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From Sacred Geometry to Cultural Branding

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Abstract
When the Louvre Abu Dhabi opened in 2017, the first thing visitors noticed was the change of light and shadow. The light passes through a huge dome, which is composed of thousands of overlapping metal star-shaped components. After being filtered layer by layer, the light is projected on the white buildings and trails below with changing patterns. Architect Jean Nouvel called this effect "Rain of Light". People then realized that this design was a tribute to the geometric hollow screen in traditional Islamic architecture. This dome not only becomes the most iconic image of the museum, but also symbolizes Abu Dhabi's great ambition to build itself into a global cultural destination on a broader level. (fig. 1).

This article discusses the changes in Islamic geometric patterns after leaving the original architectural context and entering the contemporary Gulf urbanism context. The article points out that these patterns were deeply rooted in the social, environmental and spiritual life of Islamic cities, but now they have undergone a major transformation. In the hands of architects such as Jean Nouvel and in the cultural strategies of countries such as the United Arab Emirates, they have evolved into tools for national branding and cultural soft power projection. This transformation does not only mean a kind of "loss". It has also raised a series of key issues. How does architecture build identity?

When the historical form is reinterpreted under a new scale and for a new purpose, what interests and losses are involved behind it?

This paper discusses three key nodes. First, the article traces the original context of Islamic geometric patterns and mashrabiya, and examines the spiritual, environmental, and social implications carried by these forms in pre-modern cities. Second, the article focuses on the Institut du Monde Arab, built by Nouvel in Paris in 1987, which is regarded as the first important case of modern reinterpretation of the above patterns in the field of institutional architecture. Third, the article takes Louvre Abu Dhabi as an example to analyze how geometric patterns become the carrier of shaping the national image. This article draws on the theoretical framework of Amale Andraos on interpreting the "characterization" of Arab and Gulf cities, and combines critical literature on "Orientalism" and "Gulf Urbanism". From this, it can be concluded that the trajectory of evolution from "sacred geometry" to "cultural branding" is neither a simple linear progress nor a simple loss of value, but a complex game between architectural heritage and contemporary political ambitions.[1]

1 - Amale Andraos, "Problematizing a Regional Context: Representation in Arab and Gulf Cities," in The New Arab Urban: Gulf Cities of Wealth, Ambition and Distress, edited by Harvey Molotch and Davide Ponzini (New York: New York University Press, 2017), 58–78.

Figure 1: Interior of the Louvre Abu Dhabi dome. Photo: Luc Boegly & Sergio Grazia.

Sacred Geometry and the Mashrabiya: Pattern as Cosmological Language

Islamic geometric patterns should not be simply regarded as decoration. In the classical tradition of Islamic architecture, these patterns carry profound meanings.

Among them, various shapes that appear repeatedly. Like intertwined stars, hexagons, and arabesque. All of these shapes express a core belief that through mathematical order, people can approach the infinite essence of God. Each set of patterns comes from a simple rule and is generated through endless repetition, thus pointing to a certain realm beyond the limits of naked eye perception. As pointed out by scholar Keith Critchlow, Islamic geometric design actually plays the function of a "visual cosmology".[2]

This spiritual meaning was never separate from the practical conditions of building.

The clearest example is the mashrabiya (fig.2), a projecting latticed screen typically made from turned wood or stone. It was found across Egypt, the Levant, Iraq, and the Arabian Peninsula from the medieval period onward. The mashrabiya was a highly functional element. Its dense latticework blocked direct sunlight and reduced heat inside the building. At the same time, it allowed air to pass through. In some versions, small ceramic or wooden elements placed within the openings could be moistened so that incoming air was cooled by evaporation[3]. The result was a single architectural element that combined environmental control, visual beauty, and spiritual meaning in one form.

2 - Keith Critchlow, Islamic Patterns: An Analytical and Cosmological Approach (London: Thames and Hudson, 1976), 6–8.

3 - Rima Ajlouni et al., "Application-based Principles of Islamic Geometric Patterns," npj Heritage Science (2023)

Figure 2: Bayt el-Kritiliyya, view of mashrabiya from garden courtyard.

Mashrabiya also plays an important social function. It allows people in the house, especially women, to observe the street scene outside the house without being noticed by the outside world. In Islamic cities, this is very important because the boundaries between private residences and public streets are strictly maintained. As urban historian Janet Abu-Lughod pointed out, the material form of pre-modern Arab cities is not determined by a single religious plan, but by social games, religious laws and business life between families[4]. Mashrabiya is one of the key elements that facilitate games and consultations in this architectural form. While regulating visibility and privacy, it gives different users the opportunity to enter the same space in different ways.

Before discussing how these patterns are used today, it must be clear that the meaning of Mashrabiya is inseparable from its original context. Its existence depends on the narrow streets and dense courtyard-style houses in the historic old city of Medina. It requires close contact with the human body. It is handmade by local craftsmen using local materials[5]. Once this geometric logic is de-

4 - Janet Abu-Lughod, “The Islamic City: Historic Myth, Islamic Essence, and Contemporary Relevance,” International Journal of Middle East Studies 19, no. 2 (1987): 155–176.

5 - Janet Abu-Lughod, “The Islamic City: Historic Myth, Islamic Essence, and Contemporary Relevance,” International Journal of Middle East Studies 19, no. 2 (1987): 155–176.

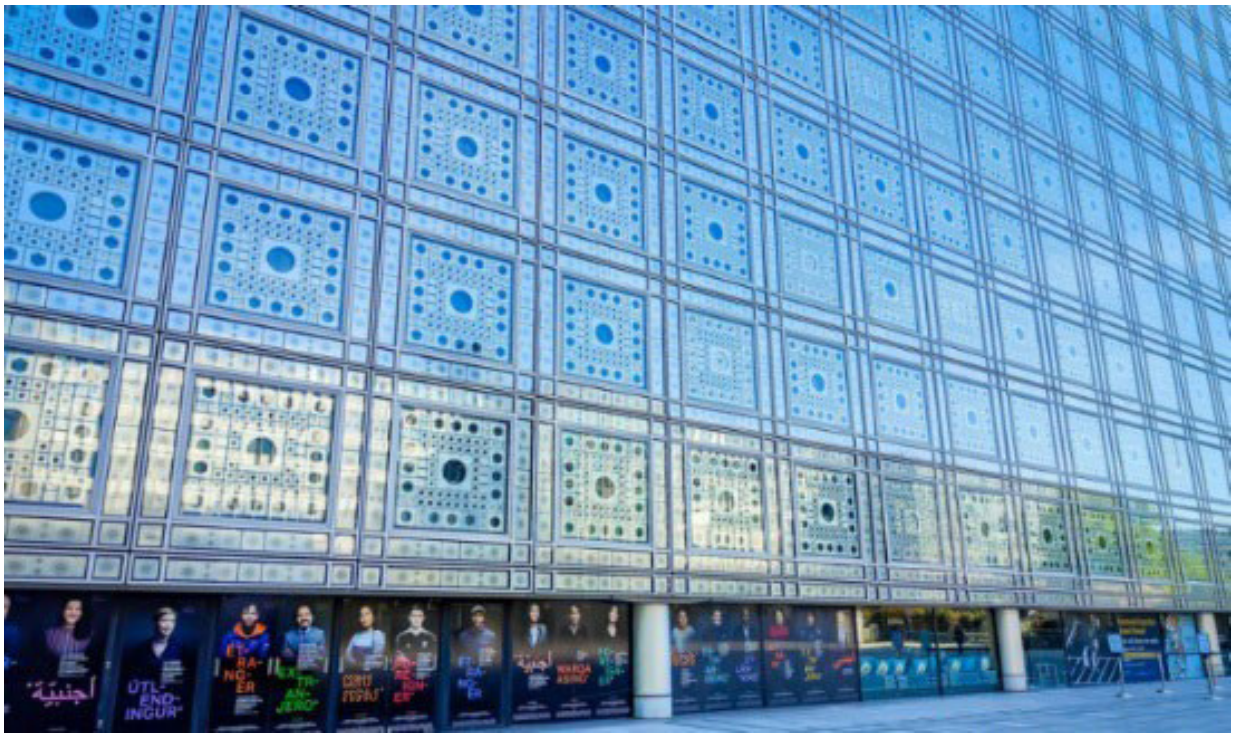

Figure 3: Facade of the Arab World Institute (Institut du Monde Arabe), Paris. Photo: Cécile de Sortiraparis.

tached from the above-mentioned specific environmental conditions and is transplanted to a completely different elevation scale of a national institution, its original meaning will undergo a fundamental change. It is this shift, made visible in the work of architect Jean Nouvel at the Institut du Monde Arabe in Paris and later at the Louvre Abu Dhabi, that this paper will trace.

The Institut du Monde Arabe:
Technology as Translation

The first major modern reinterpretation of Islamic geometric patterns in an institutional building came not from the Arab world but from Paris. In 1987, architect Jean Nouvel completed the Institut du Monde Arabe (fig. 3), a cultural center built to promote dialogue between France and the Arab world. The building sits along the Seine River in the heart of the city, and its most striking feature is its southern facade. That facade is covered by 240 large square panels, each filled with a pattern of geometric shapes that open and close in response to the amount of sunlight outside . The pattern is directly inspired by the mashrabiya, the traditional Islamic latticed screen discussed in the previous section[6].

However, Nouvel's interpretation of the mashrabiya is fundamentally different from the original. In traditional Islamic architecture, the mashrabiya was made from wood by local craftsmen and was fixed in place. Its geometry was the result of accumulated craft knowledge passed down over generations. At the Institut du Monde Arabe, the geometric pattern is produced by mechanical diaphragms, the same kind of opening and closing mechanism found in a camera lens. Small electric motors connected to light sensors control each panel automatically, adjusting the size of the openings as the light

6 - Institut du Monde Arabe, "Architecture," accessed May 2026, https://www.imarabe.org/en/architecture.

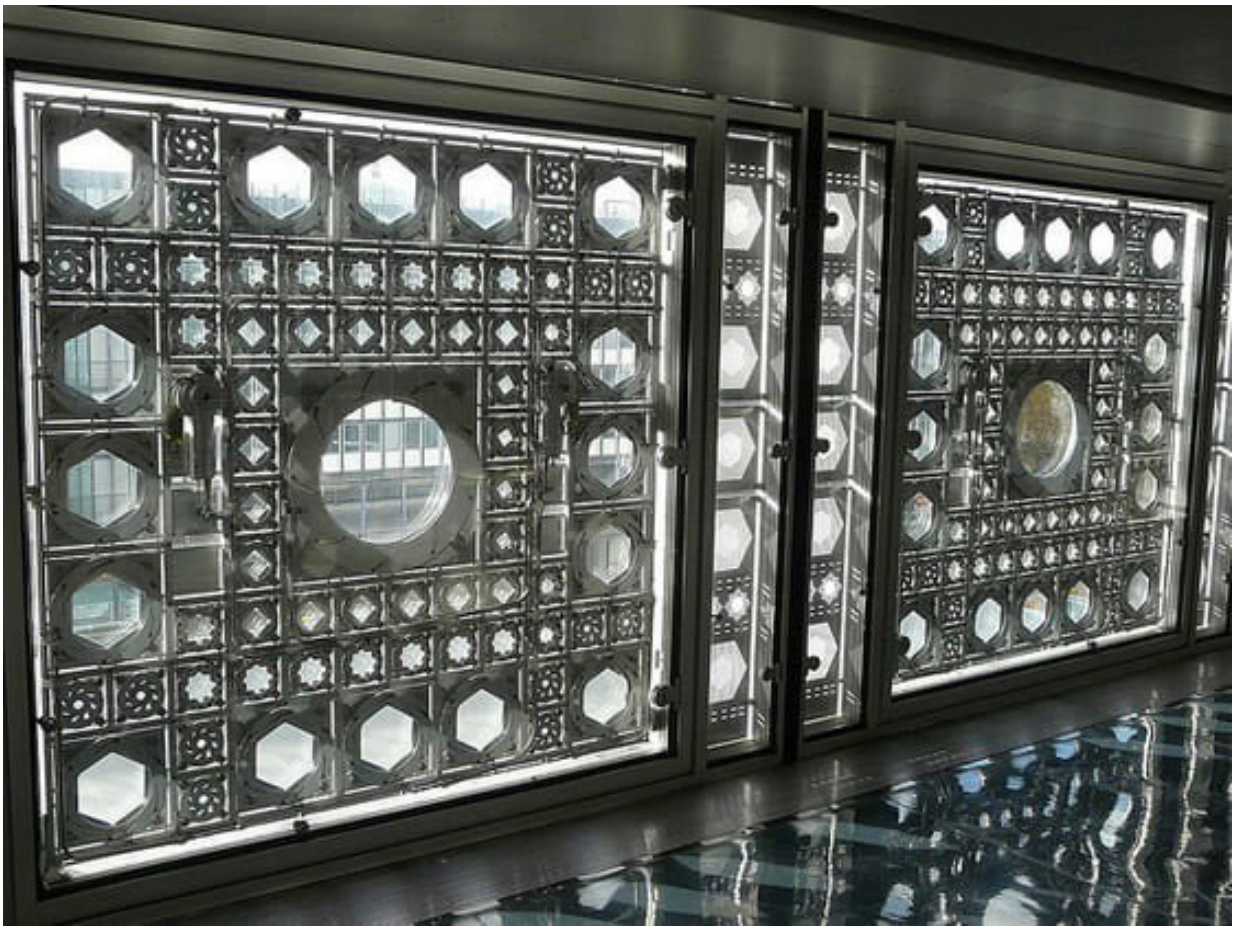

Figure 4: Light-sensitive metallic diaphragms on the south facade of the Institut du Monde Arabe, Paris.

changes throughout the day[7]. The pattern looks familiar, but the logic behind it is entirely technological rather than traditional (fig. 4).

This transformation leads to an important question about "meaning": when the geometric form is separated from the technological process and social context that gives it its original meaning, what is left? Amale Andraos pointed out that Nouvel was not a vulgar designer. She stressed that it was his deep understanding of Islamic architecture that saved his works from being rashly degraded as a mere superficial imitation[8]. The IMA facade does more than just copy a traditional pattern. It engages with the underlying principle of the mashrabiya, which is the control of light, and reinterprets that principle using contemporary technology. In this sense, the building can be understood as a genuine architectural translation rather than a superficial borrowing.

At the same time, the context of the Institut du Monde

7 - "High-Tech for Cultural Exchange: Institut du Monde Arabe in Paris (1987)," Detail, January 4, 2021, https://www.detail.de/de_en/from-our-archives-high-tech-for-cultural-exchange-institut-du-monde-arabe-in-paris-1987.

8 - Amale Andraos, "Problematizing a Regional Context: Representation in Arab and Gulf Cities," in The New Arab Urban: Gulf Cities of Wealth, Ambition and Distress, edited by Harvey Molotch and Davide Ponzini (New York: New York University Press, 2017), 63.

Figure 5: Aerial view of the Louvre Abu Dhabi, Saadiyat Island, Abu Dhabi.

Arabe is also of great significance. The building was jointly funded by France and a group of Arab countries and completed during the presidency of François Mitterrand. It is a diplomatic project. Its purpose is to show Arab culture to the Western audience in Paris. This means that the geometric pattern on the facade is not mainly aimed at people from the Arab world, but is to dialogue with visitors from France and Europe to provide them with an easy-to-recognizable Arab visual identity. From the beginning, the role played by this pattern was a form of representation, not an internal living architectural tradition[9].

Therefore, the Institut du Monde Arabe marks an important turning point. It shows that Islamic geometric patterns can be successfully detached from its original context, reinterpreted through modern technology, and used in the institutionalized context to present Arab culture. This transformation from the courtyard screen to the institutional facade has established a paradigm. In the Gulf cities of the 21st century, especially the Louvre in Abu Dhabi, this paradigm has been further expanded and carried forward.

The Louvre Abu Dhabi: Pattern as Spectacle

If the Institut du Monde Arabe marks the moment when Islamic geometric patterns enter the field of institutional architecture, the Louvre Abu Dhabi, which was completed in 2017, represents a more ambitious step in the same direction. Designed again by Jean Nouvel, the museum sits on Saadiyat Island off the coast of Abu Dhabi and is organized as a collection of low-rise buildings arranged like a traditional medina, all covered by a single enormous dome. That dome is the central architectural element of the project and the primary vehicle through which the building makes its claim to Islamic heritage (fig. 5).The result is that sunlight passing through all eight layers produces a constantly shifting pattern of light and shadow on the surfaces below, which Nouvel describes

9 - Institut du Monde Arabe, “Architecture,” accessed May 2026, https://www.imarabe.org/en/architecture.

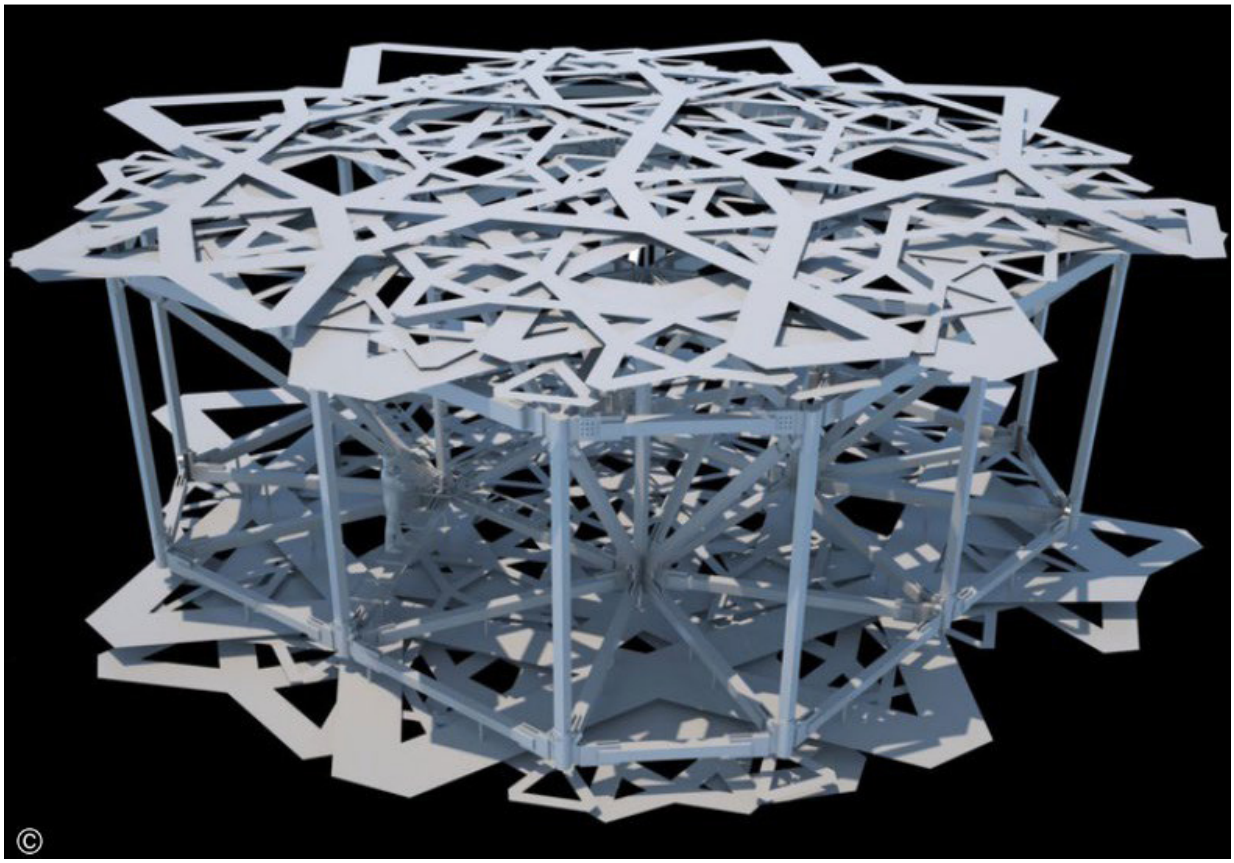

Figure 6: Digital model of the Louvre Abu Dhabi dome structure. Image © BuroHappold Engineering.

as the "rain of light." At night, the 7,850 stars become visible from both inside and outside the building, turning the dome into a glowing landmark on the waterfront[10]. Nouvel himself has described the dome as a modern proposal founded on a major symbol of Arab architecture. He acknowledges the clear shift from tradition while insisting that the dome is something new rather than a simple copy of the past[11]. In technical terms, this claim is well supported. The engineering complexity of the dome, developed in close collaboration with BuroHappold Engineering over more than a year, goes far beyond what any traditional craft process could produce. The precision with which light levels are mapped and controlled across the plaza below reflects a level of computational design that has no precedent in historic Islamic architecture (fig. 6).

However, if the dome is examined in its specific urban context, it will raise a series of important problems. As pointed out in the first part, the reason why "mashrabiya" in history is far-reaching is precisely because it is deeply rooted in a specific social and material environment. It exists in the dense texture of the old city (Medina) on a scale close to the human body, serving those real residents with real needs. In contrast, the dome of the Louvre Abu Dhabi operates on a completely differ-

10 - Alya Abourezk, "The Engineering Behind the Louvre Abu Dhabi's Striking Geometric Dome," ArchDaily, December 28, 2017, https://www.archdaily.com/886180/the-engineering-behind-the-louvre-abu-dhabis-striking-geometric-dome.

11 - Ateliers Jean Nouvel, quoted in "Louvre Abu Dhabi," Divisare, November 17, 2017, https://divisare.com/projects/371170-ateliers-jean-nouvel-roland-halbe-marc-domage-louvre-abu-dhabi.

ent scale and is in a very different environment. Saadiyat Island is a planned cultural area based on land reclamation. This area lacks the urban texture of historical accumulation, nor the existing community groups, let alone the traditional residential culture. The dome did not grow naturally from a vibrant city, but was placed on a man-made city.

This difference in context has greatly changed the deep meaning of this design model. In the Institut du Monde Arabe, its geometric facade maintains at least a dialogue with the dense urban texture of Paris and an entity that carries a substantial cultural mission. In the Louvre Abu Dhabi, the dome floats on a well-designed landscape. The primary purpose of this landscape is to attract international tourists and show the world Abu Dhabi's ambition in the cultural field. As Andraos pointed out, the rise of emerging urban centers in the Gulf region has provided architects with what some people call a "blank canvas"[12]. This is a place where there is neither an established context nor external constraints, where architectural experiments can be carried out at full speed at a very high speed and on a very large scale[13]. The dome of the Louvre in Abu Dhabi is in many ways the product of this particular context.

The primary significance of this dome is that it creates a very shocking image. For visitors inside the museum, the "rain of light" is not just a sensory experience to create an atmosphere; it is also a widely circulated photo, a logo, and even a brand. This geometric pattern, which used to be a practical and spiritual element in Islamic daily architecture, has been sublimated into a totem after being enlarged to such a grand scale, representing the Louvre Abu Dhabi, to show its unique style to the world.

12 - Andraos, "Problematizing a Regional Context," 60.
13 - Ibid.

Branding, Soft Power, and the Making of a National Image

The birth of the Louvre in Abu Dhabi is not accidental. It is the product of a deliberate political and economic decision made by the Abu Dhabi government at the beginning of the 21st century. At that time, Abu Dhabi realized that its economy was too dependent on oil and that oil resources would eventually be exhausted. Therefore, the government decided to invest heavily in the fields of culture, tourism and education to prepare for the future of the "post-oil era". Building a series of world-class museums on Saadiyat Island. These buildings include the Louvre Abu Dhabi, the planned Guggenheim Museum in Abu Dhabi, and the Zayed National Museum, which is the core of this strategy. It is estimated that the total value of the Saadiyat Island development project is as high as 27 billion US dollars[14].

The agreement to bring about the birth of the Louvre Abu Dhabi was signed by France and the United Arab Emirates in 2007. According to the agreement, Abu Dhabi paid France 1 billion euros in exchange for the right to use the name of the Louvre, the participation and assistance of French museum experts, and the right to borrow and exhibit works of art from the French National Collection. For Abu Dhabi, the name of the Louvre contains great cultural authority and international popularity. Giving this name to a building on Saadiyat Island is an effective way to instantly make Abu Dhabi one of the global cultural map[15]. For France, the agreement provided significant financial resources and an opportunity to

14 - "Louvre Abu Dhabi," in The New Arab Urban: Gulf Cities of Wealth, Ambition and Distress, edited by Harvey Molotch and Davide Ponzini (New York: New York University Press, 2017), 235.

15 - Maja Licitar, "Louvre Abu Dhabi: Setting a New Standard for Postcolonial Museums in the 21st Century?" Medium, July 15, 2024, https://medium.com/@majalicitar/louvre-abu-dhabi-setting-a-new-standard-for-postcolonial-museums-in-the-21st-century-3495ab0c9938.

extend its cultural influence into the Gulf region.

In this context, the geometric dome of the Louvre in Abu Dhabi carries a deep connotation beyond the building itself. This dome is not only the most photographed and recognizable part of the whole building, but also appears in every promotional material produced by the museum and the Abu Dhabi Tourism Board. Its geometric pattern draws from the traditional essence of Islamic architecture. As a visual symbol, it closely connects the building with the cultural heritage of the region. At the same time, the grand scale and exquisite technology of the dome also show the image of Abu Dhabi as a modern, ambitious and closely connected international city to the world.

This set of patterns has been given a dual mission: not only to show the profound heritage rooted in history, but also to show a forward-looking vision for the future. Amale Andraos regards this "dual strategy" as a prominent feature of Gulf urbanism. She pointed out that in cities like Abu Dhabi, the goal is to build a national identity of the United Arab Emirates with the image of "Bedouin" as the core. That is to regard the Bedouins as the only true aborigines in this land[16]16. This identity is presented purely and originally, although the actual demographic composition of the Gulf countries is highly diverse, including not only the citizens of the United Arab Emirates, but also foreign workers, Arab immigrants and Western professionals[17]. The geometric pattern on the dome participates in the construction of this identity. It presents a simplified and visually impactful image of Islamic cultural heritage, so that international tourists can identify and "consume" it without having a deep knowledge of the history of Arab architecture.

Anthropologist Ahmed Kanna described this process as a kind of "reverse orientalism"[18]. If the traditional orientalist perspective portrays the Arab world as exotic, backward, and self-consistent, then today's Gulf countries present themselves as futuristic, far-sighted, and leading the world. At the same time, they still claim to be closely connected with an ancient and authentic cultural identity[19]. The dome of the Louvre Abu Dhabi fits this description well. It looks ancient and modern at the same time. It uses the vocabulary of Islamic geometric patterns to suggest cultural depth while deploying the most advanced engineering technology available to signal global ambition. The result is an image that is powerful precisely because it is difficult to argue with, combining heritage and innovation in a form that is visually spectacular and politically useful.

The Limits of Pattern as Identity

The argument made in the previous sections might suggest that the Louvre Abu Dhabi is simply a problematic building, one that reduces a rich architectural tradition to a political logo. However, a more careful reading shows that the situation is more complex than that. Andraos herself acknowledges that it would be wrong to ignore the architectural power and success of projects like the Louvre Abu Dhabi. She argues that the realities of their form and content move these buildings beyond simple slogans[20].

The dome is not only an image. This is also a practical spatial experience. The richness of the light, shadow, and atmosphere perceived by the visitors below is far beyond what any photo can convey. In this sense, this building realizes a function that cannot be achieved by pure brand-building means.

At the same time, Andraos warns people to avoid treating Islamic architecture as a single and unified tradition - as if it is equally applicable in any era and in any region. She pointed out that this generalization not only makes it difficult for people to understand the actual differences within the history of Islamic architecture, but also the

16 - Andraos, "Problematizing a Regional Context," 64.
17 - Ibid.
18 - Ahmed Kanna, *The City as Corporation* (Minneapolis: University of Minnesota Press, 2011), 14.
19 - Ibid.
20 - Andraos, "Problematizing a Regional Context," 63.

risk of simplifying complex history into a single symbol[21]. The dome of the Louvre Abu Dhabi, although technically exquisite, is easy to attract the above criticism. What it draws on is not any specific geographical or historical tradition, but a broad and general Islamic geometric pattern concept. Although the image of Arab identity presented by this is visually very impactful, it is thin in historical background.

Therefore, the difference between the Institut du Monde Arabe and the Louvre Abu Dhabi is not only reflected in the scale, but also in the difference in their purpose. In the Institut du Monde Arabe, geometric patterns are a part of the whole building. This building accommodates a physical cultural institution with a real educational mission. In contrast, in the Louvre Abu Dhabi, geometric patterns are inseparable from national-level image shaping and economic development strategies. This does not mean that the building is a failure. But this does show that geometric patterns carry a heavier political burden in the Louvre Abu Dhabi than at the Institut du Monde Arabe. It is this burden that finally shapes people's understanding of the building.

Conclusion

The evolution trajectory from Mashrabiya to the Louvre Dome in Abu Dhabi is not a straight path of decline. It is a collection of a series of "translation" processes. In each translation, the geometric pattern is further out of its original context and closer to the field of institutional characterization and national image construction. What is lost in the process is not the pattern itself, but the social and material conditions that have given it meaning. What is finally left is a form that is visually very powerful, technically exquisite, and politically practical. As Andraos reminds us, is it enough to do this for architecture? This is exactly the question that the "Arab City" is continuing to ask in an increasingly urgent manner.

21 - Andraos, "Problematizing a Regional Context," 66.