



# On the Influence of Chinese Architecture in the Yuan and Ming Dynasties on the Mosques in the Timurid Era

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**Abstract:** Set against the Silk Road's cross-civilizational network, this study traces 14th–15th-century architectural exchange between Yuan-Ming China and the Timurid Empire through “entangled history”. Beijing's Temple of Heaven dougong becomes Samarkand's stucco décor; Persian Sumaliqing cobalt dyes synchronised “Timur blue” and imperial porcelain. Nanjing's porcelain tower bends Islamic geometry into lotus petals, while Herat's Gawhar Shad Mosque scrolls Chinese clouds into vine borders. Yuan-Ming artisan registers and Timurid prisoner camps share Mongol military pattern; Persian builders in Yongle's Forbidden City import cool-tone glazes. “Structural symbolization” argues technical elements shed load to become power codes—yellow tiles or “Timur blue.” XRF, 3-D scans and polyglot epigraphy reconstruct the pre-modern Eurasian knowledge network, refuting center-periphery models and casting the Silk Road as an imperial resonator of entangled creativity.

**Keywords:** entangled history; structural symbolization; Timurid architecture; Yuan-Ming architectural exchange; Silk Road material network

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## 1. Introduction

### 1.1 Research background and issues

As a transportation network across the Eurasian continent, the Silk Road is not only a channel for commodity trade, but also an important platform for the flow and intersection of civilization elements such as culture, religion, art and architecture. From the 14th to the 15th century, the rise of the Timurid Empire in Central Asia, and the development of architecture in China during the Yuan Dynasty and the early Ming Dynasty, together created a unique historical time and space, providing an important opportunity for cross-cultural exchanges. In particular, the monumental Islamic buildings built under the auspices of Timur and his successors, such as the Bibi Khanum Mosque, the Shah-i Zinda Mausoleum, and the Gur-Emir Mausoleum, not only demonstrate superb architectural skills and grand spatial layouts but also conceal rich cross-cultural technological and aesthetic interactions behind them.

Although many studies have focused on the artistic achievements of Timurid architecture, most relevant studies are limited to the evolution of style within Islamic architecture, such as the Arabic and Persian styles. And few put it in the broader context of Eurasian interaction. Research on Yuan and Ming architecture focuses more on the inheritance of local systems and styles, and the analysis of the possible mutual influence between them and Central Asian architecture and the path of technology and pattern transmission is still insufficient.

Therefore, this study attempts to place Yuan and Ming China and Timurid Central Asia in the same communication network from a new analytical perspective, and systematically explore their interactive relationship from architectural technology, decorative style to institutional structure.

The core research questions include: Which technical and decorative elements in Yuan and Ming architecture participated in or influenced the architectural system of the Timurid period? What is the dissemination mechanism of these architectural features? Through what media? How do these interactions reflect the cross-cultural communication of architectural technology in the early and late ancient times?

### 1.2 Research significance and methods

This study attempts to go beyond the traditional research path of architectural history based on country, and regards architecture as a complex composed of technology, system and cultural elements, and emphasizes the dynamic generation process of architecture in cross-cultural networks.

In terms of methods, this paper integrates architectural history, visual arts, archaeology and cultural communication theory, including the following:

- (1) Comparative analysis of architecture: Select representative buildings from the Yuan, Ming and Timurid periods, and

compare them on a technical level in terms of structure, pattern, space and other aspects.

(2) Image motif tracking: Trace the communication path of patterns, symbols and crafts in architectural decoration.

(3) Material and process research: Based on archaeological reports and craftsman records, sort out the origin and evolution of building materials, glazes and construction technologies.

(4) Institutional and cultural context analysis: Reconstruct the historical background of the royal architectural system and technical organization of the two places, and understand the cultural logic behind their technical choices.

It should be noted that due to language and data limitations, this paper does not directly study the original Persian documents, but mainly makes inferences based on Chinese and English academic achievements, and focuses on Chinese materials as the entry point for reconstructing the cross-cultural communication mechanism.

Entangled History is an important theoretical perspective that has emerged in global history research in recent years. Its core proposition is that the historical interaction between different cultures is not a linear transmission or a one-way influence, but a hybrid cultural form is jointly constructed through a complex, multi-directional and dynamic network of connections. As Werner and Zimmermann[1] pointed out: "The relationship between cultures cannot be fully grasped through mirror-like comparison, but a new social reality is generated in the interpenetration." In the study of architectural history, the use of the "entangled history" framework can effectively break through the traditional "influence-imitation" paradigm and include the reconstruction process of technology, institutions and symbols in cross-civilization exchanges. Based on this theoretical starting point, this article examines how Yuan and Ming China and Timurid Central Asia jointly developed an architectural expression system with cross-cultural characteristics in the field of architecture through the migration of craftsmen, institutional changes, religious aesthetics and technical translation. This process should no longer be regarded as a one-way "mutual learning and mutual reference", but should be understood as cultural entanglement and re-creation in the early context of globalization.

### 1.3 Literature review and chapter arrangement

In existing studies, scholars such as Lisa Golombek, Oleg Grabar, and Sheila Blair have conducted in-depth analysis of the technological characteristics and political symbolic significance of Timurid architecture; and in terms of Chinese architecture, scholars such as Liang Sicheng, Liu Dunzhen, and Li Yinong have systematically sorted out the architectural technology of the Yuan and Ming dynasties, providing a solid foundation for this article.

Western scholars such as Lisa Golombek, Oleg Grabar, and Sheila Blair have conducted in-depth discussions on the craftsmanship characteristics and political symbolism of Timurid architecture. In research *The Timurid Architectural Heritage*, Lisa Golombek[2] emphasized the absorption and transformation of Persian-Islamic traditions by Timurid architecture, especially pointing out that the symbolic use of dome structures, glazed decorations, and inscription layouts in Samarkand architecture reflects the ruler's attempt to construct sacred legitimacy through architecture. Oleg Grabar[3] analyzed the innovation of Timurid architecture in visual order and spatial organization from the perspective of Islamic art history. He believed that architecture, as a visual communication tool of imperial ideology, not only conveyed power, but also attempted to establish a cross-regional cultural identity. Sheila Blair's[4] research focuses more on the role of craftsmen and their workshop system, pointing out that the Timurid regime consciously recruited highly skilled craftsmen from Iran, Azerbaijan and other places, and organized them into the national engineering system to achieve the unification and innovation of architectural forms.

In terms of Chinese architecture, scholars such as Liang Sicheng, Liu Dunzhen, and Li Yinong systematically sorted out the architectural technology system of the Yuan and Ming dynasties. Liang Sicheng[5] emphasized the standardized development of Yuan Dynasty official architecture in terms of modular design, bracket system, and wooden structure, and believed that this laid the foundation for the standardization of Ming Dynasty architecture. Liu Dunzhen[6] revealed the political logic of the axis layout and hierarchical symbolism of Ming Dynasty palaces and temples through a large number of documents and field investigations. Li Yinong[7] conducted a special study on Ming Dynasty architectural decoration techniques such as colored paintings and glazed components. He believed that the development of decorative art not only reflects technological progress, but also the externalization of national will at the architectural level.

These studies constitute the theoretical basis of this article, and also remind us that the architectural practice of the Timurid Empire has some similarities with that of Yuan and Ming China in terms of political symbols, technical systems and craftsman mechanisms, thus providing a solid support for the comparative perspective of this article. However, it is still an innovative attempt to integrate the above research results into the communication perspective of the "Silk Road" and examine Chinese architecture in the context of the development of Central Asian architecture.

## 2. Chinese architectural technology and decoration system during the Yuan and Ming dynasties

### 2.1 Continuity and transformation of building structure

Chinese architecture during the Yuan and Ming dynasties inherited the wooden structure system from the Tang and Song dynasties, maintaining a frame structure consisting of columns, beams, rafters, and brackets. After the decline of the “Yingzao Fashi” system, craftsmen in the Yuan Dynasty relied more on traditional craftsmanship and local experience for construction, and the architectural form gradually moved towards pragmatism. By the middle of the Ming Dynasty, “Lu Ban Jing” and “Gongbu Yingzao Zeli” gradually formed new institutional norms.[8]

The brackets, as the core of traditional structures, gradually changed from load-bearing components to decorative components after the Yuan Dynasty. The brackets of the Longqing Temple Gate in the Yuan Dynasty and the Hall of Prayer for Good Harvests in the Temple of Heaven in Beijing in the Ming Dynasty still inherited the complex forms of the previous ones, but they no longer bear the real structural pressure and play a more symbolic and visual role.[9] The emergence of this “symbolic bracket set” also led to the transformation of Chinese architecture towards decorative form, providing a basis for its potential connection with Central Asian decorative architecture.

### 2.2 Plane layout and spatial organization

During the Yuan and Ming dynasties, palaces, temples and other buildings emphasized axial symmetry in spatial organization, inheriting the Song Dynasty’s “central axis-courtyard-wall” palace layout model. The planning of the Forbidden City in Beijing during the Ming Dynasty embodied a highly ritualized central axis ritual concept, with space progressing from south to north, symbolizing the hierarchical order of imperial power.[10]

Compared with the “Ivan Siheyuan” layout common in mosques during the Timurid period, Yuan and Ming architectures emphasize more on enclosure and hierarchy. However, in border areas such as the Western Regions and some Han-style buildings in Yunnan, there is also a mixture of Central Asian style elements and Chinese layout, indicating that certain concepts have begun to evolve interactively in border areas.[11]

### 2.3 Evolution of architectural decoration systems

The architectural decoration of the Yuan and Ming dynasties showed the characteristics of rich colors, rich patterns and mature technology. In the Ming Dynasty, glazed components were widely used in palaces and temples, forming a dual coding system of “yellow glazed tiles” and “green glazed tiles” on the roof, symbolizing destiny and class.[12] These color expressions are similar to the concept of “Timur Blue” in glazed brick decoration during the Timurid period. Although the materials are different, they all express sacredness and spatial sequence through color.

In terms of decorative patterns, the patterns such as “scrolling grass pattern”, “peony pattern” and “entwined lotus” that have been common since the Yuan Dynasty were widely used in Ming Dynasty buildings such as the Temple of Heaven in Beijing and the Da Baoen Temple Pagoda in Nanjing. They have similar pattern logic to the plant geometric decorations popular in Timurid architecture.[13] At the same time, brick carving and wood carving techniques developed and matured in the Ming Dynasty. For example, the stone balustrades in front of the Hall of Supreme Harmony in the Forbidden City in Beijing and the “sea water and river cliff” patterns on the ground show a very high level of decorativeness.

### 2.4 Systematization of material technology

The use of building materials in the Yuan and Ming dynasties tended to be standardized. In terms of wood, northern pine and fir were mostly used, and the emphasis was on “using every inch of material”; in terms of bricks and stones, the Yuan Dynasty Beijing city wall and the Ming Dynasty Nanjing city bricks had strict modular specifications.[14] The improvement of these material systems not only improved the efficiency of construction, but also provided technical operability for its spread to the frontier and Central Asia.

In terms of decorative materials, the glazed firing technology is highly developed. For example, the glazed tiles of the Ming Dynasty can reach dozens of glaze colors, with smooth glaze and strong adhesion. Examples have been unearthed in Xi’an, Beijing, and Nanjing. The improvement of the glaze color system also makes it possible for the decorativeness of Chinese architecture to have a dialogue with the Timurid decorative tradition in aesthetic expression.

## 3. Characteristics and Development of Monumental Architecture in the Timurid Period

The Timurid Empire (1370–1507) was a significant power in the Islamic world of Central Asia. Its monumental architecture not only carried political symbolic significance, but also promoted the innovation and dissemination of the Islamic

architectural system through form, technology and aesthetic language. Such architecture demonstrated strong political intentions, the integration of aesthetic styles, and innovation in technology, which had a significant impact on the architectural traditions of the Islamic world and even the eastern end of the Silk Road.

### **3.1 Spatial symbols of imperial power**

Under Timur's rule, a large number of craftsmen were forced to migrate from the Iranian Plateau, Khorasan, Azerbaijan and other places to Samarkand and Herat, providing a huge human resource for construction projects serving the royal power.[15] Monumental buildings, such as mausoleums and mosques, were used as symbols of legitimacy and sanctity. Timur himself, for example, was buried in the Gur-e Amir mausoleum in Samarkand, which embodied the dynasty's narrative of "prodigy" with its massive dome, decorative portals, and mosaics.[16] This memorial space has gone beyond its daily religious function and has become an important stage for political rituals.[17]

### **3.2 Formal characteristics of building structures**

The structural system of Timur's monumental architecture is characterized by double-layer domes, axial symmetrical layout and pishtaq (main porch). The use of double-layer domes not only enhances the visual height of the exterior, but also makes the interior space more harmonious.[18] In addition, the dome and porch are widely decorated with colored glaze bricks, showing a decorative style dominated by cold colors such as sky blue and ultramarine, and a large number of Kufic calligraphy and monogram inscriptions are introduced.[19] Bibi Khanum Mosque is a representative of this style with its grand scale and complex brick carvings.[20]

### **3.3 Complex functions of building types**

The architectural types of the Timurid period tended to be increasingly complex. Mosques, madrasas and mausoleums were often built in groups to form functionally integrated architectural complexes. For example, the Ghawhar-Shad complex in Herat combines mausoleums, madrasas and worship spaces, reflecting the rulers' strategy of combining religion, education and royal commemoration.[21] This complex function helps to concentrate resources and strengthen the royal control, and also reflects the overlapping of multiple roles of architecture in urban society.

### **3.4 Continuation and diffusion of architectural traditions**

Although the Timurid dynasty fell apart in the early 16th century, its architectural tradition had a profound impact on the Ottoman, Safavid and Mughal empires. Babur, the founder of the Mughal dynasty, was a descendant of Timur. His architectural style inherited the Timurid tradition in terms of double domes, decorative colors and symmetrical layout.[22] In addition, influenced by the Silk Road, Timurid architectural elements were also introduced into western China. For example, green-glazed bricks and dome structures can be seen in Muslim mosques in Gansu and Yunnan.[23]

## **4. Architectural Technology Dissemination Mechanism and Pattern Theme Transfer Path**

The spread of architectural technology is a complex process, not only the transfer of material culture, but also involves the interweaving of knowledge systems, social and political needs, religious rituals and other factors. The architectural exchanges between Central Asia during the Timurid era and China during the Yuan and Ming dynasties are a vivid example of how architectural technology can be transmitted and transformed from one region to another through multiple channels, different dissemination mechanisms and the transfer of the underlying mother culture.

### **4.1 Multidimensional Mechanism of Architectural Technology Diffusion**

The diffusion of architectural technology is not a single linear process, but rather spreads across regions through different mechanisms. These mechanisms can be explored from the following perspectives:

#### **4.1.1 The integration and development of the Mongol expansion and the craftsman management system in Eurasia**

In the Yuan and Ming dynasties, the craftsman system was directly inherited from the Mongol Empire's "Ordo system" (meaning military household management) and "prisoner of war technical organization" system. The Mongols captured a large number of technical craftsmen during the conquest wars and divided and managed them according to military units. For example, the "Tanma Red Army" was responsible for some engineering tasks.[24] The Yuan Dynasty established the "General Administration of Craftsmen of All Kinds" to unify the management of various captives and folk craftsmen, institutionalizing and bureaucratizing the Mongolian militarized management style. In the Ming Dynasty, the "hereditary craftsman registration" system established during the Hongwu period further strengthened this control model. Once registered as a craftsman, his descendants were not allowed to leave the registration for generations, and were regarded as the state's

“technical household registration.”[25] For example, the site of the artisan settlement discovered in Yongdeng (now Gansu) reflects the spatial control characteristics of this system.[26]

Correspondingly, the Timurid Empire also continued the Mongol Empire’s tradition of “captive craftsmen” in technology management. He imitated the “technology plundering” strategy of Genghis Khan’s period and forcibly relocated craftsmen from various places during each expedition. For example, after conquering Delhi in 1398, Timur brought about 27,000 Indian craftsmen to Samarkand and set up a craftsman camp, which was supervised by Turkic-Mongol officers according to the military establishment.[27] In this arrangement, the “Wan Hu System” decimal grouping was also continued to be used to facilitate military production and construction scheduling. In addition, Timur built a technical corridor based on the Yam system, imitating the Mongolian transportation and resource integration method to achieve the mobilization and collaboration of cross-regional craftsmen.[28]

The difference between the two is that the Yuan and Ming dynasties “agriculturalized” the Mongolian system, tied the identities of craftsmen to the craftsman register, and made them hereditary and settled; while Timur strengthened its “nomadic militarization” characteristics, relying on wars to continuously import new craftsmen, and the organizational form was more flexible. Although the two have different emphases in their methods, they both reflect the core idea left by the Mongolian Empire: treating craftsmen as strategic resources and implementing militarized and institutionalized centralized control.

#### 4.1.2 Craftsman mobility and technology transfer

Artisans played a vital role in the cross-civilizational spread of building technology. Whether through official dispatches or informal exchanges along the thriving trade routes, artisans were irreplaceable contributors to the spread of architectural knowledge between the East and the West. The Timurid dynasty (1370-1507) is a particularly striking example of this phenomenon, as Timur’s ambitious building program created unprecedented opportunities for the exchange of technology. Historical records show that communities of building craftsmen from Persia, Anatolia, and Central Asia were systematically relocated to Samarkand, Herat, and other emerging cultural centers. These migrations were not based on the craftsmen’s own willingness, but objectively promoted the spread of technology. Persian master builders brought their expertise in dome construction and complex vaulting, while Central Asian craftsmen contributed advanced techniques in fired brick masonry and tile making. The construction sites of Timurid mosques and palaces became veritable cross-cultural laboratories of innovation, with design concepts from different regions adapted to local materials and climatic conditions. Perhaps most importantly, these craftsmen not only passed on technical knowledge but also aesthetic tastes - the unique Timurid style that emerged during this period witnessed a creative fusion of Persian elegance, Central Asian grandeur, and innovative structural solutions. The movement of craftsmen thus constituted a key mechanism for the globalization of architectural knowledge long before the modern era, creating enduring monuments that bear witness to these historical exchanges today.[29]

#### 4.1.3 The influence of Central Asian architectural technology on China

In China, the Ming government’s management of craftsmen also reflected the characteristics of the spread of architectural technology. For example, during the Yongle period, a large number of Central Asian and Persian craftsmen were transferred to Beijing to assist in the design and construction of the Forbidden City and other royal buildings. These craftsmen brought Central Asian architectural elements, color techniques, and structural styles to China, which influenced the style and decoration of Ming Dynasty palace architecture.[30] During the Yongle period, a large number of cool color combinations with cyan, peacock blue and lake blue as the main tones appeared in the architectural decoration of the Forbidden City. This color application is similar to the decorative style of “ultramarine + white background” or “cobalt blue + sky blue” in Central Asian Islamic architecture. (Figure 1 and 2)



Figure 1. Blue-glazed eaves of the Forbidden City, Beijing. Author’s photo (taken on-site, 2025)



Figure 2. Ornament, The Gate of Heavenly Purity, Forbidden City, Beijing (Source: China stock photo, gm471544977-24822253)

In addition, the twined flowers, linked beads, and broken branches in the Forbidden City are highly similar to the Islamic decorative tradition, especially the combination of lotus petal deformation and curling grass patterns, which is obviously different from the more rough style of the Yuan Dynasty. This can be seen as the fusion and evolution of Persian miniature paintings and architectural patterns to the early Ming Dynasty.

In terms of decorative materials, “Sumaliqing” is a cobalt blue ore from Persia, which is the key raw material for Yongle blue and white porcelain. This porcelain style with a strong blue and white contrast is not only used for utensils, but also affects architectural colored porcelain, such as the blue and white color matching process of glazed tiles and brick carvings.

From the Yongle to the Xuande period, complex glazed collages and brick carvings appeared in the Forbidden City and royal temples. Their production process is close to the Central Asian “mosaic bricks” and “haft-rangi” decoration system, which may be derived from the transformation of traditional colored glaze collage techniques by Islamic craftsmen.

#### 4.1.4 Cultural exchange and communication between government and the public

Not only the direct flow of craftsmen, but also cultural exchanges and diplomatic activities are important ways to spread architectural technology. The prosperity of the Silk Road and the Maritime Silk Road promoted cultural interaction between Central Asia and China. In these exchanges, building materials and technologies were often passed as diplomatic gifts. For example, the diplomatic envoys of the Ming Dynasty brought exquisite Chinese porcelain and handicrafts to Central Asia, and the craftsmanship and architectural ideas of Central Asia were also introduced to China through envoys. Through documentary records and physical evidence, a large number of traces of craft exchanges can be traced back.[31]

#### 4.1.5 Religious propagation and architectural transformation

Religious beliefs also have a profound impact on the spread of architectural technology. In the Timurid era, the expansion of Islamic architectural styles was closely related to the functional needs of Islamic religion. In order to accommodate worship, gatherings and other religious activities, elements such as domes, arches and towers in Islamic architecture were widely spread to East Asia.[32] This process is not just a simple transfer of technology, but also a profound shaping of the architectural form by the belief system.

When the Ming Dynasty in China accepted Islamic culture, especially in Fujian and Guangdong, there was also a phenomenon of using Islamic architectural elements in religious buildings. Although these buildings have local characteristics in form, their structure and decoration are influenced by the Timurid architectural style, forming a cross-religious architectural dialogue.

## 4.2 The transfer path of motif culture and architectural technology

The spread of architectural technology is not a simple imitation or replication, but a transfer process of “motif culture”. The architectural technology of each region has its own unique historical and cultural background, and the process of technology acceptance and transformation is actually the result of cultural exchange and conflict.

### 4.2.1 Themes of Central Asian and Chinese architecture borrow from each other

The combination of Timurid architectural technology in Central Asia and Chinese Ming Dynasty architecture is not only a technical reference, but also a cultural fusion. For example, Timurid architecture strongly emphasizes symbolism and political authority, and conveys a strong imperial symbolism through pattern decoration, structural form and spatial layout. The Chinese architectural style focuses more on the idea of moderation, peace and harmony between man and nature. In the intersection of these two cultures, architecture must not only convey political and religious concepts, but also adapt to the

cultural needs of local society.[33] For example, the Phoenix Temple in Hangzhou uses arch and dome designs similar to those in Central Asia. (Figure3).

The blue glazed brick craftsmanship in the Timurid Mosque and the cobalt material technology of Chinese blue and white porcelain are an example of the mutual technical reference between the two cultures. Although blue and white porcelain originated from Central Asia, it gradually formed a unique porcelain craftsmanship in Jingdezhen, China. In this process, not only the technology was passed on, but also the cultural values were mutually infiltrated.[34] In 2024, Professor Yang Yimin's team from the Department of Archaeology and Anthropology, School of Humanities, University of Chinese Academy of Sciences, the National Museum of Iran, and Isfahan University of Arts, Iran, conducted a three-party cooperation to analyze the composition of cobalt blue glaze ceramics produced in China and Persia, trying to determine the source of cobalt materials. The study analyzed 28 ceramic products. Among them, 8 were Mina'i ceramics, 8 were blue-and-white porcelain produced in China, 10 were blue-and-white wares (including glazed pottery and sand glass) unearthed from the Jahan-Nama site in Isfahan, and 2 were Lajvardina glazed bricks from Yazd. The study used a portable X-ray fluorescence spectrometer (p-XRF) to analyze the blue part of the sample glaze and detect the content of various chemical elements. The results showed that high-manganese cobalt materials were mainly used for blue-and-white porcelain produced in China during the Ming Dynasty; Iran's cobalt materials have at least two main sources: one is the Qamsar mine close to the Kazan area, and the other is the Takht-e Soleyman mine close to the northwest of Iran. Based on the analysis results, the study explored the source of Persian cobalt materials imported for blue and white porcelain, and believed that the Takht-e Soleyman mine was more likely to be the source of cobalt materials than the Qamsar mine and Anarak mine in central Iran. The reasons are: first, the mine is located on the Silk Road transportation line, and its trade convenience exceeds that of other Iranian cobalt mines; second, the mine is rich in arsenic, copper and nickel, which is consistent with the cobalt composition of early Chinese blue and white porcelain; finally, and most importantly, the name of the mine corresponds to the "Soleymani stone" in Persian literature and the "Sumaliqing" in Chinese literature, which further supports the possibility of Takht-e Soleyman mine as the source of imported cobalt materials for blue and white porcelain(Figure 5 and 6).

The Huaisheng Mosque in Guangdong has a minaret building similar to that in Central Asia(Figure 4). Islamic motifs in mosque architecture have also been translated into Chinese styles. The geometric vines (Arabesque) prevalent in Central Asian architecture were translated into glazed passionflowers in the pagoda of Nanjing Dabaoen Temple. In contrast, the Central Asian prototype weakened the abstract geometry and strengthened the realistic flowers, and the lotus petals were closer to the peony. The Kufic calligraphy decorations prevalent in the Timurid Mosque were translated into Chinese plaques and Arabic "one-stroke writing" in the Huajue Lane Mosque in Xi'an, and the Arabic strokes were integrated with the style of seal script. Coincidentally, Chinese motifs are also widely used in the Islamic context. Deformed cloud pattern brick carvings appeared in the Shah-i Zinda Mausoleum in Samarkand. They were originally official colored painting elements of the Ming Dynasty (such as the Taihe Seal colored paintings in the Forbidden City), and were deconstructed by Persian craftsmen into continuous cirrus borders and filled in the arch shoulder area. The glazed brick "brocade ground opening" composition (central pattern + geometric ground pattern) of Ghawhar-Shad Mosque in ,This 15th-century mosque in Herat, Afghanistan ,imitates the "round nest pattern" of Chinese silk, but replaces the dragon and phoenix in the opening with Arabic inscriptions and palm leaf patterns.

Based on the logic of color politics, Timur designated blue as the exclusive color of the royal family, while the Ming court used yellow glazed tiles as a symbol of imperial power. The two color systems are also reflected in frontier religious buildings. The Bafang Mosque in Linxia, Gansu uses yellow glazed domes and blue glazed arches, which echo the Central Asian royal power symbols and Chinese rituals.



Figure 3. Phoenix Mosque , Hangzhou, China (Zhiping, 1960)



Figure 4. The Huaisheng Mosque Guangdong China (Ibid, 11)



Figure 5. Blue-and-White Porcelain of the Yuan Dynasty. In A Brief History of Chinese Imperial Porcelain (pp. 71–97). Palgrave Macmillan, Singapore.



Figure 6. Blue-glazed surface detail in the Ulugh Beg Observatory Museum, Samarkand (Author's photo, taken on-site, 2025)

#### 4.2.2 Technology transfer and transformation along the Silk Road

As an important trade and cultural link between Central Asia and China, the Silk Road carried a large amount of exchanges in architectural technology and craftsmanship. In this process, the transfer of technology is not static, but a dynamic transformation process. For example, after the Central Asian construction technology was introduced into China, it was gradually combined with China's traditional wooden structure construction technology to form an architectural style with mixed characteristics. This style not only maintains the grandeur and refinement of Central Asian architecture, but also incorporates China's unique requirements for spatial perception and structural layout.

At the same time, Central Asian masonry construction technology was widely used in the construction of palaces in the Ming Dynasty, especially the construction of the Forbidden City during the Yongle period, which not only relied on a large amount of masonry materials, but also integrated the dome and arch elements of Central Asia to construct a palace space in line with the traditional Chinese architectural philosophy.[35]

#### 4.3 Inheritance and innovation of architectural technology: cross-cultural collision

The spread of architectural technology is not only the transmission of technology, but also the collision and fusion of culture and thought. In this process, architecture is not only the expression of material culture, but also the carrier of thought, philosophy, power and faith. For example, the vaults in Timurid architecture are similar to the palace architecture of the Ming Dynasty in China in technology, but the cultural significance they carry is different. The vaults in Timurid architecture symbolize the infinity and heaven in the Islamic world, while the domes in Chinese architecture represent the combination of imperial power and destiny.

Through in-depth analysis of these architectural technology and cultural interactions, it can be found that the spread of architectural technology is not just the imitation of handicrafts, it also reflects the profound values and socio-political background in cross-cultural exchanges. In the future, with the further development of archaeology and architecture, the path of the spread of architectural technology will be clearer, and we can better understand the innovations and challenges in cross-cultural architectural practice.

#### 4.4 Explicit transplantation in the Yuan Dynasty and implicit inheritance in the Ming Dynasty

The Timurid Empire corresponds chronologically to the Yuan and Ming dynasties in China; however, the ruling ethnic groups and cultural policies of these Chinese dynasties were fundamentally different. The Yuan dynasty, ruled by the Mongol descendants of the Mongol Empire, adopted a relatively inclusive cultural policy. They regarded the Central Plains (Zhongyuan) as one part of a broader Eurasian universal empire and exhibited considerable tolerance towards Islam. Consequently, architectural practices during the Yuan period allowed for more overt incorporation of Central Asian symbols and motifs, reflecting the empire's cosmopolitan and pluralistic ethos (Wang, 2010)[36].

In contrast, the Ming dynasty, established upon a strong Han nationalist and revivalist sentiment, adopted a more conservative and restrictive stance toward foreign religions, including Tibetan Buddhism and Islam. As a result, the expression of Central Asian architectural elements during the Ming era shifted from explicit inheritance to more subtle and implicit forms of transformation. This transition reflects the Ming court's effort to assert ethnic and cultural distinctiveness while simultaneously managing the influence of external religious and cultural forces (Dardess, 1996; Brook, 2010; Mote, 1999). [37]

##### 4.4.1 Case analysis based on the Huajuexiang Grand Mosque in Xi'an

According to the stele, the Xi'an Huajue Lane Mosque was first built in the first year of the Tianbao period of the Tang Dynasty, but it was expanded and rebuilt to its current size during the Hongwu period of the Ming Dynasty. The Tang Dynasty was the initial period of Islam, and the mosque was small in scale, and its structure is difficult to verify. The Ming Dynasty was another period of in-depth spread of Islam after the Yuan Dynasty. After several generations of spread, it has already gathered believers of several ethnic groups such as the Hui and Baoan people, and formed a settlement area. The third volume of "The Chronicle of the Ming Dynasty" records that although Zhu Yuanzhang formulated the "Shintoism" system as the religious policy of the Ming Dynasty and strictly controlled religious organizations and religious populations, many Islamic generals followed Zhu Yuanzhang to fight and made great military achievements, so Zhu Yuanzhang specially authorized the Minister of War Tie Xuan to rebuild and expand the Xi'an Huajue Lane Mosque. In order to cater to the rulers and employ a large number of local Han craftsmen, as well as the deep integration of Islamic culture and Han culture over a long period of historical development, the mosques in this area clearly combined the construction form of the time, which was mainly based on wooden structures, and were far from the original brick dome style. Brick carving as a building decoration had already been quite mature and widely used at that time, so it is not difficult to explain why such an excellent folk craft combined with Islamic doctrines was built to present the Huajue Lane Mosque to the world.

#### 4.4.2 Case analysis based on the Porcelain Hall in Samarkand

The 16th-century Chagatai-language “Memoirs of Babur” records a Chinese-style building in Samarkand called “Chini Khāna”: He (referring to Ulugh Beg) opened another small garden in Kuhak. He built a hall-style building (Ayvan Imarat) there. In the hall, a large throne was built with stone, about fourteen or fifteen kāri long, seven or eight kāri wide, and one kāri high. ... In the middle of the garden, a hall with four doors was built, and its screen walls (Iyzaresi) were all paved with porcelain products (Chini), so it was called Chini Khāna. These porcelain products were purchased by Ulugh Beg from China.[38] 1497-1498, when Babur counterattacked Samarkand, he saw the beauty and grandeur of “Chini Khāna”, the most luxurious building in Samarkand. This Chinese-style building left a deep impression on Babur. He wrote: “I have wanted to go to China since I was a child, but I was unable to do so because of government affairs and relatives.

The Porcelain Hall failed to be preserved. In 1449, after the other tribes entered Transoxiana, Ulugh Beg was killed by his son Abd al-Latif Mirza. After that, the hall was gradually abandoned. In 1507, after Shay-bani Khan defeated Oszaman, a descendant of Timur, he destroyed Samarkand and Ulugh Beg’s summer palace. At this time, the “Porcelain Hall and the painting exhibition room were completely destroyed.

The existence of the Porcelain Hall shows that the interaction between Chinese architecture and Central Asian architecture is neither one-way nor linear. The building is mainly in Chinese form, with large areas of Central Asian ceramic decoration, and its aesthetic taste depends on the personal ideas of the ruler. Its generation is the result of a network interaction among countries along the Silk Road.

## 5. Cross-regional comparative study of Yuan, Ming and Timurid architecture

### 5.1 Dougong-like structures in Samarkand architecture

According to the observations of architectural historians Boris Marshak and Lisa Golombek, some royal buildings in Samarkand did have imitation bracket structures, especially in the facade decorations of some tombs in the Shah-i Zinda Ensemble (Figure 7). In these buildings, the decorative supporting components at the junction of the lintel and the wall columns are stepped out, which is similar to the brackets in the Han Dynasty, but the materials are mostly brick carvings or glazed pottery pieces, and they are not load-bearing in function.[39]

This “imitation bracket” technique is probably a decorative element created by craftsmen to enrich the rhythm of the facade when faced with large-span openings and heavy eaves. It is very similar to the symbolic transformation trend of Chinese brackets in terms of functional positioning.

In the evolution of dougong in Central Asia, ideology and religion have become important influencing factors. The form and practice of traditional Chinese dougong cater to the Confucian hierarchical order and endorse the autocratic imperial power. This value system is incompatible with the theocratic structure of the Islamic world. Therefore, in places such as Samarkand and Herat, craftsmen imitated the formal sense of dougong, but did not continue its structural function and ideological connotation. This type of “imitation dougong” is mostly presented in brick carvings or glazed components, which are used to enrich the rhythm of facade decoration rather than bear actual loads. Technical feasibility is also an important basis for the localization of architectural forms. Chinese wooden structures rely on high-grade wood and a strict master-apprentice system, but in Central Asia, where brick and stone are the main materials, this institutional foundation is difficult to replicate. Therefore, many Chinese technologies are transformed into visual symbols in brick and stone structures, or compromises are made in form. This process shows the technical translation driven by the material system.

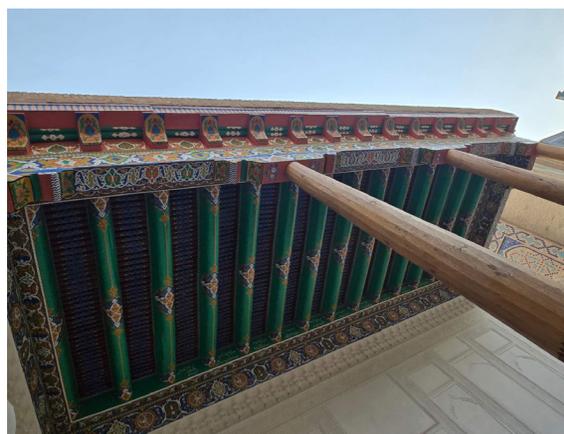


Figure 7. Imitation bracket decoration of Shah-i-Zinda Mausoleum, Samarkand (Author’s photo, taken on-site, 2025)

## 5.2 The symbolic trend of Chinese bracket sets during the Yuan and Ming dynasties

The brackets in Chinese architecture have been the core of the structure since the Song Dynasty. However, in the Yuan and Ming Dynasties, especially after the Yongle Period, the brackets gradually lost their original load-bearing function and became decorative components under the beam system. Liang Sicheng once pointed out that the size of brackets in the Ming Dynasty was generally reduced, and many buildings even used “substitute wood” to imitate the bracket shape, which only played a symbolic decorative role.[40]

For example, the brackets in the Ming Xiaoling Mausoleum in Nanjing and the Hall of Prayer for Good Harvests in the Temple of Heaven in Beijing, although beautiful in form, served more as visual separation and symbol of rank in structure. This transformation provided a prototype for the Timurid Empire’s Central Asian craftsmen to imitate bracket structures (Figure 8).

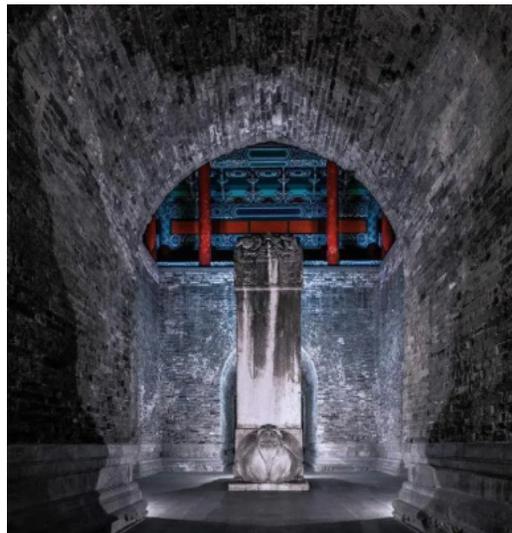


Figure 8. The Shen Gong Sheng De Stele Pavilion (commonly known as “Si Fang Cheng”) at Ming Xiaoling Mausoleum, Nanjing (Source: Visual China, VCG211449953657)

## 5.3 Similarities between the “beamless hall” and the Islamic vault structure

On the other hand, the “beamless hall” structure that appeared in Chinese Ming Dynasty architecture (such as the beamless hall in the ruins of Nanjing Da Baoen Temple[41 ])The main load-bearing form is the brick vault, which is similar to the traditional vault and dome system in Central Asia and Persia in terms of materials and technology. In the Timurid era, brick double-layer domes and large-span vaults were widely used, which resonated with the closed and sacred nature of the beamless hall in terms of spatial perception(Figure 9).



Figure 9. The Wu Liang Hall (Beamless Hall) of Ming Xiaoling Mausoleum, Nanjing. Source: Author’s compilation based on “Chinese Architecture and Planning: Volume 1” (Steinhardt, 2019).

## 5.4 Technological Interaction and Symbolic Evolution: A New Framework for Understanding

The above comparison shows that although Timurid architecture and Yuan and Ming architecture have different starting points, there is an interactive trend of “structural symbolization” and “decorative structuring” in terms of bracket decoration, vault system, and visual hierarchical expression of spatial structure. This interaction may not be due to direct technology transmission, but may be based on the similar imagination of “power space” by different civilizations in the imperial order.

## 5.5 Summary

Although the architecture of the Timurid era did not directly copy the Chinese system at the structural level, it echoed the spatial organization and symbolic system of the architecture of the Yuan and Ming dynasties through decorative brackets and brick vaults. This “asymmetric interaction” at the technical and decorative levels provides valuable evidence for our understanding of the cross-cultural evolution of architectural language in Eurasia.

## 6. Summary and Outlook

The exchange and interaction between Central Asia in the Timurid era and China in the Yuan and Ming dynasties in terms of architectural form, technology and decoration system reflects the deep logic of the Silk Road as a cultural intermediary. From glazed brick materials to dome structures, from pattern motifs to the flow of craftsmen, the architecture of this period is no longer a product of isolated development, but the result of the integration of regional knowledge systems, aesthetic tastes and political ideologies in a specific historical context.

First, the “Timur blue” displayed by the glazed brick decoration in the Timurid Mosque and the Chinese blue and white porcelain show a high degree of material logic consistency in terms of the mineral source and coloring technology of the cobalt material. The scientific and technological analysis of the samples unearthed in Samarkand and Jingdezhen shows that the cobalt materials of both are rich in high iron and low manganese components, indicating that the raw material transmission path comes from the Persia-Yunnan-South China sea route.[42] This cross-cultural sharing of technology echoes the connection space between the Timurid regime’s strong visual political needs and the Ming Empire’s export-oriented ceramic industry.

Secondly, the comparative analysis of dome structures reveals the different orientations of both parties towards spatial tension and structural innovation. Double-layer domes are commonly used in Timurid architecture to enhance the grandeur of the exterior and the acoustic performance of the interior worship space.[43] The brick domes used in the palaces of the Yuan and Ming dynasties in China, such as the beamless palace in Nanjing, focused more on the juxtaposition of structural stability and religious functions. This difference in technical paths does not lie in which side is advanced or backward; rather, it reflects the dynamic relationship between religion, rituals, and technology.

It is worth emphasizing that the “non-load-bearing bracket sets” components that appear in some mosques in Samarkand and Herat do not have the mortise and tenon structure of traditional Chinese bracket sets, but they use similar visual logic to express the effects of “overhanging eaves” and “double eaves”, which is most likely derived from the cognitive imitation of the East Asian architectural composition system.[44] This phenomenon not only provides an example for the spread of architectural decorative styles, but may also mean that there was a specific knowledge translation process at the craftsman level.

In addition, the records of diplomatic envoys in Ming Dynasty documents, such as Xingcha Shenglan and Xiyu Zhuan, provide many fragments that can be analyzed about the process of Central Asian craftsmen entering China or porcelain exporting to Central Asia. For example, the Arab Huihui envoys during the Yongle period carried glazed pottery samples and brocade patterns as tribute and medium of technical exchange. These archives can be regarded as material evidence of informal scientific and technological diplomacy.[45] These archives can be seen as material evidence of informal technological diplomacy.

In summary, the architectural interaction between Central Asia and the Central Plains should not be understood only from the perspective of ethnicity or dynasty as “mutual learning”, but should be seen as a dynamic construction process formed by the coupling of political needs, aesthetic systems and technological paths in the early context of globalization. In the future, the academic community can further combine remote sensing archaeology, component analysis and craftsman genealogy to expand the “micro-history of technology” perspective on this type of cross-civilization communication.

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