gap in adapting architectural pattern theory to the theological and ritual logic of Islamic architecture.

This study aims to develop a culturally embedded analytical framework for decoding sacred spatial logic in Islamic architecture, with a specific focus on Ottoman mosque architecture. The objectives are threefold:

1. To reinterpret selected patterns from Christopher Alexander's *A Pattern Language* through the lens of Islamic theological symbolism and ritual structure.
2. To construct a pattern-based framework—the *Pattern Language for Ottoman Mosque Architecture*—that identifies and systematizes spatial, symbolic, and experiential principles in sacred mosque architecture.

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3. To apply this framework to the Şehzade Mosque by Mimar Sinan, analyzing how sacred meaning is encoded through spatial form, material articulation, and symbolic sequencing.

This study proceeds from the following analytical hypotheses:

H1: The original formulations of Alexander's patterns are insufficient for interpreting Islamic sacred space due to their secular and functionalist epistemology.

H2: Ottoman mosque architecture operates as a spatial theology, where ritual, cosmological, and symbolic meanings are encoded through specific spatial strategies and formal compositions.

H3: A reconfigured pattern framework, grounded in Islamic epistemology, can more effectively decode the layered sacred logic of mosque architecture and serve as a generative tool for contemporary religious design.

This study contributes to architectural theory by proposing a culturally specific, symbolically attuned reinterpretation of pattern language theory. It challenges the secular and universalist assumptions embedded in widely used frameworks such as Alexander's Pattern Language, and demonstrates the necessity of epistemological pluralism in analyzing religious architecture. By developing a pattern-based methodology rooted in Islamic theological and spatial principles, the research offers an interpretive tool for reading sacred architecture as a system of ritual intelligence and metaphysical intentionality. In doing so, it not only deepens the scholarly understanding of Ottoman mosque design, but also provides a generative vocabulary for architects engaged in the design of contemporary religious spaces.

The structure of the paper is as follows:

- Section 2 outlines the methodological orientation of the study, including the case study design, analytical scope, data sources, and the development of the adapted pattern framework.
- Section 3 presents the findings through the application of the framework to the Şehzade Mosque, analyzing how sacred meaning is spatialized across four symbolic domains.
- Section 4 discusses the theoretical implications of the results, situates the findings within existing scholarship, and reflects on methodological strengths and limitations.
- Section 5 concludes the paper by summarizing the key contributions, acknowledging limitations, and offering directions for future research and design practice.

Materials and Methods

Study Design and Case Setting: This research adopts a qualitative, interpretive methodology situated at the intersection of sacred space theory, architectural typology, and symbolic-spatial analysis. It is grounded in the premise that sacred architecture functions as an epistemological medium through which theology, ritual, and metaphysical meaning are spatially enacted. Rather than relying on empirical measurement or behavioral observation, the study applies a hermeneutic approach—treating architectural form as a structured language of symbolic expression and theological intentionality.

The methodological framework is anchored in a critical reinterpretation of Christopher Alexander's *A Pattern Language* (1977), adapted to reflect Islamic spatial epistemologies. The research does not apply Alexander's patterns directly but transforms them into a culturally embedded analytical tool, capable of decoding sacred spatial logic in mosque architecture. Patterns are thus treated not as functional typologies, but as symbolic and ritual configurations that generate sacred experience.

The study is structured as a single-case, theory-building inquiry centered on the Şehzade Mosque, designed by Mimar Sinan and completed in 1548. As Sinan's first major imperial commission, the mosque holds particular importance in the development of the Ottoman architectural discourse. It demonstrates typological clarity, axial symmetry, centralized planning, and symbolic layering—all of which make it methodologically well-suited for testing the adapted pattern framework. The mosque's integration of commemorative, theological, and multiple functions also exemplifies the multidimensional role of sacred architecture in Ottoman urban and spiritual life (Ediz & Ostwald, 2012; Freely, 2011; Kuban, 2007; Kuran, 1968; Necipoglu, 2010).

The Şehzade Mosque, located in Istanbul's historic Fatih district, was selected for its methodological clarity and typological significance. As an early yet mature example of Sinan's centralized mosque design, it exemplifies the integration of formal order, symbolic geometry, and spatial hierarchy. Its legible planning system and rich architectural articulation allow for a systematic tracing of ritual sequences, spatial transitions, and symbolic elements. These characteristics make the mosque an effective and coherent subject for applying the adapted pattern framework and for investigating how sacred meaning is spatialized within Ottoman mosque architecture (Ediz & Ostwald, 2012; Freely, 2011; Geisler, 2019; Günay, 2020; Mårtelius, 2015; Necipoglu, 2010).



Figure 1. Şehzade Mosque (From: Archnet).

The analytical subject of this study is the architectural and symbolic-spatial system of the Şehzade Mosque, treated not as a static formal object but as a structured expression of theological, ritual, and cosmological meaning. The analysis focuses on how spatial form, sequencing, geometry, orientation, ornamentation, and environmental modulation contribute to the encoding of sacred presence within the mosque's architectural language.

The scope of analysis includes:

- Architectural elements: floor plans, sectional hierarchies, dome structures, circulation paths, thresholds, arcades, courtyards, and mihrab.
- Symbolic and ornamental content: such as calligraphy, geometric patterns, light-filtering systems, and material articulation.
- Ritual-spatial sequences: transitions from profane to sacred zones, stages of purification and prayer preparation, and spatial framing of movement.
- The study does not engage in ethnographic observation or behavioral studies of worshippers, nor does it analyze post-Ottoman modifications or comparative typologies across geographic regions. The aim is not to generalize across mosque forms, but to produce a theory-driven, symbolically embedded reading of sacred space as it is architecturally encoded in a canonical Ottoman context.

The mosque is thus analyzed as a semiotic and ritual field—where formal strategies are treated as operative patterns that convey theological and cosmological intentionality. These patterns serve as the unit of analysis through which Alexander's framework is reinterpreted and reapplied.

This study is based on a triangulated set of materials combining architectural documentation, visual records, and textual-theoretical sources. These materials were selected to support a culturally embedded, symbolically attuned reading of the Şehzade Mosque, and to facilitate the reinterpretation of architectural patterns within an Islamic theological and ritual framework.

Primary architectural documentation—comprising plans, sections, and elevations of the Şehzade Mosque—was obtained from the Archnet digital repository, a reputable platform for scholarly architectural resources. These orthographic drawings formed the basis for identifying spatial hierarchies, circulation paths, axial symmetries, and formal compositions, enabling the precise mapping of spatial sequences and ritual transitions.

Visual materials, including high-resolution photography, satellite imagery, and on-site documentation, were used to verify spatial configurations and material articulation. These images supported the analysis of symbolic elements such as inscriptions, muqarnas, dome ornamentation, and patterns of natural light. Particular attention was given to the role of ornamentation in constructing a non-figurative symbolic field aligned with Islamic theological aesthetics.

Textual sources played a critical role in shaping the analytical framework. Historical and interpretive literature on Ottoman mosque architecture, sacred space, and Islamic symbolism—including the writings of Necipoğlu (2010), Kuran (1968, 1988), Waziri (2008), Frishman and Khan (2002), Kuban (1987, 2007) and Freely (2011)—provided the necessary cultural and theological context for spatial interpretation. In parallel, theoretical texts on architectural typology and pattern theory, particularly Christopher Alexander's *A Pattern Language* (1977), informed the methodological logic of pattern extraction and reinterpretation. Where relevant, classical Islamic theological and exegetical sources were consulted to align symbolic readings with Qur'anic and Hadithic principles, particularly in relation to ritual space, purity, and divine orientation.

Together, these materials formed an integrated analytical base for reconstructing a pattern language specific to mosque architecture—grounded in spatial observation, historical context, symbolic interpretation, and theological coherence.

The methodological core of this study lies in the critical adaptation of Christopher Alexander's *A Pattern Language* (1977) to the symbolic and theological context of Islamic sacred architecture. Alexander's original framework, while generative in secular and functionalist design contexts, does not account for the metaphysical intentionality and ritual specificity that characterize mosque architecture. Consequently, the study develops an

alternative pattern logic—a Pattern Language for Ottoman Mosque Architecture—by reinterpreting and expanding upon Alexander’s typologies through an Islamic epistemological lens.

The development of this framework followed a four-phase interpretive protocol. First, a set of 29 spatial patterns was selectively extracted from Alexander’s corpus based on their potential resonance with sacred architectural conditions. These included patterns such as Entrance Transition, Courtyards Which Live, Hierarchy of Open Space, Filtered Light, and Ornament. While these patterns offered spatial clarity, they lacked theological depth, omitting ritual gradation, qibla logic, or metaphysical orientation. Each pattern was thus subjected to a process of conceptual critique and symbolic reassessment in light of Islamic architectural theory, ritual practice, and theological sources.

Second, each selected pattern was mapped onto the architectural structure and spatial system of the Şehzade Mosque. This mapping allowed for the identification of ritual pathways, symbolic thresholds, dome hierarchies, light configurations, and ornamentation as sacred operations rather than merely aesthetic or functional features. Where conceptual gaps emerged—such as the absence of ritual purity (ṭahāra) or directional sanctity (qibla)—new patterns were formulated to supplement or replace Alexander’s original formulations.

Third, the resulting pattern set was organized into a structured framework composed of four interrelated macro-domains:

1. Ritual and Sacred Logics, including ablution spaces, directional thresholds, and hierarchies of sanctity;
2. Spatial and Formal Organization, such as centralized dome geometry, axial orientation, and spatial sequencing;
3. Symbolic and Cultural Layers, involving ornament, calligraphy, muqarnas, and various symbolic elements; and
4. Environmental and Experiential Conditions, such as light modulation, sound absorption, and material tactility designed to induce spiritual inwardness.

Finally, the framework was refined through an iterative analytical process in which each reinterpreted pattern was systematically applied to the spatial and symbolic structure of the Şehzade Mosque. Patterns were evaluated for their theological coherence, spatial correspondence, and symbolic consistency within the mosque’s architectural system. This process involved ongoing adjustments to ensure that each pattern reflected not only formal and functional attributes, but also conformed to Islamic ritual logic and metaphysical principles. Interpretations were cross-referenced with Qur’anic exegesis, Hadith traditions, and classical texts in Islamic architectural theory to maintain cultural and epistemological integrity. In doing so, the framework was not used to impose meaning upon architectural form, but to uncover and articulate sacred intentionalities already encoded within the Ottoman mosque typology.

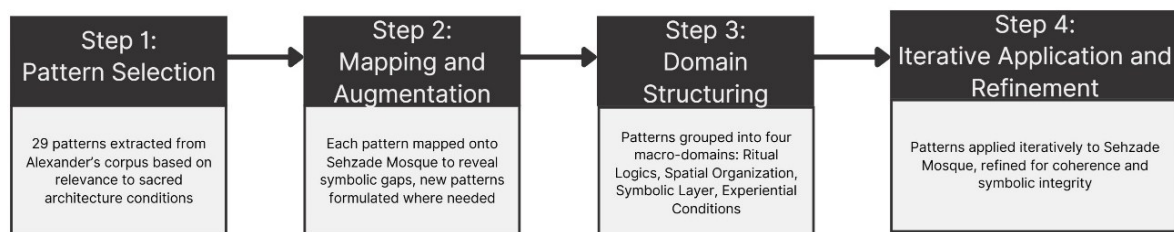


Figure 2. Pattern Development Protocol.

The analytical phase of this study involved a structured interpretive process combining spatial analysis, symbolic mapping, and theological correlation. These techniques were used to apply the reinterpreted pattern framework to the Şehzade Mosque and to identify how sacred meaning is encoded within its spatial configuration.

Spatial diagramming was used to analyze architectural hierarchies, threshold sequences, circulation flows, and geometric compositions. Drawings sourced from Archnet and scholarly archives were reinterpreted through scaled overlays and annotated mappings to reveal how the mosque orchestrates ritual movement, sacred orientation, and spatial gradients of sanctity. Special focus was given to axial symmetry, centralization, dome hierarchies, and the spatial rhythm connecting courtyard, portico, and prayer hall.

Symbolic mapping involved the visual and conceptual identification of non-figurative ornamentation, calligraphic inscriptions, muqarnas, and light-filtering devices, and their alignment with Islamic theological aesthetics. These elements were not treated as decorative surfaces but as semiotic fields—channels for transmitting metaphysical meaning and mnemonic functions related to divine remembrance (dhikr), purity, and cosmological order.

Textual interpretation was conducted in parallel to spatial analysis. Patterns were interpreted not only through visual-spatial analysis but also through engagement with theological and historical texts. Qur’anic and Hadithic references were consulted to contextualize the symbolic dimensions of key spatial elements (e.g., the significance of light, the sanctity of orientation, the ritual function of ablution), while architectural theory provided a secondary frame for symbolic legibility.

Finally, cross-referencing and triangulation ensured that each pattern interpretation was consistent across architectural, symbolic, and theological registers. Visual findings were systematically compared with the theoretical logic of the framework to maintain internal coherence, and with historical accounts of Sinan's work to preserve contextual authenticity. This multilayered analytical process enabled a reading of the Şehzade Mosque not only as a historical structure, but as a spatial embodiment of Islamic sacred ontology.

Presentation of Key Findings

The analytical application of the reinterpreted pattern framework to the Şehzade Mosque yielded a comprehensive reading of the mosque as a spatial-theological system. Through symbolic-spatial analysis, the study reveals that sacred meaning in Ottoman mosque architecture is not merely represented through ornament or ritual function but actively encoded and enacted through architectural structure, spatial hierarchy, and environmental modulation. Each component—from the sequencing of thresholds to the alignment of prayer rows—operates within a larger system of theological intentionality.

The results of the analysis are organized across four macro-domains that structure the adapted pattern language:

1. Ritual and Sacred Logics,
2. Spatial and Formal Organization,
3. Symbolic and Cultural Layers, and
4. Environmental and Experiential Conditions.

Each domain contains a set of patterns derived either from reinterpretations of Alexander's original typologies or from newly constructed formulations specific to Islamic sacred architecture.

In total, the framework comprises forty-two spatial patterns: twenty-nine adapted from Christopher Alexander's *A Pattern Language*, and fourteen newly constructed patterns designed to address ritual, symbolic, and theological dimensions not captured in the original secular framework. The adapted patterns were critically redefined through symbolic mapping and theological correlation. For example, patterns such as Entrance Transition, Paths and Goals, Hierarchy of Open Space, Filtered Light, Courtyards Which Live, and Ornament were revised to reflect sacred sequencing, spiritual orientation, and embodied ritual movement in the mosque setting.

The newly constructed patterns emerged from spatial-theological analysis and include critical concepts absent from Alexander's system. These patterns capture core Islamic spatial practices and sacred meanings: Qibla Axis, Ablution Entry Sequence, Prayer Rows, Mihrab Focus, Dome Sequence, Quiet Interiors, Calligraphic Walls, and Memorialized Core, among others. They address functions and symbolisms such as ritual purification, divine orientation, acoustic reverence, and cosmological hierarchy—each fundamental to the logic of mosque design.

Collectively, these patterns articulate a layered sacred syntax: from exterior to interior, from horizontal processions to vertical symbolism, from communal gathering to divine alignment. The findings demonstrate that the Şehzade Mosque is not simply an architectural object but a structured field of metaphysical expression—where meaning is not superimposed but architecturally embedded. The following sections present these patterns in detail, organized by domain, and supported by spatial diagrams and analytical tables.

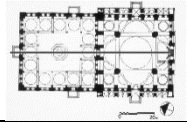
To support the analytical findings, this study integrates a set of visual tools that clarify the structure and application of the pattern framework. A comparative pattern table presents all forty-two patterns, distinguishing between those adapted from Alexander's *A Pattern Language* and those newly constructed through symbolic and theological analysis. Each pattern is listed with its domain classification, dominant function, and corresponding spatial manifestation in the Şehzade Mosque.

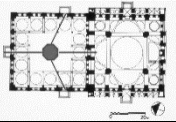
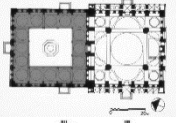
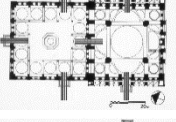
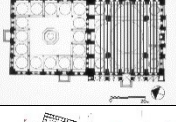
In addition, a series of annotated diagrams overlays selected patterns onto architectural plans and sections of the mosque. These visual mappings highlight how sacred meaning is embedded in elements such as entrance sequences, dome hierarchies, prayer alignments, and calligraphic zones. A framework diagram also visualizes the four macro-domains, illustrating how each contributes to the layered structure of sacred experience—ritual, spatial, symbolic, and experiential.

These figures function as essential components of the research, translating abstract pattern logic into concrete spatial analysis and offering a replicable visual model for interpreting sacred architecture.

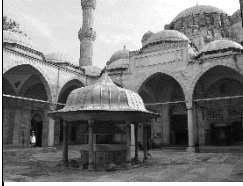
Table 1. Pattern Matrix Organized by Domain → Pattern Type → Name → Source → Function → Spatial Manifestation

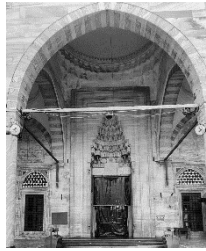
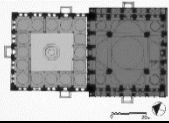
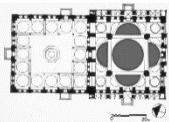
1. Ritual and Sacred Logics

Pattern Name	Type	Function	Spatial Manifestation	Image
Qibla Axis (01)	Original	Ritual/Spatial	Orientation of prayer hall, mihrab alignment	

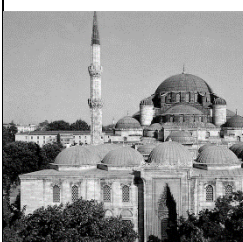
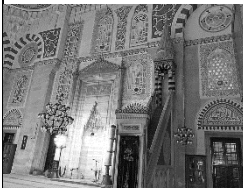
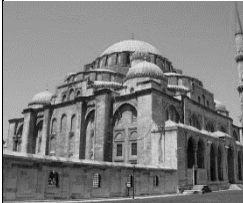
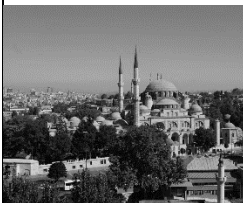
Ablution Sequence Entry (02)	Original	Ritual	Sequential transition from courtyard to prayer space via ablution facilities	
Entrance to Sacred Zone (03)	Original	Ritual	Arcade thresholds, transition from public to sacred domain	
Prayer Movement Paths (04)	Original	Ritual	Directional flow of movement during prayers	
Prayer Rows (05)	Original	Ritual/Social	Aligned rows within main prayer hall, emphasizing unity	
Paths and Goals (120)	Adapted	Ritual/Spatial	Spatial progression from entrance to focal point	
Holy Ground (66)	Adapted	Ritual/Symbolic	Sanctification of prayer space through placement and hierarchy	
Pools and Streams (64)	Adapted	Ritual/Experiential	Ablution fountains in courtyard	

2. Spatial and Formal Organization

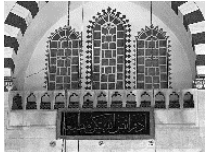
Pattern Name	Type	Function	Spatial Manifestation	Image
Entrance Transition (112)	Adapted	Spatial	Layered portals, elevation change at entry	
Main Entrance (110)	Adapted	Spatial	Frontal orientation and articulation of entry	

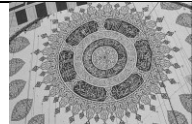
Family of Entrances (102)	Adapted	Spatial	Differentiated side and main entries	
Circulation Realms (98)	Adapted	Spatial	Progressive entry realms (courtyard, arcade, hall)	
Hierarchy of Open Space (114)	Adapted	Spatial	Transition from open (courtyard) to enclosed (prayer hall)	
Courtyards Which Live (115), Common land (67)	Adapted	Spatial/Social	Central courtyard as functional and symbolic gathering space	
Building Complex (95)	Adapted	Spatial	Modular arrangement of mosque and auxiliary structures	
Roof Caps (232)	Adapted	Spatial	Cascading domes and visual termination	
Cascade of Roofs (116), Sheltering Roof (117)	Adapted	Spatial	Hierarchical arrangement dome around central core	
Dome Sequence (06)	Original	Spatial	Progression of domes as cosmological structure	
Mihrab Focus (07)	Original	Spatial/Theological	Spatial concentration around the mihrab zone	

3. Symbolic and Cultural Layers

Pattern Name	Type	Function	Spatial Manifestation	Image
Calligraphic Walls (08)	Original	Symbolic	Qur'anic inscriptions across interior zones	
Memorialized Core (09)	Original	Symbolic/Spatial	Placement of Şehzade tomb integrated within complex	
Sacred Sites (24)	Adapted	Symbolic	Spatial memory and historical sacredness	
High Places (62)	Adapted	Symbolic	Verticality and domical visibility	
Ornament (249)	Adapted	Symbolic	Non-figurative ornament and calligraphy	
Building Fronts (122)	Adapted	Symbolic	Façade articulation communicating purpose	
Sacred Skyline (010)	Original	Symbolic	Mosque silhouette as urban-symbolic anchor	

4. Environmental and Experiential Conditions

Pattern Name	Type	Function	Spatial Manifestation	Image
Filtered Light (238) and small Panes (239)	Adapted	Experiential	Use of stained glass, clerestories	
Indoor Sunlight (128)	Adapted	Experiential	Orientation of domes and windows	

Light on Two Sides (159)	Adapted	Experiential	Double-sided light in galleries	
Layered Light (011)	Original	Experiential	Temporal modulation of light in relation to time of day and ritual	
Floor Surface (233)	Adapted	Experiential	Texture and tactility of carpeted floors	
Soft Inside Walls (235)	Adapted	Experiential	Acoustic dampening and visual softness	
Warm Colors (250)	Adapted	Experiential	Chromatic tones within interior decoration	
Quiet Interiors (012)	Original	Experiential	Acoustic stillness to support inward focus	
Connection to Earth (168)	Adapted	Experiential	Groundedness through low platforms, steps	
Thickening Outer Walls (211)	Adapted	Experiential	Buffering external noise and thermal insulation	
Arcades (119), Floor-Ceiling Vaults (219)	Adapted	Spatial/Experiential	Covered circulation and spatial rhythm	
Repetitive Spatial Rhythm (013)	Original	Spatial/Experiential	Repetition of arches, domes, bays as symbolic rhythm	

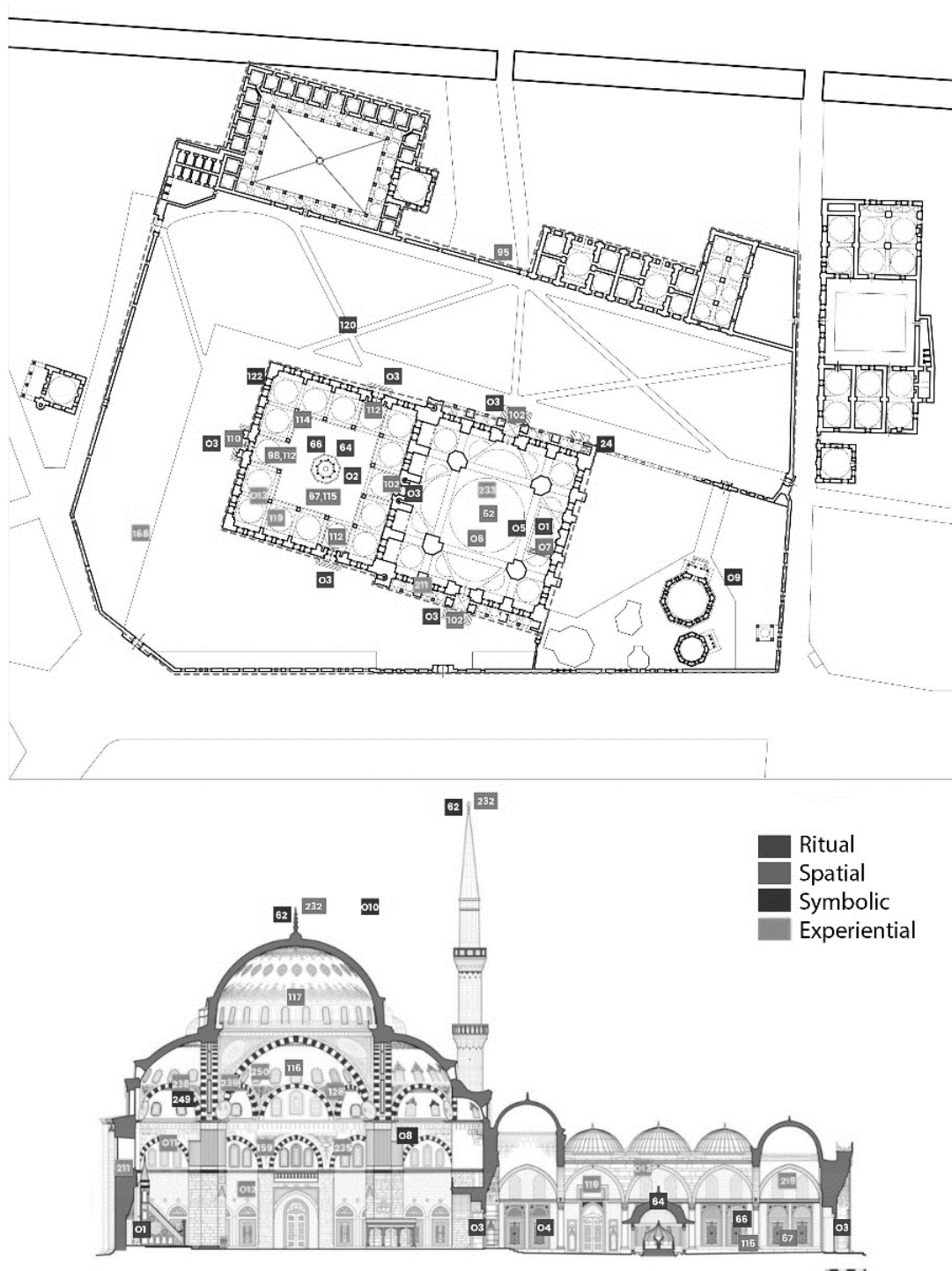


Figure 3. Pattern Overlay Map of the Şehzade Mosque Floor Plan. Selected patterns are annotated according to their spatial manifestation and symbolic role, color-coded by macro-domain.

Pattern Distribution and Thematic Cross-Relations

The developed pattern framework demonstrates a structured distribution of symbolic-spatial functions across four macro-domains. While each pattern was initially classified according to its dominant logic—ritual, spatial, symbolic, or experiential—the analysis reveals significant thematic overlaps and cross-domain interactions, indicating a layered architectural and theological system.

Of the forty-two patterns, the largest concentration appears in the Spatial and Formal Organization domain, which reflects the architectural clarity and compositional hierarchy of Sinan's design. This includes patterns such as Hierarchy of Open Space, Prayer Rows, Main Entrance, and Dome Sequence, all of which define spatial progression, centralization, and enclosure. The Ritual and Sacred Logics domain follows, comprising patterns that structure bodily purification, directional alignment, and sacred access—such as Ablution Entry Sequence, Qibla Axis, and Entrance to Sacred Zone.

The Symbolic and Cultural Layers domain contains patterns like Calligraphic Walls, Sacred Skyline, and Memorialized Core, which articulate theological memory and cosmological reference. Finally, the Environmental and Experiential Conditions domain emphasizes atmospheric depth and sensory engagement through patterns like Filtered Light, Quiet Interiors, and Repetitive Spatial Rhythm. These relationships are summarized in Table 2, which shows how patterns are distributed across the four domains, and identifies overlaps in their symbolic operation.

A key insight from this distribution is the inter-domain operation of several patterns. For example, Courtyards Which Live participates in both Spatial and Experiential domains, functioning as a transitional node and sensory field. Dome Sequence links Formal Hierarchy with Symbolic Verticality, while Prayer Rows spans Spatial, Ritual, and Social meanings.

These thematic overlaps reveal that the pattern framework operates not as a static classification, but as a semiotic lattice—a network of spatial-symbolic relations in which architectural elements carry multiple layers of theological significance. This structural interdependence echoes the Islamic principle of *tawhīd* (divine unity), where sacred space integrates form, function, and meaning as a coherent epistemological system.

Table 2. Pattern Distribution by Macro-Domain

Macro Domain	Total Patterns	Adapted	Original	Cross-Domain Overlaps
Ritual and Sacred Logics	8	3	5	5
Spatial and Formal Organization	13	11	2	2
Symbolic and Cultural Layers	7	4	3	1
Environmental and Experiential	14	11	3	2
Total	42	29	13	

Note: Some patterns appear in multiple domains, reinforcing their layered symbolic function

Table 3. Thematic Correlation Table: Theological and Spatial Relations

Pattern Name	Macro Domain	Theological Reference	Symbolic Function	Spatial Zone
Qibla Axis	Ritual & Sacred Logics	Quran 2:144	Divine orientation	Mihrab and prayer hall
Ablution Entry Sequence	Ritual & Sacred Logics	Sahih al-Bukhari 164	Ritual purification	Courtyard and entrance
Entrance to Sacred Zone	Ritual & Sacred Logics	Quran 24:36	Threshold demarcation	Arcade thresholds, Entrances
Prayer Movement Paths	Ritual & Sacred Logics	Sahih al-Bukhari 510	Directed ritual flow	Main Prayer hall
Prayer Rows	Ritual & Sacred Logics	Sahih al-Bukhari 723	Communal alignment	Main Prayer hall
Paths and Goals	Ritual & Sacred Logics	Quran 6:153	Spiritual journey	Processional axis
Holy Ground	Ritual & Sacred Logics	Quran 20:12	Sanctity encoding	Prayer space
Pools and Streams	Ritual & Sacred Logics	Sahih Muslim 241	Purificatory symbolism	Courtyard fountains
Entrance Transition	Spatial & Formal Organization	Quran 7:31	Ritual and ethical preparation	Entry gates
Main Entrance	Spatial & Formal Organization	Quran 24:36	Liminal transformation	Frontal gate
Family of Entrances	Spatial & Formal Organization	Sunan Abu Dawood 462	inclusive participation; architectural hospitality guided by ethical order	Side and main entrances
Circulation Realms	Spatial & Formal Organization	Quran 6:153, Sahih Muslim 867	Segregated flows, Avoidance of disruption during prayer, Pathway integrity aligned with qibla and sanctity	Courtyard to prayer hall

Hierarchy of Open Space	Spatial & Formal Organization	Sahih al-Bukhari 470	Sacred gradation encoded in space—architectural progression from public approach to divine nearness	Aracades, Courtyard, prayer hall
Courtyards Which Live	Spatial & Formal Organization	Quran 9:18	Courtyard as a spiritual agora—hosting collective life, ritual overflow, and ambient sanctity	Courtyard
Common land	Spatial & Formal Organization	Quran 49:13	pace of mutual access, spiritual encounter, and civic mercy	Courtyard, prayer hall
Building Complex	Spatial & Formal Organization	Masjid al-Nabawi	Spatial unity of sacred, civic, and memorial	Mosque, tombs, fountain
Roof Caps	Spatial & Formal Organization	Quran 57:4	the axis of divine sovereignty	Roofline articulation
Cascade of Roofs	Spatial & Formal Organization	Quran 67:3	Sequential domes mirror celestial strata—spatial metaphor for ascent toward divine oneness	Layered domes
Sheltering Roof	Spatial & Formal Organization	Quran 38:27	The dome is like the revolving heavens	Prayer Hall roof, arcades
Dome Sequence	Spatial & Formal Organization	Quran 112:1-4	Central dome symbolizes divine oneness; dome hierarchy mirrors cosmological order	Central and half domes
Mihrab Focus	Spatial & Formal Organization	Quran 2:44	Spatial and spiritual directionality	Mihrab
Calligraphic Walls	Symbolic & Cultural Layers	Quran 24:35	Text as light and guidance	Interior inscriptions
Memorialized Core	Symbolic & Cultural Layers	Islam's strict position on grave worship and elevation of tombs (per Hadith in Sahih Muslim and Sahih Bukhari) led to debates: Scholars like Ibn Taymiyyah and al-Shawkānī condemned elaborate tomb structures within mosques. However, Sunni Ottoman jurists (especially Ḥanafīs) permitted them under specific conditions of intention and structure—seeing them as memorials, not objects of veneration.	Architectural assertion of dynastic piety—tombs placed near prayer halls to embody charitable continuity and proximity to sanctity	Sehzade tomb zone
Sacred Sites	Symbolic & Cultural Layers	Quran 2:125	divine encounter, prophetic memory, and architectural continuity—preserved through form, not figuration.	Historic plot
High Places	Symbolic & Cultural Layers	Quran 23:17	cosmic verticality	Dome and minaret prominence
Ornament	Symbolic & Cultural Layers	Quran 16:6	Non-figurative theology and visual dhikr	Interior decorations

Building Fronts	Symbolic & Cultural Layers	Quran 22:26	The façade of a mosque announces purity of function and clarity of spiritual orientation	Entrance facade
Sacred Skyline	Symbolic & Cultural Layers	Quran 24:36	Vertical testimony—mosque skyline as urban dhikr, asserting sacred presence in public realm	Minarets and domes
Filtered Light, Small Panes, Indoor Sunlight, Light on Two Sides, Layered Light	Environmental & Experiential	Quran 24:35	Spiritual illumination	Clerestories, stained glass, Window orientation, side walls, light gradients
Floor Surface	Environmental & Experiential	Quran 20:12	Consecrated ground	Carpeted prayer hall
Soft Inside Walls	Environmental & Experiential	Quran 16:6	divine beauty	Interior walls
Warm Colors	Environmental & Experiential	Quran 16:13	invoking remembrance (dhikr) and stimulating reflection	Interior palette
Quiet Interiors	Environmental & Experiential	Quran 22:32	Contemplative silence	Prayer hall
Connection to Earth	Environmental & Experiential	Quran 20:55, Sahih Muslim 522a	Material rootedness and ground symbolism	Steps, platform, garden
Thickening Outer Walls	Environmental & Experiential	Quran 16:80	Sanctified enclosure—walls separate profane exterior from sacred interior	Walls
Arcades	Environmental & Experiential	Quran 55:17	Ritual passage	Arcades
Floor-Ceiling Vaults	Environmental & Experiential	Quran 88:18	Architectural heavens	Ceiling vaults
Repetitive Spatial Rythms	Environmental & Experiential	Quran 39:23	Symbolic sequence	Arches, domes

Architectural Concentration and Spatial Layers

The spatial analysis of the Şehzade Mosque reveals that sacred meaning is not evenly distributed across the architectural ensemble, but rather intensely concentrated in specific zones, where multiple patterns converge and reinforce each other. These pattern clusters are not arbitrary; they align with core theological functions, ritual sequences, and symbolic hierarchies embedded in the Islamic conception of sacred space.

The entrance and threshold zone serves as the critical interface between the profane urban exterior and the sanctified interior. This zone concentrates several patterns—Entrance Transition, Ablution Entry Sequence, Paths and Goals, and Entrance to Sacred Zone—which collectively construct a graduated ritual threshold. The spatial configuration of porticoes, fountains, and layered gateways guides the visitor through stages of purification and psychological orientation, choreographing a bodily transition toward divine presence. This architectural sequence transforms movement into ritualized enactment, echoing Islamic epistemologies of preparation and intentionality.

Beyond the threshold, the central courtyard operates as a spatial hinge and liminal field. Patterns such as Courtyards Which Live, Filtered Light, Connection to the Earth, and Memorialized Core converge here, making the courtyard a site of both liturgical anticipation and symbolic memory. The integration of the Şehzade Mehmed tomb into the courtyard fabric intensifies its function, linking ritual purification with dynastic remembrance and cosmological reflection. In this zone, sacredness emerges not only through function but through spatial commemoration and symbolic atmosphere.

At the heart of the mosque, the prayer hall functions as the most saturated symbolic field. It is shaped by a dense convergence of patterns including Qibla Axis, Prayer Rows, Mihrab Focus, Calligraphic Walls, Hierarchy of

Open Space, and Quiet Interiors. These patterns collectively align the physical body, architectural form, and theological intention. The hall spatializes the core Islamic principle of *tawhīd*—the unity of divine orientation, community structure, and contemplative silence—through the integration of directional geometry, scriptural ornamentation, and acoustic calm.

Above, the dome structure reinforces this symbolic verticality. Patterns such as Dome Sequence, Roof Caps, Light on Two Sides, and Sacred Skyline articulate a cosmological hierarchy that transitions from the grounded alignment of prayer to the metaphysical register of divine transcendence. The central dome, surrounded by cascading smaller domes, becomes not merely a structural element but a symbolic vessel of ascent—reinforcing the theological verticality of the sacred experience.

Even in peripheral spaces—side galleries, corridors, and auxiliary structures—symbolic density persists. Patterns like Family of Entrances, Soft Inside Walls, and Warm Colors articulate inclusivity, environmental modulation, and sensory comfort. These areas support a broader conception of the mosque as both a spiritual and civic institution, where contemplation, teaching, and community co-exist with formal liturgical practice.

In totality, the spatial concentration of patterns reveals the mosque as a layered field of sacred operations. Rather than a single monumental gesture, sacredness is produced through architectural coordination, where ritual, symbolism, form, and sensory experience are spatially integrated. The Şehzade Mosque thus exemplifies a sacred architecture of relational intensities, where theological meaning is not represented through image, but enacted through form.

Discussion and Conclusion

The analysis of the Şehzade Mosque through a reconfigured pattern language reveals that sacredness in Ottoman mosque architecture is not a fixed symbolic attribute but a relational condition, constructed through layered spatial operations. Patterns such as Ablution Entry Sequence, Qibla Axis, Dome Sequence, and Calligraphic Walls demonstrate that theological meaning emerges through the coordination of movement, orientation, vertical hierarchy, and non-figurative inscription. The mosque does not illustrate sacredness; it performs it—through spatial progression, bodily alignment, environmental modulation, and scriptural embodiment.

One of the central findings is that sacred meaning in Islamic architecture operates across domains, requiring analytical models that are both spatially rigorous and theologically grounded. The high incidence of cross-domain patterns—such as Prayer Rows or Courtyards Which Live—confirms that sacred experience is never isolated within a single architectural logic (e.g., form, ritual, or aesthetics), but produced through their integration. The analytical utility of macro-domains lies not in compartmentalization, but in revealing how these layers intersect and intensify at key spatial nodes.

The reinterpretation of Alexander's patterns reveals both the potential and the limits of transposing secular design theory into sacred contexts. While many of his patterns—Entrance Transition, Filtered Light, Paths and Goals—retain architectural value, they required epistemological reorientation to capture the theological and ritual dimensions embedded in mosque architecture. The new patterns constructed—such as Mihrab Focus, Calligraphic Walls, and Memorialized Core—fill critical symbolic gaps and illustrate the necessity of cultural and religious specificity in pattern languages for sacred space.

These findings confirm that sacred architecture, particularly in the Ottoman-Islamic tradition, cannot be adequately theorized through typology or stylistic analysis alone. It demands a symbolic-spatial grammar, where architectural elements operate not only as formal devices but as theological instruments—structuring the believer's journey from purification to alignment, remembrance, and transcendence. The proposed pattern framework makes this grammar visible, interpretable, and adaptable to both scholarly analysis and contemporary design practice.

The interpretive findings of this study both affirm and extend the work of key scholars in Islamic architectural history, sacred space theory, and design methodology. Foundational studies by scholars such as Kuban (2007) and Necipoğlu (2010) have thoroughly documented the formal typologies, stylistic evolution, and cultural significance of Ottoman mosque architecture, particularly in relation to Mimar Sinan's oeuvre. However, these studies often emphasize architectural mastery and urban symbolism without providing an analytical framework capable of decoding how sacred meaning is spatially enacted through specific architectural configurations.

This research also intersects with broader theoretical treatments of sacred space, such as those by Grabar, Waziri, and Serageldin, who have emphasized the theological and symbolic depth of Islamic architecture. While these contributions recognize that mosque architecture is more than functional typology, they tend to remain either descriptive or philosophically abstract, lacking a systematic analytical tool for interpreting sacred space as a structured symbolic field. By contrast, the pattern framework developed in this study offers a replicable system for tracing sacred meaning through spatial, ritual, symbolic, and experiential layers.

The most direct methodological comparison arises with Christopher Alexander's *A Pattern Language* (1977). Alexander's contribution lies in articulating spatial patterns that support human-centered environments through typological clarity and intuitive design logic. Yet his framework, developed in a secular and largely Euro-American context, is limited in its capacity to address ritual specificity, metaphysical symbolism, and theological

intentionality—elements essential to sacred architecture. Previous attempts to apply Alexander's framework in religious contexts have typically done so without critique or adaptation, thereby flattening cultural difference.

This study departs from that trend by offering a culturally embedded reinterpretation of selected Alexander patterns, while also constructing new patterns to capture symbolic and ritual logics specific to Islamic theology and Ottoman architectural expression. In doing so, it positions itself as both a methodological supplement to Alexander's work and a conceptual bridge between design theory and sacred spatial analysis.

In summary, while earlier studies have richly documented Ottoman mosque architecture and theorized the sacred in Islamic design, this study contributes a formalized, multi-domain analytical framework that clarifies how sacred meaning is systematically embedded in space. It does not replace historical or stylistic approaches, but rather complements them by offering a symbolic-architectural grammar grounded in Islamic epistemology and validated through spatial application.

A key strength of this study lies in its development of a culturally specific, symbolically attuned analytical framework for interpreting sacred architecture. By reconfiguring selected patterns from Alexander's *A Pattern Language* and supplementing them with new patterns grounded in Islamic ritual, theological, and spatial epistemologies, the study offers a replicable model for analyzing how sacred meaning is architecturally enacted. The four-domain structure—ritual, spatial, symbolic, experiential—provides a comprehensive interpretive lens that avoids the reductivism of purely formalist or functionalist approaches.

Another methodological strength is the use of cross-domain pattern mapping and architectural concentration analysis, which reveals not only the presence of symbolic patterns but their spatial clustering and theological intensity in specific zones of the mosque. This allows for a deeper understanding of how sacred space operates as a layered system, not simply a composition of isolated elements. The visual tools—pattern matrices, annotated overlays, and spatial diagrams—translate abstract symbolic logic into analytical clarity, enhancing both academic and design applicability.

However, the study also faces certain limitations. First, it is based on a single case study, and while the Şehzade Mosque is typologically and symbolically rich, the findings may not be generalizable across all Islamic or Ottoman mosque types. Future research should test the framework on other typologies (e.g., hypostyle, regional vernacular) to assess its adaptability.

Second, the study is conducted through interpretive symbolic analysis, which, while rigorous, remains non-empirical. It does not include user perception studies, ethnographic engagement, or historical textual analysis beyond selective theological references. These omitted dimensions may limit the framework's depth in capturing lived experience or historical nuance.

Finally, while the adapted pattern language offers theoretical and analytical value, its application in contemporary mosque design remains propositional rather than tested. Its value as a generative design tool would require application in a live design process or pedagogical setting.

Despite these limitations, the framework demonstrates significant potential as a scholarly and pedagogical tool for interpreting sacred space. Its originality lies in its capacity to synthesize symbolic, ritual, spatial, and environmental logics into a unified analytical grammar rooted in Islamic sacred architecture.

The pattern framework developed in this study has significant implications for both architectural theory and design methodology, particularly within the domain of sacred architecture. Theologically grounded yet spatially rigorous, the framework offers an alternative to conventional formalist or typological analyses by treating sacred architecture as a semiotic and ritual system. In doing so, it extends pattern theory beyond its original secular-humanist scope, demonstrating that spatial languages can be culturally specific, symbolically charged, and epistemologically plural.

For scholars of Islamic architecture, the framework provides a replicable model for interpreting mosque design as a layered theological field, rather than as a stylistic or functional artifact. It complements historical studies by offering a tool for decoding how architectural forms communicate sacred meaning through coordinated spatial, symbolic, and sensory operations.

In terms of design practice, the framework opens new possibilities for contemporary mosque design, particularly in post-traditional or pluralistic contexts where the symbolic logic of sacred space must be rearticulated without relying on historical replication. The pattern set may serve as a generative toolkit for designers seeking to integrate theological intentionality, ritual structure, and cultural continuity into new architectural expressions.

Future research should explore the application of this framework across diverse mosque typologies—including regional variants, vernacular forms, and modern reinterpretations—to assess its adaptability and limitations. Further work may also extend the methodology into other sacred traditions, enabling comparative analysis across religious architectures. Additionally, integrating user-based studies, such as perception mapping or ethnographic engagement, would deepen the framework's sensitivity to lived sacred experience and social usage.

Finally, the pattern framework may be developed into a pedagogical instrument for design education, particularly in courses focused on sacred space, cultural theory, or architecture and theology. By making visible the invisible logic of sacred form, it invites both students and practitioners to design not only with form, but with meaning.

This study developed a multi-domain pattern framework for interpreting sacred spatial logic in Islamic architecture, using the Şehzade Mosque as a case study. Drawing on and extending Christopher Alexander's A Pattern Language, the research reinterpreted twenty-nine of his original patterns through an Islamic epistemological lens and introduced thirteen new patterns specific to theological, ritual, and symbolic dimensions absent in the original system. The patterns were organized across four macro-domains—ritual, spatial, symbolic, and experiential—revealing that sacred meaning in the mosque is enacted through architectural form, movement, orientation, and atmosphere.

The framework provides a structured method for decoding sacred space that bridges design theory, Islamic theology, and architectural analysis. It shows that Ottoman mosque architecture, particularly under Sinan, operates not only through typological elegance but through an embedded symbolic grammar. The framework has potential application in contemporary mosque design, architectural pedagogy, and comparative sacred architecture studies.

This study is based on a single case and employs an interpretive symbolic method without ethnographic or empirical user data. It also does not address the design implementation of the framework in contemporary practice, which remains a subject for future application.

Future work should test the framework across other mosque typologies, regional traditions, and even non-Islamic sacred architectures to evaluate its adaptability and limits. Empirical studies involving users and designers may also deepen its interpretive scope. Further development as a pedagogical model could support design education in culturally and theologically sensitive contexts.

In a design culture increasingly marked by abstraction, eclecticism, or superficial symbolism, the need for epistemologically grounded architectural frameworks is more urgent than ever—particularly in the domain of sacred space. This study proposes that the mosque is not simply a site of worship or cultural expression, but a spatialized theology—a structured embodiment of metaphysical principles enacted through architectural form. By constructing a pattern language attuned to Islamic sacred logic, this research affirms that meaning in architecture is not accidental, aesthetic, or representational alone—it is designed, encoded, and lived. What is required, then, is not only better buildings, but better grammars of sacred form, capable of honoring both historical continuity and contemporary transformation.

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Conflict of Interests

The author(s) declare(s) no conflict of interest.

References

- Alexander, C. (1977). *A pattern language: Towns, buildings, construction*. Oxford university press.
- Alioğlu, E. F., & Köroğlu, N. (2011). Modular system in Mimar Sinan's Mosques. *Sigma Journal of Engineering and Natural Sciences*, 3, 331.
- Ayyad, E. (2019). *The Making of the Mosque: A Survey of Religious Imperatives*. Gorgias Press.
- Ediz, Ö., & Ostwald, M. J. (2012). The Süleymaniye Mosque: A computational fractal analysis of visual complexity and layering in Sinan's masterwork. *Arq: Architectural Research Quarterly*, 16(2), 171–182. <https://doi.org/10.1017/S1359135512000474>
- Freely, J. (2011). *A History of Ottoman Architecture* (1st edition). WIT Press.
- Frishman, M., & Khan, H.-U. (Eds.). (2002). *The Mosque: History, Architectural Development & Regional Diversity* (New Ed edition). Thames & Hudson.
- Geisler, P. (2019). Challenging the Hagia Sophia. The Selimiye Mosque in Edirne as Ottoman Empire Branding. In B. Krawietz & F. Riedler (Eds.), *The Heritage of Edirne in Ottoman and Turkish Times: Continuities, Disruptions and Reconnections* (pp. 91–151). De Gruyter. <https://doi.org/10.1515/9783110639087-005>
- Grube, E. J., Dickie, J., Grabar, O., Sims, E., Lewcock, R., Jones, D., & Petherbridge, G. T. (1995). *Architecture of the Islamic World: Its History and Social Meaning* (G. Michell, Ed.; Reprint edition). Thames & Hudson.
- Günay, R. (2020). *Mimar Sinan Neden Bir Tasarım Dehasıdır?* (1st edition). Yem Yayınları.
- Idham, N. C., & Numan, I. (2020). Megadome Evolution in The Ottoman's Mosques; The Links. *Journal of Design and Built Environment*, 20(3), Article 3. <https://doi.org/10.22452/jdbe.vol20no3.4>
- Kuban, D. (1987). The Style of Sinan's Domed Structures. *Muqarnas*, 4, 72–97. <https://doi.org/10.2307/1523097>
- Kuban, D. (1997). *Sinan's art and Selimiye*. THE ECONOMIC AND SOCIAL HISTORY FOUNDATION.
- Kuban, D. (2007). *Osmanlı mimarisi*. YEM Yayın.
- Kuran, A. (1968). *The Mosque in Early Ottoman Architecture* (1st ed.). Generic.
- Kuran, A. (1988). *Mimar Sinan'ın Camileri*. <https://acikerisim.fsm.edu.tr/xmlui/handle/11352/1771>

- Mårtelius, J. (2015). The Süleymaniye Complex as the centre of the world. *A/Z ITU JOURNAL OF THE FACULTY OF ARCHITECTURE*, Vol. 12(No. 2), 49–57.
- Mustafa, F. A., & Hassan, A. S. (2013). Mosque layout design: An analytical study of mosque layouts in the early Ottoman period. *Frontiers of Architectural Research*, 2(4), 445–456. <https://doi.org/10.1016/j.foar.2013.08.005>
- Necipoglu, G. (2010). *The Age of Sinan: Architectural Culture in the Ottoman Empire*. Reaktion Books.
- Okasha, T. (1994). القيم الجمالية في العمارة الإسلامية تاريخ الفن. دار الشروق.
- Samir, H., Amir, G., Hamza, J., & Alshoaibi, L. (2023). Pattern and Form Language as Constituents of the Mosque Architecture. In M. Fekry, M. A. A. Mohamed, A. Visvizi, A. Ibrahim, & L. F. Ghamri (Eds.), *Mosque Architecture: A Transdisciplinary Debate* (pp. 167–181). Springer International Publishing. https://doi.org/10.1007/978-3-031-24751-4_17
- Serageldin, I. (Ed.). (1996). *Architecture of the Contemporary Mosque* (1st edition). Wiley.
- Silva Leite, J., Fernandes, S., & Dias Coelho, C. (2024). The Sacred Building and the City: Decoding the Formal Interface between Public Space and Community. *Religions*, 15(2), Article 2. <https://doi.org/10.3390/rel15020246>
- Şimşek, C. F., Peker, A. U., & Şener, S. M. (2024). Symbolism In The Mosques of Mimar Sinan: Inscriptions, Meanings, and Architectural Order. *Kadim*, 8, Article 8. <https://doi.org/10.54462/kadim.1343868>
- Waziri, Y. (2005). *Mausū'at 'anāšir al-'imāra al-islāmīya* (aṭ-Ṭab'a 2). Maktabat Madbūlī.
- Waziri, Y. (2008). العمران والبنیان في منظور الإسلام (First Edition). Ministry of Awqaf and Islamic Affairs, Kuwait.