

Kapsarc Mosque as a Representation of Contemporary Architecture in Saudi Arabia

Pramasari Atmadiputri, Fath Nadizti
Insitut Teknologi Bandung, Indonesia
Email: pramasari.atmadiputri@gmail.com

ABSTRACT

This study examines the application of mosque architectural elements in the design of the KAPSARC Mosque in Saudi Arabia, which represents a contemporary architectural approach in response to sustainability and modernization issues. Unlike traditional mosques that feature domes, minarets, columns, and arches as key elements, the KAPSARC Mosque reinterprets these components with a more minimalist and innovative design. The dome is omitted and replaced with a flat, cube-shaped roof, while arches are substituted with visual transitions through reflective pools and natural lighting. The minaret is retained but integrated more seamlessly with the main building, reinforcing the mosque's identity in a modern urban context. This study employs a qualitative case study approach based on secondary data, including architectural documentation, academic sources, and visual references, to analyze four key architectural elements: dome, minaret, columns and arches, and ornamentation. The findings reveal that the KAPSARC Mosque introduces a new paradigm in Islamic architecture by combining spiritual values with modern design principles. This study contributes to understanding how contemporary mosque architecture can maintain Islamic identity while adapting to current environmental and cultural contexts.

Keywords: Globalization; Islamic architecture; KAPSARC Mosque; Modernization; Mosque design

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INTRODUCTION

Saudi Arabia has a history of highly dynamic economic, political, and architectural development, especially since the discovery and exploitation of petroleum reserves in the early 20th century (Hikmah & Abrar, 2019). Before the discovery of oil, Saudi Arabia's economy depended on trade, agriculture, and especially *Hajj* and *Umrah*, which were the main sources of income. However, since oil exploration was first carried out in 1938 in Dammam, the country's economy has undergone a massive transformation (Sewang, 2024). The increase in oil production managed by Saudi Aramco has made Saudi Arabia one of the richest countries in the world, with revenues used to build modern infrastructure and improve the standard of living of its people. Over time, the government began to reduce its dependence on oil by developing other sectors such as tourism, technology, and industry through *Vision 2030*, which aims to diversify the country's economy (Warsito & Wulandari, 2022).

Politically, Saudi Arabia is an absolute monarchy ruled by the Al-Saud family since the country was founded in 1932 by King Abdulaziz bin Saud. Political stability in the country is highly dependent on the royal system, where important decisions are made by kings and princes who occupy strategic positions in government. However, in recent decades, there have been significant changes in political and social policy under the leadership of King Salman and Crown Prince Mohammed bin Salman (MBS). Reforms such as allowing women to drive, opening up the entertainment sector, and encouraging economic liberalization point to a shift toward

broader modernization (Herman et al., 2024). However, Saudi Arabia continues to face political challenges both domestically and in international relations, including human rights issues and geopolitical tensions with neighboring countries in the Middle East region. The following are the milestones and key phases in the development of Saudi Arabia's architectural history (Figure 1) (Ibraheem, 2024).

In the field of architecture, Saudi Arabia has undergone a significant transformation—from traditional styles dominated by stone and clay-based buildings to becoming a futuristic architectural center influenced by technological advances and modern design. Cities such as Riyadh, Jeddah, and Dammam are now filled with skyscrapers and mega-infrastructure projects such as *NEOM*, King Abdullah Financial District (*KAFD*), and *Qiddiya* (Group, 2024). Despite this, Saudi Arabia retains its cultural heritage through the preservation of historic buildings such as *Al-Balad* (Jeddah's Old City)—a UNESCO World Heritage Site known for its traditional houses built of rock and decorated with *mashrabiya*, carved wooden windows (Hamouié, 2020). The area reflects the cultural mix that took place in Jeddah as a major port for pilgrims for centuries. This combination of modernity and tradition reflects Saudi Arabia's developmental direction—seeking to become a developed country without losing its identity as the center of world Islam.

In the realm of architecture, Saudi Arabia's transformation is evidenced by futuristic urban projects like NEOM and the King Abdullah Financial District. Yet amidst these developments, mosque design must balance innovation against preserving Islamic identity. Contemporary trends in mosque architecture emphasize modern materials, sustainability, and minimalism—seen in structures such as the KAFD Grand Mosque, which employs stone cladding and minimal glazing inspired by desert geometry to reflect Islamic heritage while optimizing energy efficiency (Wikipedia on KAFD Grand Mosque, 2024). Research by Hoteit (2015) underscores the importance of retaining spiritual symbolism—domes, minarets, and mihrabs—even amid modern influences. Studies on European contemporary mosques reveal that ornamentation, calligraphy, and Islamic motifs are vital for maintaining identity in ultramodern designs (Al Khalifa & Lafi, 2025). However, minimalist mosques like Sancaklar in Turkey prioritize experiential spirituality through light, materiality, and form, rejecting overt historicist symbolism (Berin, 2017). Furthermore, sustainable mosques in Malaysia demonstrate effective integration of daylighting and ventilation for eco-conscious design (Mohd Rodzi et al., 2022). Minimal glazing and timber use in mosques such as Cambridge Central Mosque exemplify modern environmental stewardship while preserving communal identity (Mosaic Indonesia, 2024) Meanwhile, hybrid designs in Europe that fuse traditional calligraphy and geometric motifs with modern materials provide a template for balancing identity and innovation (ArchDaily on color symbolism, 2023; Springer article on Islamic city art, 2022). Together, these studies highlight a multidimensional design paradigm—one that integrates minimalism, sustainability, and Islamic symbolism, but few specifically explore how minimalism and environmental performance impact religious identity in Saudi mosque architecture.

This research aims to fill that gap by exploring the *KAPSARC Mosque* in Riyadh—a mosque that breaks convention by eliminating iconic forms like domes and arches while retaining the spiritual experience through light, space, and material. The novelty of this study lies in its focus on architectural reinterpretation through contemporary design principles without

dismissing the symbolic and functional values of traditional mosque architecture. By examining how elements such as the dome, minaret, and ornamentation are reimagined, this study contributes to the discourse on how Islamic architecture adapts in the face of global modernization and sustainability imperatives.

METHOD

This study uses a qualitative approach with case study techniques focused on the *KAPSARC Mosque* in Saudi Arabia. This approach was chosen because it allows for an in-depth exploration of the architectural characteristics of the mosque, which have not been extensively studied before. Case studies as a research method provide the space to understand the design, concept, and architectural meaning applied in the construction of the *KAPSARC Mosque*. By analyzing this mosque in detail, the research reveals how modern architectural elements are utilized within the context of Islamic culture, and how design innovations reflect the evolution of mosque architecture in the contemporary era.

The data used in this study consists of secondary sources, including architectural documentation, academic studies, and visual materials such as photographs and design drawings of the *KAPSARC Mosque*. The analysis focuses on four main elements of mosque architecture: domes, towers, columns and arches, and ornamentation. The dome is analyzed in terms of its form and function, assessing whether it is retained or has undergone a design transformation. The tower is reviewed in terms of its presence and relevance in the design of modern mosques. The columns and arches are studied from both structural and aesthetic perspectives, particularly in supporting innovative architectural concepts. Meanwhile, ornamentation is examined from the perspective of patterns, materials, and underlying design philosophies. Through this analysis, the study offers new insights into the evolution of modern mosque architecture and how the *KAPSARC Mosque* represents a contemporary reinterpretation of Islamic architectural elements.

To organize and analyze the visual and architectural data, the study employed visual analysis and thematic categorization. The visual analysis involved interpreting form, composition, and spatial configuration, while the thematic categorization grouped findings into four primary architectural elements: domes, minarets, columns and arches, and ornamentation. Each of these elements was examined in terms of symbolic meaning, structural function, aesthetic value, and cultural adaptation. This methodological combination enabled a comprehensive examination of how modern architectural strategies can preserve spiritual meaning and Islamic identity within a contemporary mosque context.

RESULTS AND DISCUSSION

The KAPSARC Mosque, located within the *King Abdullah Petroleum Studies and Research Center* (KAPSARC) complex in Riyadh, Saudi Arabia, is one example of modern architecture that combines innovative design with sustainability principles. The mosque was designed by HOK Architects and completed in 2017 as part of the development of the KAPSARC area, an energy research center focused on sustainability and energy efficiency (Saudipedia, 2024). The architecture of this mosque features a unique geometric shape with a structure inspired by Islamic tessellation patterns, creating a dynamic play of light and shadow in the room. With its conventional dome-free design and minarets, the KAPSARC Mosque offers a modern interpretation of Islamic architecture while still

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maintaining spiritual values and religious symbolism. The mosque is also designed with energy-efficient technology, such as a natural lighting system and optimal ventilation, making it in line with the KAPSARC region's sustainability vision.

The KAPSARC Mosque serves not only as a place of worship for researchers, workers, and residents of the complex, but also as an integral part of KAPSARC's vision of creating a sustainable and innovative environment. KAPSARC itself is an independent city project developed to become a global energy research center, with facilities that include laboratories, offices, conference centers, and residential areas that support a modern lifestyle based on energy efficiency. The mosque complements the ecosystem of the area by providing a spiritual space that is in harmony with the surrounding environment, where its design elements reflect the philosophy of sustainability and openness (Figure 2) (Center, 2016). The existence of this mosque confirms that in the development of an independent city based on research and technology, cultural and spiritual aspects remain an important part in establishing a balance between scientific progress and the social life of the community.



Figure 1. (a) Manifestation of the outer space of the KAPSARC Mosque; (b) Interior space plan of the KAPSARC Mosque

Source: District Architecture Center, 2016

4.1 Geometry

The KAPSARC Mosque has a mass shape that resembles the Kaaba, with a characteristic in the form of a flat roof without a dome. The mosque building is cube-shaped with the application of a minimalist flat roof design (Figure 3) (HOK, 2015). In the tradition of mosque architecture, the dome often symbolizes the sky as a symbol of majesty and the link between humans and God. However, the simple cube shape of the KAPSARC Mosque reflects the simplicity and unity that strengthens the concept of Tawheed in Islam.



Figure 2. The geometric shape of the KAPSARC Mosque

Source: KAPSARC Mosque / HOK, 2015

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Although there is a view that a mosque without a dome is considered not to maintain Islamic values, basically the building of a mosque without a dome is not a problem, because the fact that when viewed from Islamic architecture and the history of Islam, no one confirms that the dome in the mosque is a symbol or form of obligation in designing a mosque. The shape of the Kaaba also does not have a dome on its roof.



Figure 3. Ceiling with perforations in the interior of the KAPSARC Mosque

Source: KAPSARC Mosque / HOK, 2015

In the KAPSARC mosque, the height of the prayer room and the geometric pattern with perforations allow natural light to enter (Figure 4) (HOK, 2015). The airy height of the space combined with the light that breaks through these crevices, creates a spiritual experience that replaces the visual role of the traditional dome. This reinterpretation of traditional elements connects tradition with modernity. So that even though the form of the KAPSARC mosque does not maintain the dome that is a characteristic of the architecture of the Saudi Arabian mosque, the essence and spiritual meaning of the dome itself is conveyed in a different form. So that it still contains spiritual values that are relevant to the Muslim community in KAPSARC residential.

Tower

The use of minarets or *minarettes* is still maintained in the design of the KAPSARC mosque, the tower in modern times still has a significant function as a mosque element, namely as a vertical element that can help the community identify the location of the mosque easily and be associated as an element that functions to invite the community to gather and interact. Based on history, the tower did exist during the renovation of the Prophet's Mosque, which influenced the architecture of mosques in Saudi Arabia, where in addition to creating the embodiment of mosque architecture, this tower also provides a symbol of the existence of Islam and faith that creates an emotional connection for Muslims with the KAPSARC mosque itself. In addition, HOK Architects has reinterpreted classical tower elements with a contemporary approach, creating a structure that is not only functional but also has a deep symbolic meaning.

The 115-foot-tall tower (HOK, 2015) has a carving pattern similar to the walls and windows of the mosque's main building in a brownish color that blends in with the desert environment around the area, creating a harmonious visual unity. Its sleek and elegant design rises to the sky, as if directing the gaze and mind of the pilgrim upwards, reinforcing the embodiment of the concept of vertical relationship between man and the Creator in the dome element. Where this shows the form that is still relevant to Islamic and Saudi Arabian architecture in the KAPSARC mosque.

Pillars and Arches

The KAPSARC Mosque is designed with a prayer area free of poles or columns. This is a form of structural innovation in contemporary mosques today, where this column-free design utilizes modern structural technology, such as a roof truss system and calculated materials to be able to distribute the

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load without the need for columns (poles) in the main area. This column less design shows an innovative and functional form element in the KAPSARC mosque.

The spacious, unobstructed prayer room creates a sense of airiness and cohesion (Figure 6) (Elfrida et al., 2021), allowing worshippers to focus on worship without visual distractions. Aesthetically, the absence of columns strengthens the minimalist and modern impression of the mosque's interior. The high, unobstructed ceiling gives it a strong vertical dimension, reinforcing the great spiritual value inside the mosque. The use of this advanced structure technology shows that mosque design can adopt technological advances without sacrificing spiritual values.

In addition, with the absence of dome and column elements, curved elements which are usually semicircular or *pointed arch* which are often combined with domes and columns are also absent from the design of the KAPSARC mosque. In the KAPSARC mosque, it is not the curved elements that are visible, but straight lines with various slopes that form complex geometric patterns.

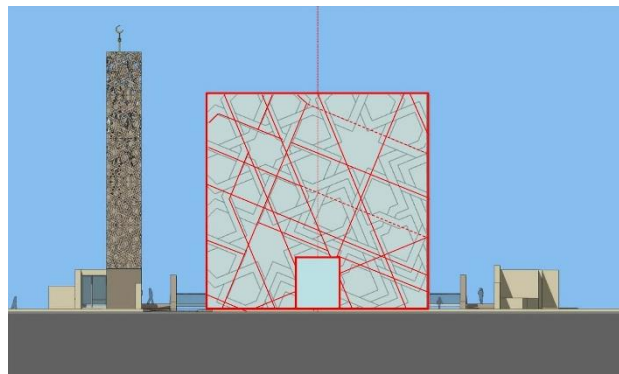


Figure 4. Straight line elements on the KAPSARC Mosque

Source: KAPSARC Mosque / HOK, 2015

This geometric pattern is a hallmark of the KAPSARC mosque design, creating a unique and modern visual aesthetic (Figure 7) (HOK, 2015). Straight lines and sharp corners form intricate motifs on the façade and interior of mosques, replacing the decorative functions usually filled by the arches and traditional ornaments of mosques in Saudi Arabia. This pattern not only serves as an aesthetic element, but also has a functional role in regulating natural lighting and ventilation.

The arch that is usually used as a symbolic portal that presents as a symbolic gate, which marks the transition from the everyday world to the holy places to the Divine is replaced by a reflection pond located under the *entrance* to the prayer room where there is a tall glass bridge as the main access to the prayer room.

The reflection pool provides a soothing and soothing essence, helping to prepare the minds and souls of the worshippers before entering the prayer room. The reflection of the mosque's architecture on the surface of the water creates a stunning visual illusion, especially at night when the mosque's lighting is reflected in the water. This procession symbolizes the spiritual transition of man, from earthly life to the sacred realm.

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Figure 5. *Entrance to the prayer area of the KAPSARC Mosque*
Source: KAPSARC Mosque / HOK, 2015

This combination of a glass bridge and a reflection pond is a modern reinterpretation of the concept of symbolic gates in traditional mosque architecture. Although they differ in application in form, these elements still fulfill the same spiritual values and are identical to Islamic and Saudi Arabian architecture, which is to prepare worshippers mentally and emotionally before worship, while reflecting Saudi Arabia's futuristic vision in the architecture of the KAPSARC mosque.

Ornamentation

Ornamentation in this mosque has a different application than usual, where from its history ornamentation is usually attached to certain elements, such as the sky, some parts of the wall, and pillars, but HOK *Architect* uses a different approach. The ornaments in the KAPSARC mosque use a *layering system*, where the ornamentation becomes the sheath of the building which is divided into several layers of the building from the exterior to the interior, which are combined and create complex geometric shapes but are still harmonious and identical with Islamic architecture and traditional Arabic patterns.



Figure 6. *Ornamentation elements in the interior of the KAPSARC Mosque*
Source: KAPSARC Mosque / HOK, 2015

Inspired by traditional Mashrabiya screens, the mosque's monolithic core is complemented by luminous window patterns and intricate designs, and is surrounded by glass. In the exterior of the mosque, the use of Mashrabiya panels made of *glass-reinforced gypsum* is used as a decorative as well as a functional

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element to regulate lighting and ventilation, and the transparency of the Mashrabiya panels provides a more subtle and unified effect on the ornaments on the layers inside for those that have more complicated geometric patterns from the outside.

The *layering approach* to ornamentation changes the appearance of the mosque from day to night and from season to season. At night, the light from the garden lights reflected on the surface of the pond creates the illusion that the KAPSARC Mosque appears to be floating above the water (Figure 10) (HOK, 2015). Meanwhile, the Mashrabiya layer made of box-shaped glass emits a bright light, resembling a large lantern, creating an illusion of warmth and spiritual invitation.

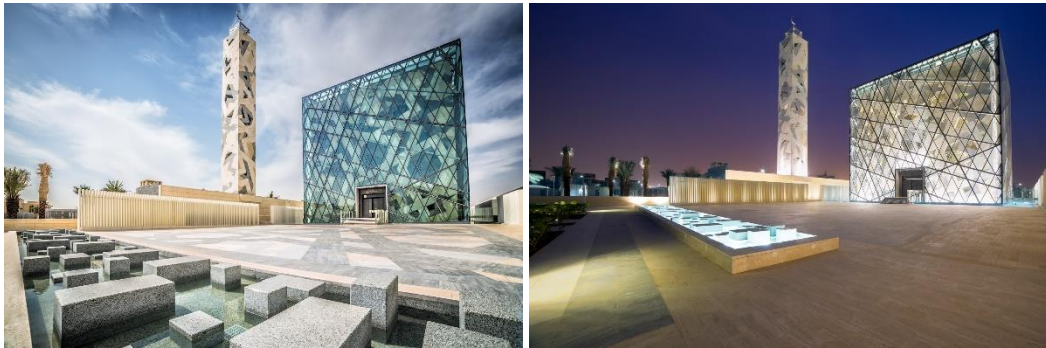


Figure 7. KAPSARC Mosque Lighting
Source: KAPSARC Mosque / HOK, 2015

In the inner layer, ornaments are found throughout the interior of the mosque, with ornaments that have a smaller and more complex scale, which provides privacy of the visual relationship between the worship space and the surrounding environment without compromising the main function as a solemn place for worship. These ornaments work in harmony with natural lighting, creating a gentle play of light and shadows that filter out sunlight (Figure 11) (HOK, 2015). This effect reinforces the sense of shade, creating a calming atmosphere in the prayer room. This atmosphere symbolizes God's presence represented through coolness and shade, reinforcing the spiritual experience for the worshippers.



Figure 8. Ornamentation on the interior of the KAPSARC Mosque
Source: KAPSARC Mosque / HOK, 2015

The visual beauty resulting from this ornamentation forms an embodiment that reflects the deep connection with Islamic traditions, while creating the essence of a harmonious transition between the heritage of traditional Islamic ornamentation and modern aesthetics. This combination not only strengthens the spiritual identity of the mosque but also presents a contemporary representation of Islamic values in architectural design.

Discussion

The KAPSARC mosque in Saudi Arabia exhibits an innovative and modern architectural approach, distinct from traditional mosques that typically have domes, minarets, as well as elements of columns and arches (Table 1). The dome element, which in conventional mosque architecture serves as a marker of majesty and spiritual center, is omitted in the design of the KAPSARC Mosque. Instead, the roof is flat with a cube structure, giving it a minimalist and futuristic feel. Even without a dome, the atmosphere of the inner space still feels spacious and open due to the use of natural light from the high ceiling. This shows how Islamic architecture can develop without having to rely on traditional elements, but still retain its functional essence.

Table 1. Application of mosque architectural elements in the KAPSARC Mosque.

Source : by Researcher

Mosque Architectural Elements	Description	Architectural Elements at the KAPSARC Mosque
Dome	It serves as a protective roof, as well as reflecting the space as a vast sky with its splendor and grandeur.	There are no domes. The roof of the mosque is flat, with the whole building in the shape of a cube. The majestic and large feel is obtained from the high ceiling size.
Tower	Symbols to indicate the existence of the mosque and help expand the range of the call to prayer.	As a marker of the existence of the mosque, it helps to loud the azan, and becomes part of the composition of the mosque building.
Pillars and Arches	A building structure that can form a symbolic gate, which marks the transition from the everyday world to holy places.	There are no pillars and arches inside the mosque. The transition from the everyday world to the spiritual world is bridged by reflective pools around the building.
Ornamentation	A mirror of harmony and unity that is considered to be a manifestation of God's power. Generally, it is in the form of Islamic geometry and calligraphy art.	It consists of several layers, where each layer has a different pattern, namely Islamic geometry and diagonal axis with different angles. The layers form the inner and outer walls of the building.

Meanwhile, the tower, which is usually a symbol of the presence of the mosque and expands the reach of the azan, is retained in a form that is more integrated with the main building. The KAPSARC Mosque Tower does not stand alone like in classical mosques, but rather becomes part of the overall composition of the building, reflecting a more integrative design. In addition, in the aspect of pillars and arches, which are usually used to support the structure and give a distinctive character to the interior of the mosque, the KAPSARC Mosque chooses to eliminate this element. Instead, the interior design relies on a more subtle spatial transition between the everyday world and the spiritual space, with a play of light and reflective materials that create a contemplative atmosphere.

In terms of ornamentation, the KAPSARC Mosque still maintains the aesthetic elements of Islam in a more modern and abstract way. The ornaments in this mosque consist of layered patterns that form Islamic geometry and different axis alignment in each layer. This shows that although the design leads

to minimalism and functionality, there are still decorative elements that reinforce the Islamic identity in the building. This overall approach reflects the evolution of mosque architecture in the contemporary era, where form and structure can undergo transformation, but spiritual and philosophical values remain central to their design.

CONCLUSION

The *KAPSARC Mosque* in Saudi Arabia represents an architectural approach that diverges from traditional mosques by responding to contemporary issues through innovative design and sustainability principles. The main elements of the mosque's architecture—such as domes, minarets, columns and arches, and ornamentation—are reinterpreted to create a spiritual experience that still upholds Islamic values. The dome is removed and replaced with a flat, cube-shaped roof, while the transition from the outside world to the prayer hall is no longer marked by monumental arches or doors, but rather through reflective elements such as pools and natural lighting. The design of the tower is also more integrated with the main building, illustrating how symbolic elements can still be applied in modern architecture without losing *Islamic* identity.

This study demonstrates that mosque architecture in the contemporary era does not need to be fixated on traditional forms but can adapt to modern needs and technological advancements. The *KAPSARC Mosque* exemplifies how architectural design can address sustainability challenges by employing complex geometry and natural lighting technologies to create a comfortable and inspiring worship environment. This approach affirms that the architectural elements of mosques can evolve without losing their spiritual essence, thus remaining relevant to modern Muslim communities in urban environments or research-oriented areas such as *KAPSARC*.

However, this study has limitations, as it relies solely on secondary data without conducting direct observations or interviews with designers or mosque users. Therefore, further research using more comprehensive methods is needed to gain a deeper understanding of user experiences and how the mosque's design contributes to the community's social and spiritual life. An in-depth study of cultural aspects, congregational perceptions, and the impact of design on social interaction within mosques would provide a valuable contribution to the field of *Islamic* architectural studies in the future.

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