

The Development and Legacy of Mughal Architecture in India

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Abstract

Mughal architecture in India is a distinctive blend of Persian, Turkish, and Indian styles, characterized by grandeur, symmetry, and artistic refinement. This study examines the evolution of Mughal architecture across different reigns, focusing on the contributions of emperors like Akbar, Jahangir, Shah Jahan, and Aurangzeb. It highlights key architectural elements such as domes, minarets, intricate calligraphy, geometric patterns, and the Charbagh garden layout. The research explores major Mughal structures, including forts, mausoleums, palaces, mosques, and gardens, analyzing their construction techniques, material choices, and aesthetic innovations. A significant aspect of the study is the transformation of building materials, from Akbar's extensive use of red sandstone to Shah Jahan's preference for white marble, culminating in masterpieces like the Taj Mahal. The study also emphasizes the Mughals' advanced urban planning, sophisticated water management systems, and the fusion of Islamic and Indian architectural traditions. The research further assesses the enduring influence of Mughal architecture on regional styles such as Rajput, Sikh, and Deccan architecture, as well as its impact on modern Indian architectural practices. The findings highlight that Mughal architecture is not just a historical achievement but a lasting cultural legacy. Its principles of balance, symmetry, and intricate detailing continue to inspire contemporary architectural designs worldwide. This research underscores the artistic and structural ingenuity of Mughal architects, reaffirming their significant role in shaping India's architectural landscape.

Keywords: Mughal architecture, Indo-Islamic style, symmetry, Charbagh, Red Sandstone, Pietra Dura, urban planning

INTRODUCTION

Throughout the Mughal dynasty (1526–1857), the Indian subcontinent saw a flourishing of the distinctive Indo-Islamic-Persian style known as Mughal art and architecture [1]. During the Delhi Sultanate (1192–1398), Persian and Islamic art and architecture were introduced to India, and this new style combined them to create stunning buildings like the Qutab Minar [2]. Most Mughal monuments are in India, while Pakistan also has many ruins. The development of these unique art and architectural styles under a series of Mughal monarchs is covered in this essay.

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During the Mughal era, magnificent forts, mosques, mausoleums, gardens, and towns were constructed [3]. Beginning with Akbar, who exhibited a tremendous passion for structures by meticulously planning and erecting magnificent edifices, Mughal architecture was beginning to emerge. It was his ability to make the most of the Hindu and Persian architectural styles that he utilized. The most notable characteristics of Akbar's structures are the use of red sandstone that has been inlaid with white marble and the painted motifs that are carried out on the walls and ceiling.

Mughal Architecture is the new style of Indian architecture from the Mughal era [4]. Central Asian, Timurid Iranian, Persian, Turkic, and Indian Hindu architectural styles were all combined to create Mughal architecture.

Mughal architecture first appeared and peaked under Akbar's reign. Red sandstone was often used for construction during this time. The height of Mughal architecture occurred under Shah Jahan's reign. During and after Aurangzeb's reign, Mughal architecture started to deteriorate. Gorgeous quadrilateral gardens were a legacy of the Mughals [5].

Some of the Most Famous Architecture Created During the Mughal Era Are [6]

- *Taj Mahal*: Dedicated to Shah Jahan's wife, Mumtaz Mahal, it took him from 1632 until 1653 to complete construction. Since its 1983 designation as a World Heritage Site, the Taj Mahal has been under the auspices of UNESCO. Agra is where you'll find it.
- *Red Fort*: In 2007, UNESCO designated it a World Heritage Site. When Shah Jahan chose Delhi over Agra as the new capital, he had it constructed. There, the Mughal emperors lived.
- *Shalimar Gardens*: This 40-acre garden was constructed in 1642 by Shah Jahan. In 1981, it received UNESCO's World Heritage Site designation.
- *Jama Masjid*: Created by Shah Jahan. Finishing touches were applied in 1656.
- *Badshahi Mosque*: When it was finished in 1673, it was the biggest mosque in Earth. He had it constructed while Aurangzeb was in power.
- *Humayun's Tomb*: It was constructed in 1570 as a monument to Emperor Humayun, and in 1993 it was designated a World Heritage Site.

MUGHAL ARCHITECTURE

Mughal architecture in India is a unique blend of various artistic and cultural influences, resulting in grand structures that continue to define the country's architectural landscape [7]. The Agra Fort, the principal palace of the Mughal rulers, is among the most prominent examples. The splendor and strategic planning of the empire are reflected in this magnificent building, which was constructed with accuracy and care. Similarly, with its elaborate decorations and distinctive red sandstone structure, Emperor Shah Jahan's Red Fort in Delhi is a quintessential example of Mughal beauty [8].

Gates were important in Mughal architecture and frequently represented strength and triumph. An excellent example is the Buland Darwaza in Fatehpur Sikri, which was constructed by Emperor Akbar to honor his conquest of Gujarat [9]. In addition to being an entryway, this magnificent gateway is a work of architecture that exemplifies the magnificence of the empire. Additionally, public buildings such as sarais (inns) and hamams (bathhouses) were crucial elements of Mughal urban planning, facilitating commerce, travel, and luxury. The Jama Masjid in Delhi, one of the largest mosques in India, showcases the synthesis of Persian and Indian styles, embodying the cultural inclusivity of the Mughal rulers [10].

Gardens were another defining feature of Mughal architecture, meticulously planned with symmetrical layouts, flowing water channels, fountains, and reflecting pools. These gardens, such as Shalimar Bagh in Lahore and Nishat Bagh in Kashmir, not only provided aesthetic pleasure but also demonstrated the Mughals' advanced landscaping skills. Water features played an essential role in their architectural designs, adding beauty and tranquillity to their palaces and pleasure resorts [11].

The Mughal architectural legacy also extends to Sasaram, a historic town in Bihar, home to the Mausoleum of Sher Shah Suri. Modelled after the octagonal Lodi tombs, this magnificent structure stands on a high square platform, symbolizing grandeur and prominence [12]. The mausoleum's design, with its corner kiosks and elegant dome topped with a lotus finial, exhibits elements later refined in the Taj Mahal [13]. Though Sher Shah's mausoleum shares similarities with Shah Jahan's masterpiece, its stone construction gives it a more solid, imposing appearance compared to the ethereal beauty of the marble-clad Taj Mahal.

Sasaram is home to mausoleums as well as the Purana Qila, a medieval fort that showcases the Mughals' architectural and military capabilities [14]. This fort blends Persian and Indian elements with its formidable walls, bastions, and great entrance gateway. The Mughals' capacity to combine practicality with creative brilliance is demonstrated by the fort complex's audience halls, palaces, and administrative structures [15]. Additionally, the fort complex's use of water channels and baolis (stepwells) demonstrates their proficiency in hydraulic engineering. The architectural legacy of the Mughal Empire is a testament to its grandeur, innovation, and cultural synthesis [16]. From the Agra Fort and Buland Darwaza to the Taj Mahal and Sasaram's architectural gems, Mughal structures continue to captivate historians, architects, and tourists alike. Their blend of artistic expression, engineering brilliance, and cultural influences has left an enduring mark on India's historical and cultural heritage [17].

The legacy of Mughal architecture extends beyond its aesthetic appeal, influencing urban planning, structural innovation, and artistic traditions in India and beyond [18]. The Mughals introduced domes, minarets, grand gateways, intricate inlay work, and symmetrical gardens, which later inspired Rajput, Sikh, and British colonial architecture in India. The use of marble, red sandstone, calligraphy, geometric patterns, and floral motifs set new standards in artistic expression, blending functionality with visual grandeur [19].

Numerous Mughal architectural wonders are now acknowledged worldwide for their cultural and historical significance as UNESCO World Heritage Sites [20]. Their architectural principles—such as proportional balance, symmetry, water conservation techniques, and integration with nature—have influenced modern architecture and sustainable design philosophies worldwide.

Beyond its historical and artistic significance, Mughal architecture serves as a symbol of India's rich and diverse past, showcasing the religious tolerance, cultural synthesis, and craftsmanship of an era that shaped India's built environment [21]. Today, these structures attract millions of tourists, contributing to India's cultural tourism and economic growth while preserving the architectural ingenuity of the Mughal period for future generations.

RESEARCH PROBLEM

Mughal architecture is one of the most significant contributions of the Mughal Empire to India's cultural and artistic heritage. While its grandeur and artistic excellence are well acknowledged, there is a need for a comprehensive analysis of the evolution, distinct styles, and development of Mughal architecture under different rulers. Existing studies often focus on individual monuments rather than the architectural progress across different reigns. Additionally, the specific skills and innovations introduced by various emperors require deeper exploration to understand how Mughal architecture evolved over time.

This study seeks to address the gap in understanding the architectural transformation under different Mughal rulers, the defining features that distinguish Mughal architecture, and the techniques and construction skills that developed during the Mughal period. By examining the stylistic diversity, structural innovations, and artistic advancements, the research aims to provide a holistic view of Mughal architectural legacy and its long-lasting influence on Indian architecture.

OBJECTIVES OF THE STUDY

- To examine the many Mughals architectural styles.
- To outline the key characteristics of Mughal architecture
- To determine how architecture evolved during the different Mughal emperors.
- To concentrate on the growth of Mughal architectural abilities during the reign of the Mughal emperors.

RESEARCH QUESTIONS

- What are the distinctive styles and characteristics of Mughal architecture?
- How did Mughal architecture evolve under different emperors?
- Which major architectural advancements were made during the Mughal era? How did Mughal architecture influence later architectural developments in India?

SIGNIFICANCE OF THE STUDY

The study on the Development and Legacy of Mughal Architecture in India holds significant importance in understanding the artistic, cultural, and historical contributions of the Mughal era. This study aids in determining the unique qualities that distinguish Mughal architecture from other architectural traditions by examining its many styles. The study provides a detailed examination of the salient features of Mughal architecture, including symmetry, intricate carvings, grand domes, minarets, and the use of red sandstone and white marble, contributing to a deeper appreciation of its artistic and structural uniqueness.

Furthermore, the research sheds light on the architectural advancements under different Mughal rulers, from Babur's introduction of Persian-style gardens to Shah Jahan's monumental contributions like the Taj Mahal. Understanding how each emperor influenced architectural styles allows for a comprehensive exploration of the empire's evolution in design, engineering, and aesthetics. Additionally, by focusing on the development of Mughal architectural skills, the study highlights the Mughals' mastery in construction techniques, urban planning, and landscaping, which continue to inspire modern architecture in India and beyond.

This study is significant for historians, architects, and scholars as it preserves and promotes.

knowledge of India's rich architectural heritage. Additionally, it offers insightful information for conservation initiatives, guaranteeing that these historic buildings be preserved for upcoming generations. Moreover, by analyzing the legacy of Mughal architecture, the research contributes to the understanding of cultural integration and artistic synthesis, demonstrating how Persian, Indian, and Central Asian influences merged to create some of the world's most celebrated architectural wonders.

Limitations of the Study

- *Geographical Scope:* While the study focuses on Mughal architecture in India, it does not extensively cover similar styles in other regions influenced by Mughal aesthetics, such as Pakistan, Bangladesh, or Afghanistan.
- *Time Constraints:* The research is limited to the Mughal period (1526–1857) and does not delve deeply into later architectural influences or modern adaptations of Mughal design.
- *Limited Technical Analysis:* This study emphasizes historical and artistic aspects rather than advanced structural engineering or material science studies of Mughal monuments.
- *Dependency on Secondary Sources:* The study primarily relies on historical records, books, and scholarly articles rather than first-hand archaeological surveys or field visits.
- *Exclusion of Non-Royal Structures:* While the research covers forts, palaces, mosques, and tombs built by Mughal rulers, it does not extensively analyze commoner dwellings or smaller structures from the same period.

LITERATURE REVIEW

An essential component of academic research that analyzes and arranges the body of knowledge on a particular subject is a literature review. It provides a comprehensive summary of relevant studies, theories, and methods, helping researchers identify gaps, trends, and key discussions in the field. By critically analyzing and summarizing scholarly works, the literature review refines research questions and enhances understanding of the subject. Ultimately, a well-structured literature review guides the study framework and helps shape future research.

Singh [22]: The Mughal Empire graced Indian history with its grandeur, diversity, and ingenuity. Founded by Babur in the 16th century, the empire prospered under emperors Akbar, Jahangir, and Shah Jahan, showcasing a blend of civilisations and political talent. A unique cultural mosaic emerged from the Mughal Empire, which combined Central Asian and Indian features. The Taj Mahal, in India, combines Islamic and Persian aesthetics. It was created there and later moved to Delhi, the capital of the empire. The empire's sponsorship of arts and literature made Akbar's court a centre for cultural exchange throughout this golden age of creativity. Popular for his religious tolerance, Akbar advocated for an inclusive government model. His Sulh-e-kay policy, aimed at balancing religious traditions, established India's dedication to cultural pluralism. Administrative reforms and economic reforms increased the empire's power. Aesthetics and nature were prioritised throughout Jahangir's reign, fostering Mughal miniature art. The combination of cultural values and political tensions throughout his reign led to Shah Jahan's massive architectural legacy. Shah Jahan led the Mughal Empire to its apex, manifested in the Red Fort and Taj Mahal. The empire's fall highlighted the complex factors that impact its success. External invasions, economic difficulties, and internal turmoil contributed to its demise. In the 18th century, the British East India Company played a key role in ushering in a new era in Indian history. Indian culture, architecture, and politics are influenced by the Mughal Empire. Significant contributions to visual expression, architecture, and governmental values remain important today. Akbar's legacy of religious diversity and cultural harmony illuminates a culturally diverse nation. In retrospect, the Mughal Empire stood out for its achievements, difficulties, and lasting contributions. The history of a nation reflects the intricate relationship between power, culture, and identity, suggesting that the past shapes the present and future.

Rahman & Tahir, 2008 [23]: The city of Mughal heritage in its purest form is Lahore. Magnificent structures with a little landscaping touch tell the tale of a magnificent building age. A testament to Mughal magnificence, some of this enormous architecture's chapters have been destroyed or warped by succeeding emperors, while others are disappearing because of the harsh surroundings. The influence of environmental aggression on the slow disintegration of the three jewels of Mughal architectural treasures – Lahore Fort, Jahangir's mausoleum, and Shalimar Gardens – is discussed in this paper. The focus is primarily on structural deterioration. Two of the three previously listed locations – the Lahore Fort and Shalimar Gardens – were designated UNESCO World Heritage Sites in 1981, but UNESCO-funded repair projects are rapidly eroding their designation. These buildings are still suffering from their fate while holding out hope for restoration, which would reappraise their past, because of the renovations' carelessness, which is making environmental agents' devastation worse.

Campbell, 2011 [24]: My research focusses on the cultural threads that bind us to places and allow us to connect the past and present. Understanding the life histories of historic locations allows us to appreciate their significance in the world today. The thesis examines Mughal caravanserais from north-western Pakistan, investigating its original use during Mughal control and subsequent reuse (Sikh, Afghani, British, and Pakistani). Tourists can stop at caravanserais, which are walled structures with arcades. Post-Mughal Empire demise, caravanserais were repurposed by locals or passed on to new governments. Remaining structures are still utilised, albeit with altered appearance and functionalities for new uses. My research is conducted under Dr. Heather Miller's direction at the University of Toronto's Caravanserai Networks Project. The survey approach is developed by comparing two caravanserais, Gor Khuttree and Pakka Khanpur. I develop three-dimensional architectural models of Gor Khuttree's vocations using survey data, historic papers, and images. Access and planning analysis are used to analyse the use and changes to the sites' architecture. I create a threefold concept of place formation: produced, practiced, and remembered. Regarding Gor Khuttree, I explore its history, vocations, identities, and recollections across time. This research focusses on Peshawar, located in Pakistan's Northwest Frontier Province. From April 15, 2010, this province became Khyber Pakhtunkhwa. This research refers to the province by its old name. Maintains consistency with public documents and organisational names used by Pakistani counterparts during research.

Meena, 2015 [25]: The entrance of the Mughals paved the way for a significant event that occurred in the history of our nation. The legacy that they have left behind, in addition to their influence, will continue to be felt in our country. The Taj Mahal, regarded as one of the seven wonders of the world, is another well-known feature of the Mughal empire. Additionally, the Mughal empire is responsible for several other buildings that have made significant contributions to the way of life, fashion, and cuisine in our country. The focus of this inquiry is on the numerous factors that have contributed to the formation of our social and cultural perspectives as Indians, as well as the way these perspectives are portrayed even in the present day.

Sarkar, 2016 [26]: The charm of ancient architecture, planning, and construction methods worldwide are covered in this literature research. This succinct study outlines and clarifies several aspects of the evolution of planning, design, and building over the globe. The art form that combines science and art is architecture. In a well-constructed state, it integrates safety, structure, proportions, aesthetics, and emotions. Since the dawn of time, architecture, planning, and the building of cities, temples, and shelters have been extremely basic. Planning and architecture developed along with humanity. The historical shifts in trends, civilisations, customs, styles, and geographical areas are traced in this study. There is a description of the several evolutionary stages as well as the revolutionary shifts in architecture, design, and building across time. This essay aims to condense the development of planning, design, and building from the outset into a few pages.

Azmeem et al., 2016 [27]: The Islamic Garden serves as a reminder of paradise and a space for relaxation and introspection. Shade and water are key components of an Islamic Garden. The old Islamic gardens, which are primarily from Spain, Iran, and Mughal India, have an influence on the Islamic gardens. These gardens were among the most well-known designs created during the Islamic Civilisation and are still standing as a reminder of the powerful Islamic era. Nonetheless, the gardens' many cultural influences result in unique designs for each garden. This essay will analyse the elements that were employed in the Taj Mahal's Mughal Garden in Agra, India. Both feature observation and content analysis were used in the study's landscape design. As a component of the Islamic cultural heritage, Islamic Garden design will be more valued and appreciated by the next generation thanks to the study's conclusions.

Jamil & Gulzar, 2017 [28]: The Mughals, who had a strong interest in both art and architecture, created new designs and technologies to adorn and design their magnificent structures. Mughal structures are renowned for their distinctive architectural embellishments, which showcase their sophisticated architectural taste and artistic sensibility. Iranian, Persian, Indian, and Islamic architectural styles are all combined to create the ornamentation evident in Mughal structures. This essay's goal is to highlight how wall decorating – particularly dado art – became a significant component of ornamentation and how it evolved throughout the course of the many Mughal eras. It is an effort to identify the influences and effects that the various Mughal kings' reigns had on the architectural embellishment of Mughal structures. This thorough research explores the evolution of Mughal building design, techniques, and materials in historical order; that is, the fusion of Islamic, Indian, and Persian art traditions that were utilised for both external and interior wall decorating. The study also shows how distinct Mughal architectural theme designs were used to decorate the walls of various squares and rectangular sections of buildings.

Mishra, 2019 [29]: The Mughal Empire was established in 1526 and ruled over the Indian subcontinent. In addition to having direct ancestry from Genghis Khan (through his son Chagatai Khan) and Timur, the Timurid dynasty was founded and ruled by them. The first two Mughal emperors had both Central Asian parents, and they also had substantial Indian Rajput and Persian ancestry through marriage relationships. With its blend of Persianate and indigenous Indian cultural elements seen in its characteristics and traditions, the dynasty was Indo-Persian in origin. The evolution of art and architecture in India during the Mughals (1526–1707) is described in this study. The paper's focus is on both analysis and description. The use of both primary and secondary data has helped the study achieve its objectives.

Sharma, 2021 [30]: Indian art and architecture are thousands of years old. Indian art and architecture evolved over time, including rock art, prehistoric settlement designs, Indus Valley Civilisation urban planning, primitive Buddhist monastic architecture, early Jainism, Gupta architecture, and Hindu temple architecture. Hinduism, Buddhism, Jainism, Islam, and Sikhism are just a few of the religions and empires that have produced distinctive architectural enterprises. Sculptures and mural paintings found in Gupta temples and cave complexes like Ajanta and Ellora demonstrate spiritual and artistic superiority. Islamic architecture introduced new styles, while Mughal marvels like Taj Mahal combined Persian and local ideas. During colonial times, European design and native aesthetics were combined and showcased, as evidenced in major constructions like Victoria Memorial. This historical blend is evident in modern Indian architecture, which combines traditional and modern approaches. Indian art, from ancient sculptures to modern paintings, reflects architectural patterns across its rich and dynamic visual language, reflecting spirituality, social, and cultural variety. This tradition illustrates the continued creativity and adaptability of Indian art for millennia.

Mungasiroh & Mawardi, 2022 [31]: Dynasties in Islamic history typically indicate that numerous regions developed under kingship. In Islamic political life, monarchical governments are supported by the likelihood of an heir to the throne. Islamic dynasties, like countries, have had successes and losses, even collapsing after gaining recognition. For instance, the Mughal dynasty lasted only 332 years until being defeated by the British. A qualitative technique is utilised in library research or literature studies, where researchers employ varied publications to gather data in the form of words or descriptions. Science and technological advancements during the Mughal empire in India were not as prominent as in previous Islamic regimes, but their legacy demonstrates their sophisticated progress. A dynasty. The rise of weak rulers, power battles between royal succession, and weak control of authority are internal variables to consider. External forces included rebellions and British colonisation expansion in India. The collapse of the Mughal dynasty in India was caused by two things. The first reason is internal, including weak rulers, power disputes among royal descendants, and inadequate control of authority. External causes, such rebellions and British colonisation of India, contributed to the situation.

Saxena and Rana, 2024 [32]: This study examines the significant impact of British colonial architecture on Lucknow, focussing on three notable structures: La Martiniere College, Dilkusha Kothi, and The Residence. Key instances of European and Mughal architectural synthesis, these structures represent a significant era in Lucknow's history and culture. The research examines the architectural innovations, stylistic nuances, and historical settings that shaped these landmarks, emphasising their role in shaping the city's urban and cultural identity. A thorough investigation uncovers the intricate relationship between colonial and indigenous customs, enriching Lucknow's past. The study explores the delicate balance between preserving historic sites' inherent integrity and adapting them for modern use. The research emphasises the importance of preserving Lucknow's architectural gems and promoting their recognition as vital links to its unique history. Analysis of La Martiniere College, Dilkusha Kothi, and The Residency highlights the cultural, historical, and architectural relevance of British colonial architecture in Lucknow, emphasising the need for heritage protection. These findings enhance our understanding of the city's architectural evolution and emphasise the importance of safeguarding its rich cultural heritage for future generations. The research also examines how these constructions shaped social and political narratives and influenced subsequent architectural developments in the region. By contextualising these buildings within colonial and post-colonial discourse, the research provides a nuanced understanding of their continued relevance.

Khan et al. 2024 [33]: The embellishment of structures enhances the memorable image. Identify and analyse Mughal Era architectural embellishments, including their current context, development, and position. Modern architectural forms that prioritized beauty in buildings and a flourishing cultural iconography were features of Lahore's Mughal Era (16th–18th century). This decoration blends Islamic Persian and Indian art, highlighting Mughal architecture. This research focusses on Mughal decoration techniques, construction, and materials utilised in Lahore buildings. This qualitative study used site observation, archival research, and visual material evaluation to assess the architectural ornamentation

of Mughal Era buildings in Lahore. For this investigation, three building samples were used. The researcher collected material using photographs, sketches, and field notes, then analysed it using theme analysis. The examination revealed the exquisite Mughal-era elements of Lahore structures, including intricate marble inlay, intricate carvings, ornamental tilework, and lavish gold works. The study demonstrated the Mughal Empire's level of creativity and culture by illuminating the hidden meanings and significance of beautiful themes. This study examines the preservation and restoration of Mughal Era buildings in Lahore, with a focus on upgrading and recovering decorative aspects. The study suggests implementing culture-based tourist initiatives to promote understanding and appreciation of Mughal architecture and its significance in Lahore's history. The study suggests further research on Mughal ornamentation, particularly in the built environment, and its cultural and artistic qualities.

Farooq et al. 2024 [34]: This study explores the relationship between accuracy, symbolism, and historical relevance through a thorough quantitative investigation of the Taj Mahal's architectural design using cutting-edge computer technologies. Our results demonstrate an impressive main dome curvature radius of 13.75 meters and minor alignment with an average angular deviation of only 0.15 degrees. The precision of our measurements is confirmed by computational validation using Rhino 3D, which produces a virtual model that closely resembles the Taj Mahal's real dimensions. Intentional spatial correlations are revealed by our study symbolically, such as the reflecting pool's length to main structure width proportion, which adheres to the golden ratio (1.618). When compared to architectural standards, the Taj Mahal is positioned as a structure that defies accepted conventions and demonstrates sound engineering principles. Verification by history guarantees that the deliberate decisions made by Mughal architects are deeply ingrained in the sociocultural forces of the time. With wider ramifications for the preservation of cultural heritage, this multifaceted analysis presents the Taj Mahal as a masterpiece that combines historical depth, cultural meaning, and geometric accuracy.

RESEARCH GAP

Despite extensive research on Mughal architecture, several gaps remain that require further exploration. While many studies focus on iconic monuments like the Taj Mahal and Red Fort, there is a lack of research on regional variations of Mughal architecture in lesser-explored areas such as Bengal, the Deccan, and Rajputana. Additionally, although computational tools have been used to analyze the architectural precision of the Taj Mahal, similar technological assessments of other Mughal structures remain limited. Environmental degradation affecting Mughal sites has been discussed, but the long-term impact of climate change and urbanization on their preservation needs further investigation. Moreover, while the Persian, Islamic, and Indian influences on Mughal architecture are acknowledged, direct comparative studies between Mughal architecture and contemporary architectural developments in regions like the Ottoman and Safavid Empires are lacking. There is also an insufficient exploration of the socio-cultural symbolism embedded in Mughal ornamentation and how it influenced later artistic and architectural movements. Furthermore, although British colonial architecture in India has been studied, research on how Mughal architectural principles influenced colonial and post-colonial structures remains underdeveloped. Lastly, while discussions on the deterioration of Mughal sites exist, there is limited research on sustainable restoration techniques that integrate modern conservation methods with traditional craftsmanship. Addressing these gaps will contribute to a deeper understanding of Mughal architecture's evolution, influence, and preservation challenges.

RESEARCH METHODOLOGY

General

Research is the process of gaining knowledge, whether you're exploring a topic for the first time or revisiting it to deepen your understanding. An intriguing aspect of research is that every time a researcher attempts to learn something new with a set of goals and a hypothesis, he not only gains insights but also learns a great deal about that field of study. Some authors claimed that it is an intellectual endeavour, while others claimed that it is scientific.

There are two ways that research can be carried out: formally, with a researcher following specific rules, or informally, with few or no clear plans or procedures. It is a methodical procedure that is used to gather, examine, or evaluate data to provide a solution for a specific issue. Research essentially contributes to the body of knowledge by examining other facets of it. Research relies heavily on curiosity. It is an innovative journey across several domains. Human nature essentially dictates this.

According to Clifford Woody: Determining and clarifying issues, developing hypotheses or potential solutions, gathering, organising, and analysing data, drawing conclusions, and finally rigorously verifying those conclusions to see if they agree with the hypothesis are all steps in the research process. Research is the process of identifying unknown information through identification.

Kinds of Research

- Quantitative Research.
- Qualitative Research.

Quantitative Research

The purpose of the quantitative research is conclusive by its nature. As it proposes useful signs of observable fact of interest concerned to research theme/topic.

Definition

Matthews & Ross (2019) said that in general, structured data that can be represented numerically is collected using quantitative research methodologies. When a researcher uses a positivist epistemological approach, they typically gather quantitative data – that is, data that can be examined scientifically.

Qualitative Research

Researchers that specialise in qualitative research (Creswell 2002; Pope & Mays 1995; Denzin & Lincoln, 1994) have inquired about the purpose of qualitative research, which is to comprehend, analyse, and interpret social phenomena in their natural environments. Researchers hope to obtain more comprehensive data and a more thorough image of problems, situations, or occurrences by employing a qualitative research methodology (Arora and Stoner 2009).

Scope of the Study

- *Diverse Mughal Architectural Styles:* The study looks at the various architectural styles that arose throughout the Mughal era, such as the combination of Central Asian, Indian, and Persian influences.
- *Salient Features:* It highlights key characteristics such as symmetrical layouts, domes, minarets, intricate carvings, inlay work, and water features in gardens and palaces.
- *Architectural Development under Different Rulers:* The research examines how each Mughal emperor contributed to architectural advancements, from Babur's initial influences on Shah Jahan's artistic refinement.
- *Skill Development and Innovation:* It investigates the engineering and artistic techniques perfected during the Mughal period, including the use of red sandstone, white marble, and decorative elements like calligraphy and floral motifs.

Objectives of the Study

- To examine the many Mughals architectural styles.
- To outline the key characteristics of Mughal architecture.
- To determine how architecture evolved under the different Mughal rulers.
- To concentrate on the growth of Mughal architectural abilities during the reign of the Mughal emperors.

Research Plan

Define Variables

The key variables in this study include:

- *Architectural Styles*: The distinct styles of Mughal architecture developed under different rulers.
- *Salient Features*: The defining characteristics of Mughal architecture, such as symmetry, domes, minarets, and use of red sandstone and marble.
- *Architectural Development under Mughal Rulers*: The evolution of architectural techniques and innovations introduced by various emperors.
- *Cultural and Artistic Influence*: The long-lasting impact of Mughal architecture on Indian and global architectural traditions.

Research Design

An exploratory and descriptive research design is used in this study to examine the development and legacy of Mughal architecture in India. The exploratory aspect helps in understanding the evolution of Mughal architectural styles, while the descriptive nature allows for a detailed examination of its key features, development under various Mughal rulers, and the skills employed by Mughal architects.

Population and Sampling

- *Target Population*: The study focuses on the works of Mughal architects, historical sites, and scholarly research related to Mughal architecture.

Sampling Method

- *Purposive Sampling*: Selected academic studies, books, and historical records focusing on Mughal architecture.
- *Random Sampling*: A diverse range of sources is analyzed to ensure a comprehensive understanding of Mughal architectural development.

Sample Selection

The research includes analysis of major Mughal architectural sites such as:

- *Agra Fort and Red Fort*: (imperial palaces and fortifications).
- *Taj Mahal and Humayun's Tomb*: (mausoleums showcasing Mughal grandeur).
- *Jama Masjid and Buland Darwaza*: (religious structures exemplifying Mughal architectural beauty).
- *Shalimar Bagh and Nishat Bagh*: (landscaped gardens reflecting Persian and Indian influences).

Nature of Data

The study is based on secondary data, which includes:

- *Historical Records*: Official accounts of Mughal architectural projects.
- *Books and Research Papers*: Scholarly works detailing the evolution and impact of Mughal architecture.
- *Government and Institutional Reports*: Documentation from heritage organizations and cultural institutions.
- *Online Databases and Archives*: Digital repositories of architectural studies and historical documents.

Data Collection Method

The research is based on secondary data, which is collected from various authentic and scholarly sources to ensure accuracy and reliability. The sources of data include:

- *Books and Academic Journals*: Historical and architectural studies on Mughal architecture.
- *Research Papers & Theses*: Scholarly works by historians and architects.
- *Government Reports & Websites*: data from official sources, including the Ministry of Culture, Government of India, and the Archaeological Survey of India (ASI).

- *Newspapers & Magazines*: Articles covering conservation efforts and recent studies on Mughal monuments.
- *Online Databases & Digital Archives*: Websites of universities, research institutions, and cultural heritage organizations.

Data Analysis Method

The collected data is analyzed through qualitative content analysis, which involves systematically reviewing and interpreting historical texts, architectural descriptions, and scholarly discussions on Mughal architecture. Comparative analysis is also used to examine the architectural contributions of different Mughal rulers and their impact on Indian cultural heritage.

Interpretation

The findings will be interpreted to understand how Mughal architecture evolved over time and its lasting impact on India's cultural heritage. The research will examine how each emperor's reign influenced the architectural style, the incorporation of new materials and techniques, and how these structures reflect the Mughal Empire's political, cultural, and religious dynamics. Furthermore, the research will highlight the enduring legacy of Mughal architecture, including its influence on modern architectural practices and its role in India's cultural identity.

This structured research plan aims to provide a comprehensive study of Mughal architecture, shedding light on the development, distinctive features, and long-lasting legacy of the Mughal Empire's architectural achievements. The data collected will offer valuable insights into the empire's monumental constructions and their continued influence in the modern world (Figure 1).

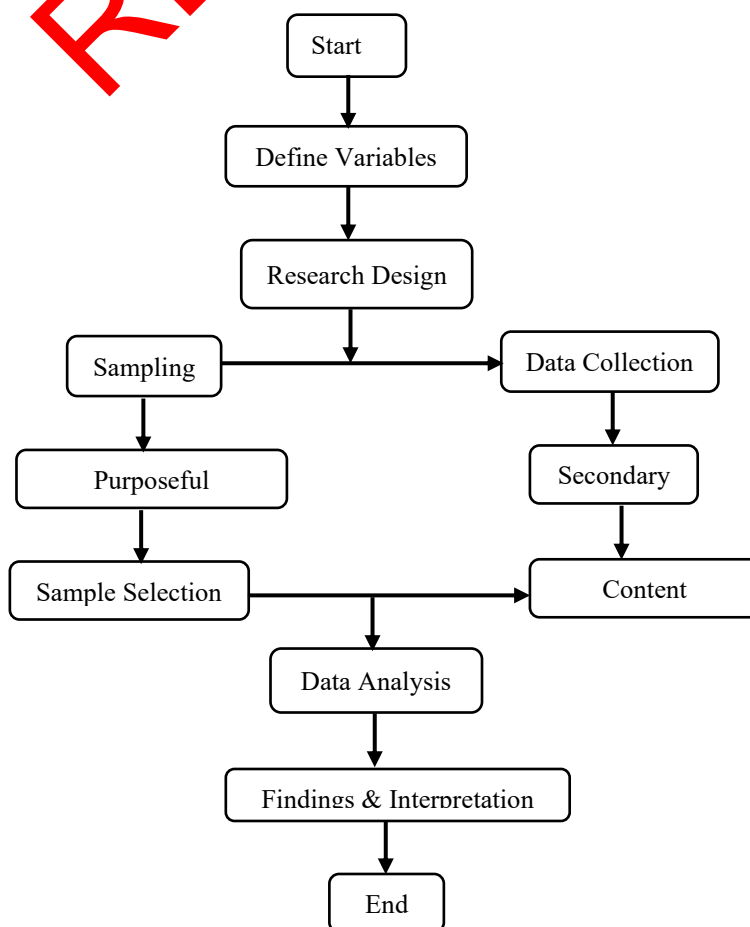


Figure 1. Flowchart of research plan.

Research Design

Descriptive and exploratory research designs are combined in this study. The descriptive research will help document the physical attributes, architectural styles, and evolution of Mughal architecture over time. This aspect will involve collecting data on the specific characteristics of iconic structures such as the Taj Mahal, Red Fort, Agra Fort, and Jama Masjid. It will also include detailed information on architectural materials, spatial planning, and landscaping features used in Mughal constructions.

The exploratory research will investigate the broader cultural, artistic, and historical implications of Mughal architecture, looking at how these buildings reflect the empire's values, influence on later architectural movements, and the legacy they have left in contemporary architecture. It will involve gathering insights through analysis of historical records, literature, and government reports, as well as conducting interviews with historians and architects to explore less visible aspects of Mughal architectural techniques and their development over time (Table 1).

Table 1. Summary of research design.

Aspect	Details
Research Title	The Development and Legacy of Mughal Architecture in India.
Research Approach	Qualitative
Research Method	Historical and Architectural Analysis.
Sampling Design	Purposive Sampling Technique.
Population of the Study	Historical Mughal architectural sites, architectural treatises, and scholarly research on Mughal architecture.
Method of Data Collection	Books, academic journals, government reports (ASI), online archives, research articles on Mughal architecture.
Source of Data	Secondary Data.

Ethical Considerations

Ethical considerations play a crucial role in ensuring the integrity, fairness, and credibility of this research on The Development and Legacy of Mughal Architecture in India. Since the study is based on secondary data, the following ethical principles will be observed throughout the research process:

- *Academic Integrity and Plagiarism Avoidance:* Ensure proper citations and avoid plagiarism by accurately referencing all sources of secondary data.
- *Respect for Intellectual Property Rights:* Use published materials ethically, complying with copyright laws and obtaining necessary permissions when required.
- *Accuracy and Objectivity:* Present accurate data and provide objective analysis, avoiding bias or misrepresentation in interpreting Mughal architecture.
- *Cultural Sensitivity and Respect:* Approach the subject of Mughal architecture with respect, acknowledging its cultural significance and avoiding politically sensitive misinterpretations.
- *Transparency and Reliability:* Maintain transparency in source usage and provide verifiable data to support conclusions, ensuring a trustworthy and balanced study.

DATA ANALYSIS AND INTERPRETATION

General

This section will focus on analyzing and interpreting the development and legacy of Mughal architecture in India. It will primarily involve examining secondary data sourced from historical records, books, journals, and research studies to explore the key features, styles, and innovations introduced by the Mughal emperors. The examination will investigate how architecture changed under Akbar, Shah Jahan, and Aurangzeb, highlighting the distinctive fusion of Central Asian, Indian, and Persian elements. Special attention will be given to iconic structures such as the Taj Mahal, Red Fort, and Agra Fort, assessing their architectural significance and cultural symbolism. The study will also interpret the lasting impact of these monumental works on both contemporary architecture and Indian cultural heritage. By identifying patterns, themes, and trends, this section aims to provide insights into

the socio-political, economic, and cultural factors that influenced Mughal architectural achievements and their enduring legacy.

Objective 1: To Analyze the Various Styles of Mughal Architecture

Mughal architecture is a fusion of Persian, Turkish, and Indian styles, creating a distinctive and grand artistic expression. Over different reigns, the architectural style evolved, incorporating various elements while maintaining its signature elegance and symmetry.

Blend of Cultural Influences

- The Mughal architectural style masterfully integrates Persian Charbagh layouts, bulbous domes, geometric patterns, and arabesque designs, combined with Indian elements like deep eaves, chhatris (domed pavilions), and balconies.
- Sikh and Rajput architectural styles were also influenced by Mughal designs, evident in forts, palaces, and religious structures.

Monumental Structures and City Planning

- Mughal rulers constructed entire cities, like Fatehpur Sikri (Akbar) and Shahjahanabad.
- (Shah Jahan), as well as magnificent forts (Red Fort, Agra Fort), palaces, mosques, and tombs.
- Architectural innovations included walled gardens, pillared halls (Diwan-i-Khas, Diwan-i-Aam), and vast courtyards.

Material and Decorative Art

- Extensive use of red sandstone and white marble gave Mughal structures a striking aesthetic.
- The Pietra Dura (Parchin Kari) technique of intricate stone inlay work, as seen in Taj Mahal and Itim-ud-Daulah's tomb, became a hallmark of later Mughal architecture.

Evolution Over Time

- *Babur and Humayun*: Early Mughal architecture was modest, with limited construction due to political instability.
- *Akbar*: Focused on massive structures like Fatehpur Sikri, emphasizing Rajput and Persian influences.
- *Jahangir*: Favoured more refined styles, introducing delicate inlays and floral motifs.
- *Shah Jahan*: Reached the peak of Mughal architecture with Taj Mahal, Red Fort, and Jama Masjid, characterized by elegance and balance.
- *Aurangzeb*: Did not prioritize grand architecture, leading to a decline in Mughal architectural innovation.

In general, Mughal architecture evolved through different rulers, each adding unique elements to create some of India's most iconic structures.

Objective 2: To Describe the Salient Features of Mughal Architecture

Under the patronage of Mughal monarchs, Mughal architecture flourished from the 16th to the 18th century. This distinctive style blended Indian, Persian, and Turkish elements, resulting in a grand yet elegant aesthetic. Mughal architecture is characterized by its emphasis on symmetry, balance, and intricate detailing, visible in various structures, including forts, palaces, mosques, mausoleums, gardens, and sarais (rest houses).

Fusion of Indian, Persian, and Turkish Architectural Styles

The Mughals inherited architectural influences from their Timurid ancestry, particularly Persian and Central Asian styles. However, they adapted and fused these with indigenous Indian elements, creating a unique Indo-Islamic architectural identity.

- The use of elaborate tile work, symmetrical gardens, iwans (vaulted halls), and enormous Blend domes all exhibit Persian influence (Figure 2). Indian architectural elements, such as chhatris (domed pavilions), jharokhas (overhanging balconies), and ornate brackets, were seamlessly incorporated. Turkish influence can be seen in the grand entrance gates, fortifications, and minarets (Figure 2).



Figure 2. Enormous blend dome of turkish, persian and indian architecture.

Diverse Range of Architectural Structures

The Mughals built various types of structures, each serving a specific purpose:

- *Forts:* Massive, strategically built structures for defence, often with intricate palaces inside (e.g., Agra Fort, Red Fort).
- *Mausoleums:* Elaborate tombs, usually set within lush gardens, exemplifying grandeur and spiritual symbolism (e.g., Humayun's Tomb, Taj Mahal).
- *Mosques:* Large congregational mosques with domes, minarets, and courtyards (e.g., Jama Masjid, Badshahi Mosque).
- *Palaces:* Luxurious royal residences with detailed ornamentation and extensive courtyards (e.g., Shah Mahal in Lahore Fort).
- *Sarais (Rest Houses):* Built for travelers, they served as key infrastructure for trade and pilgrimage routes (e.g., Kos Minar network).
- *Gates and Entrances:* Monumental structures that signified power and grandeur, often decorated with calligraphy and geometric patterns (e.g., Buland Darwaza).

Use of Red Sandstone and White Marble

Mughal architects primarily used two distinct building materials

- *Red Sandstone:* Commonly used in early Mughal structures under Akbar and Jahangir (e.g., Fatehpur Sikri, Agra Fort).
- *White Marble:* Became prominent during Shah Jahan's reign, symbolizing purity and grandeur (e.g., Taj Mahal, Moti Masjid). The contrast between these materials added to the visual appeal of Mughal structures (Figures 3 and 4).



Excessive Use of Red Sandstone

Figure 3. Decorative floral carvings in red sandstone.



Extensive Use of White Marble Inlay

Figure 4. Intricate marble inlay design in white stone.

Charbagh Style (Four-Part Garden Layout)

The Charbagh (Persian-style quadrilateral garden) was a significant feature of Mughal mausoleums and pleasure gardens. This symmetrical garden layout, divided by water channels, symbolized paradise in Islamic tradition.

- *Examples:* Taj Mahal's Garden, Humayun's Tomb, Shalimar Bagh in Kashmir.

Grand Bulbous Domes and Minarets

Mughal domes were large, bulbous, and double-layered, designed for both aesthetic appeal and structural stability.

- *Examples:* Taj Mahal's onion-shaped dome, Jama Masjid's three domes.
- Slender minarets (usually four) were placed at the corners of important structures for balance and grandeur.

Broad Gateways and Majestic Entrances

Mughal buildings featured imposing gateways adorned with intricate designs, reflecting both functional and symbolic significance.

- *Buland Darwaza:* (Fatehpur Sikri) The tallest gateway in India, symbolizing Akbar's victory.
- *Delhi Gate of Red Fort:* An example of a grand entrance built for imperial processions.

Intricate Calligraphy and Decorative Art

Mughal architecture is renowned for its refined ornamentation, incorporating:

- *Calligraphy:* Quranic inscriptions in Arabic, particularly on mausoleums (e.g., the Taj Mahal).
- *Pietra Dura (Parchin Kari):* Marble inlay work using semi-precious stones to create floral motifs (seen in the Taj Mahal).
- *Geometric and Arabesque Patterns:* Used in jali screens, ceilings, and walls to create stunning visual effects.

Structural and Engineering Innovations

Mughal architects introduced advanced construction techniques, including:

- *Double Dome System:* A hollow space between two domes reduced weight and enhanced acoustics (e.g., Humayun's Tomb, Taj Mahal).
- *True Arches and Vaults:* Precision-engineered to support vast interiors without excessive pillars.
- *Jali (Lattice Screens):* Allowed for ventilation and diffused natural light, creating beautiful patterns.

Symmetry and Geometrical Precision

Mughal structures emphasized perfect symmetry, with aligned pathways, water channels, and evenly spaced elements.

- *Example:* The Taj Mahal's perfect bilateral symmetry, reflected in its riverfront setting.

Water Management and Aesthetic Features

Mughal palaces, gardens, and tombs integrated water elements for both aesthetic and functional purposes:

- *Reflecting Pools:* Enhanced the visual impact of structures, as seen at the Taj Mahal.
- *Fountains and Canals:* Used for cooling effects and visual appeal, evident in the Shalimar Gardens of Lahore and Nishat Bagh in Kashmir.

Integration of Hindu and Islamic Architectural Elements

Under Akbar's rule, there was an increased fusion of Indian architectural elements with Islamic styles.

- *Hindu Influences:* Chhatris, jharokhas (balconies), carved brackets.
- *Islamic Influences:* Persian iwans (arches), intricate tilework, Quranic inscriptions.
- *Examples:* Fatehpur Sikri's Panch Mahal (Rajput-style), Itimad-ud-Daula's Tomb (Persian influence).

Fortifications and Military Architecture

Mughal forts were built with strategic designs, high walls, defensive bastions, and secret escape routes.

- *Agra Fort:* A UNESCO World Heritage Site with palaces, mosques, and defensive walls.
- *Lahore Fort:* An architectural masterpiece with Persian-inspired decorative elements.

Overall

Mughal architecture represents one of the most refined and enduring architectural traditions in history. It combined the best elements of Persian, Turkish, and Indian architecture to create structures that remain unparalleled in beauty and engineering. The emphasis on symmetry, elaborate ornamentation, monumental scale, and integration with nature continues to influence contemporary architecture and urban planning in South Asia.

Objective 3: To Identify the Architectural Development Under Various Mughal Rulers

Babur (1526–1530) – Introduction of Persian Gardens

Due to his short reign (1526-1530), most of which was spent in wars, Babur could not leave any significant construction except the mosque of Kabuli Bagh at Panipat and Jama Masjid at Sambhal near Delhi. He also built Ram Bagh, the first Mughal Garden in India (1528) in Charbagh Style located in Agra.

Humayun (1530–1540, 1555–1556) – Early Mughal Tomb Architecture

Although he succeeded Babur, he was continuously involved in conflict with Sher Shah Suri during his rule. He was unable to complete the city of Dinpanah, but he laid the groundwork for it. The first majestic building of the Mughals was Humayun's Tomb, also called the Taj Mahal's forerunner. It was designed by Persian architect Mirak Mirza Ghiyas and constructed by his widow Hamida Begum. Using white marble and red sandstone, the tomb, which is situated on an elevated platform, combines Persian and Indian artistic elements. Its style is Persian Charbagh. In 1993, UNESCO designated the tomb as a World Heritage Site. Perhaps the most well-known monument constructed using the Charbagh pattern is the Taj Mahal, which serves as the centerpiece (Figure 5).

A Masterpiece of the Mughal Era (Accessed 7th October 2020)

The Charbagh Style is a Persian garden design where the main building is positioned in the middle of a quadrilateral garden that is neatly divided into smaller parks by shallow water channels.



Figure 5. Humāyūn's Tomb at Delhi, India.
Source: https://www.academia.edu/38762456/Humayun_Tomb.

Akbar (1556–1605) – Fusion of Hindu and Islamic Styles

Akbar's reign (1556–1605) saw significant advancements in Mughal architecture and art. From 1571 to 1585, he established Fatehpur Sikri, the Mughals' first planned metropolis, as his capital. Important landmarks in Fatehpur Sikri include the Tomb of Saint Salim Chishti, Birbal's home, Diwan-i-aam, Diwan-i-khaas, Jama Masjid, and Buland Darwaza (1576, constructed to celebrate Akbar's victory over Gujarat monarch). He also constructed the Govind Dev Temple in Vrindavan. Akbar proceeded to construct the whole city of Fatehpur Sikri (City of Victory), making significant use of the bulbous domes and low arches that define the Mughal architectural style. Sikri was constructed in 1571, and its location was chosen to honor Akbar's thanks to a Muslim saint there for his son's birth. Soon after, courtiers began erecting houses all around the mosque and palace. Although it was abandoned in 1585, the rebuilt city served as the empire's capital.

Agra Fort

In Agra, Uttar Pradesh, the Agra Fort is recognized as a UNESCO World Heritage Site. Between 1565 and 1574, Akbar constructed most of the Agra Fort. It is evident from the fort's architecture that Rajput planning and building were freely adopted. Among the fort's significant structures are the Moti Masjid, the Mena Bazaars, and Jahangiri Mahal, which was constructed for Jahangir and his family. An amazing building, the Jahangiri Mahal features double-story halls and rooms encircling a courtyard (Figure 6).



Figure 6. Agra Fort at Agra, Uttar Pradesh.

Buland Darwaza

To celebrate his conquest, Akbar the Great constructed Agra. To celebrate his conquest of Gujarat and the Deccan, Akbar constructed Buland Darwaza, also called the Gate of Magnificence, in 1576. At a height of 40 meters, it is 50 meters above the ground. The building is approximately 54 meters above ground level. The building of Fatehpur Sikri, Akbar's capital city close to Agra, during a commerce and Jain pilgrimage, is considered his finest architectural accomplishment. Beginning in 1569, the

walled city's construction was finished in 1574 (Figure 7). A testament to the emperor's goal of attaining social, political, and religious unity, it was home to some of the most exquisite buildings, both secular and holy. The modest Tomb of Salim Chisti and the enormous Jama Masjid served as the primary places of worship. The royal women of Fatehpur Sikri resided in the Haramsara, the royal seraglio. The Haramsara is accessed from the Khwabgah side, which is divided by a line of monasteries. Abul Fazl claims that in *Ain-i-Akbari*, the eunuchs were positioned outside the perimeter, the Rajput guards were obedient, and the interior of the Harem was guarded by elderly and vigorous women. The biggest palace in the Fatehpur Sikri seraglio, Jodha Bai's Palace, is attached to the smaller Haramsara apartments. The two-story main entry extends from the front to form a sort of porch that leads to a balcony-equipped recessed entrance. Inside, there are rooms encircling a quadrangle. Numerous Hindu sculpture elements adorn the room columns (Figure 8).



Figure 7. Buland Darwaza at Fatehpur Sikri.



Figure 8. Buland Darwaza of Jami'ah Masjid at Fatehpur Sikri, India.

Source: <https://www.culturalindia.net/monuments/buland-darwaza.html>, (accessed 1st October 2020).

Shaikh Salim Chisti's mausoleum, which was constructed between 1580 and 1581, is regarded as one of the best specimens of Mughal architecture. The tomb is a square marble room with a verandah that was constructed in 1571 at the corner of the mosque compound. A beautifully crafted lattice screen encircles the cenotaph. Salim Chisti, a descendant of Khwaja Moinuddin Chishti of Ajmer, was buried in a grotto on the ridge near Sikri and was a Sufi saint from 1478 to 1572. Akbar built the monument as a tribute to the Sufi saint who predicted the birth of his son (Figure 9).

Sidi Saiyyed Mosque: Built 1573, Ahmedabad, Gujrat

Sidi Saiyyed Mosque one of the finest Architecture of Ahmedabad located in Laldarwaja Ahmedabad. Sidi Saiyyed Mosque popularly known as Sidi Saiyyad ni Jali. The mosque was built 1572-

73 AD (Hirji Year 980). It was built with sublime ode in stone to the extraordinary architectural legacy of the African diaspora in India. It was built by Sidi Saiyyed a slave of sultan Ahmed shah during Mughal Rule. The mosque is famous for unique carved stone latticework windows. It's symbolic of Ahmedabad like Charminar to Ahmedabad.



Figure 9. Tomb of Sheikh Salim Chishti (1478-1572) Fatehpur Sikri, Constructed 1580-81.
Source: https://www.makemytrip.com/travel-guide/fatehpur_sikri/tomb-of-sheikh-salim-chisti-monuments.html (Accessed 3rd October 2020).

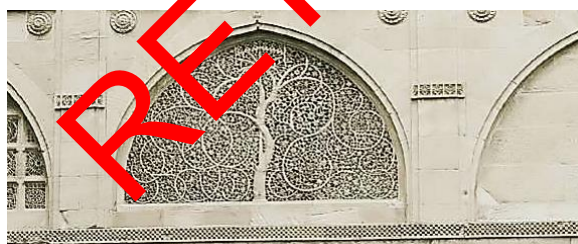


Figure 10. Fort building under Mughals.

Forts and tombs built during the reign of Mughal rulers bore a strong similarity to Islamic architecture. This was because many of these structures were constructed (Figure 10).

- The styles of Persian and Indian art were deftly combined to produce high-caliber, accurate pieces.
- The forts, which were situated inside a walled garden enclosure, featured streamlined towers at each corner, distinct domes, and grand halls in the middle that were supported by pillars and wide entrances.
- The main features were the delicate arches and decorative sections with exquisite geometrical patterns and inscriptions.
- The forts were designed with soldier quarters, halls for public and private gatherings, stables for horses and elephants, and landscaping at the entryway. For instance, Shah Jahan's Red Fort is a masterpiece.
- All the structures from that era make extensive use of red sandstone and white marbles.
- Decorative coloured tiles painted designs on walls and ceilings, and intricately carved gateways showcase the exquisite taste and ornamentation of the emperors.

Shah Jahan (1628–1658) – Peak of Mughal Architecture

The Tomb of Jahangir at Lahore does not have a dome as Jahangir forbade construction of a dome over his tomb. Rather than building huge monuments like his predecessors to demonstrate their power, Shah Jahan built elegant monuments. The force and originality of this previous building style gave way under Shah Jahan to a delicate elegance and refinement of detail, illustrated in the palaces erected during his reign at Agra, Delhi and Lahore. Some examples include the Taj Mahal at the grave of his wife,

Mumtaz Mahal, in Agra. Two of the most impressive structures of his time are the Moti Masjid (Pearl Mosque) in the Agra Fort and the Jama Masjid in Delhi. Their placement and design have been thoughtfully chosen to provide a favourable impression of roomy elegance and proportioned portions. Within the Lahore Fort, Shah Jahan also restored structures like the Moti Masjid, Sheesh Mahal, and Naulakha pavilion. Shahjahan Mosque, which bears his name, was constructed at Thatta using Safavid and Timurid architecture, which were influenced by Persian architecture, rather than Mughal architecture. In Shah Jahanabad, which is now Old Delhi, Shah Jahan also constructed the Red Fort in his new capital. Red Fort, which is made of red sandstone, is famous for its unique buildings, Diwan-i-Aam and Diwan-i-Khas. Additionally, Shaikh Im-ud-din Ansari, the emperor's court physician, constructed Wazir Khan Mosque when he was in Lahore. It is well-known for the lavish adornment that covers practically every surface within (Figure 11).



Figure 11. Red Fort at Delhi, India.

Source: <https://www.holidify.com/places/agra/fatehpur-sikri-photos-1015.html> (accessed 3rd October 2020).

Taj Mahal

The Taj Mahal, a World Heritage Site was built between 1630–49 by the emperor Shah Jahan in memory of his wife Mumtaz Mahal. Its construction took 22 years and required 22,000 laborers and 1,000 elephants, at a cost of 32 million rupees. (corresponding to US\$ 827 million in 2015) Standing on a square platform, this massive white marble structure is symmetrical and features an arch-shaped doorway called an iwan, which is crowned by a sizable dome final.

Except for Shah Jahan's sarcophagus, which is positioned off-center in the crypt room beneath the main floor, the whole complex is traversed by the building's longest plane of symmetry. To match the Mecca-facing Mosque to the west of the main edifice, a whole mirror mosque made of red sandstone was constructed. The building has been embellished with Jali work and Parchin kari, a technique for large-scale gem inlay (Figure 12).



Figure 12. The memorial tomb of Tāj Maḥal in Agra, India.

Source: <https://www.britannica.com/topic/Taj-Mahal> (Accessed 28th October 2020).

Shalimar Bagh

The Mughal Garden complex is situated in Lahore, the capital of Punjab province in Pakistan. During the height of the Mughal Empire's artistic and aesthetic achievements, the gardens were created. The gardens' construction was finished in 1642, having started in 1641 under Emperor Shah Jahan. Because they represent Mughal Garden design at its height of development, the Shalimar Gardens were inscribed as a UNESCO World Heritage Site in 1981.

Built in Lahore, Pakistan, in 1635 CE under Emperor Shah Jahan, the Shahi Hammam is a Persian-style bath. It was constructed by Wazir Khan, also known as Ham-ud-din Ansari, the senior physician of the Mughal Court. The purpose of the bath's construction was to provide endowment, or waqf, for the Wazir Khan Mosque's upkeep (Figure 15).



Figure 15. The central chamber of the Shahi Hammam is decorated with frescoes.

Important Developments During Akbar's Reign

A superb fusion of Persian, Central Asian, and diverse Indian (Bengal and Gujarat) styles can be found in the architecture of Fatehpur Sikri.

Red sandstone is used extensively.

Deep eaves, balconies, and Bengali and Gujarati-style kiosks are examples of Indian features combined with glazed tiles from Central Asia.

Jahangir (1605–1627) – Emphasis on Decorative Art and Gardens

- The artworks were more important to the prince than the building. He finished Akbar's tomb at Sikandra and constructed the tomb of Itimad-ud-Daula (father of his wife Nur Jahan), which features the best Pietra-dura artwork in the world.
- He also constructed the Moti Masjid in Lahore and the well-known Shalimar Bagh in Srinagar. Pietra Dura- also called as Parchin Kari is an inlay technique of pictorial mosaic (Figure 14) work using cut and fitted, highly polished semi-precious stones as decorative art.

Use of Red Sandstone and White Marble

- Early Mughal architecture under Akbar and Jahangir prominently featured red sandstone, as seen in Fatehpur Sikri and Agra Fort.
- During Shah Jahan's rule, there was a shift towards white marble, culminating in the construction of the Taj Mahal.

Innovations in Dome and Arch Construction

- The Mughals perfected double domes, allowing greater height and visual appeal.

- Arches became more refined, with intricate carvings and inlay work, as seen in Jama Masjid and Humayun's Tomb.



Figure 14. Pietra Dura in Taj Mahal.

Mastery of Symmetry and Geometry

- Mughal architects emphasized symmetry, axial alignments, and geometrical precision, evident in gardens, palaces, and mosques.
- The Charbagh (four-part garden) layout, influenced by Persian design, became a signature element in tombs and pleasure gardens.

Advanced Water Management Systems

- The Mughals skillfully incorporated fountains, canals, and reflecting pools to enhance aesthetics and cooling, as seen in the Shalimar Gardens and Nishat Bagh.

Intricate Ornamentation and Decorative Arts

- Mughal structures featured detailed calligraphy, floral motifs, pietra dura (marble inlay with semi-precious stones), and jali (lattice screens).
- The best example of these artistic advancements is the Taj Mahal, showcasing fine inlay work and Quranic inscriptions.

Integration of Hindu and Islamic Architectural Elements

- Akbar's architects fused Rajput, Persian, and Timurid styles, creating unique structures like Buland Darwaza and Panch Mahal.
- Later Mughal buildings, such as Badshahi Mosque, displayed strong Persian influences.

Development of Fortifications and Urban Planning

- Large forts like the Red Fort, Lahore Fort, and Agra Fort showcased military architecture combined with aesthetic brilliance.
- Planned cities such as Shahjahanabad (Old Delhi) reflected Mughal urban planning expertise.

Mughal architecture represents a legacy of technical and artistic mastery, influencing Indian architecture even today.

SUMMARY AND CONCLUSIONS

Summary

This chapter highlights the key findings on the development and legacy of Mughal architecture in India. It reveals how Mughal architecture blended Persian, Islamic, and Indian styles, introducing innovations like grand domes, minarets, intricate inlay work, and symmetrical gardens. The study emphasizes the lasting impact of Mughal design on India's architectural landscape, influencing both colonial and modern structures. The conclusion stresses the importance of preserving these monuments

as cultural symbols and suggests areas for future research, particularly in conservation and the adaptation of Mughal aesthetics in contemporary architecture.

FINDINGS

Objective 1: To Analyze the Various Styles of Mughal Architecture

The analysis of Mughal architecture highlights its rich evolution, influenced by cultural, political, and artistic developments throughout different reigns. The key findings are as follows:

- Mughal architecture represents a unique fusion of Persian, Turkish, and Indian styles, creating a distinct and recognizable aesthetic.
- The architectural style significantly influenced other regional styles, including Sikh and Rajput architecture.
- Mughal rulers were visionary urban planners, establishing well-planned cities like Fatehpur Sikri and Shahjahanabad.
- Iconic monuments such as the Red Fort, Agra Fort, and Jama Masjid reflect grandeur, symmetry, and sophisticated design.
- The extensive use of red sandstone and white marble became signature materials in Mughal architecture.
- Decorative techniques like Pietra Dura, intricate carvings, and calligraphy highlight the Mughals' refined artistic sensibilities.
- Mughal architecture evolved over time, with each ruler contributing distinct styles and innovations.
- Babur and Humayun's period featured modest structures influenced by Persian design.
- Akbar's reign focused on large-scale constructions with a blend of Persian and Rajput elements.
- Jahangir emphasized aesthetic refinement with delicate designs and naturalistic motifs.
- Shah Jahan's era marked the peak of Mughal architecture with masterpieces like the Taj Mahal.
- Aurangzeb's reign saw a decline in architectural innovation, with simpler and less ornate structures.
- Mughal architectural principles influenced modern Indian architecture and urban planning.
- The legacy of Mughal architecture endures through its timeless beauty, cultural significance, and impact on subsequent architectural traditions.

Objective 2: To Describe the Salient Features of Mughal Architecture

- Mughal architecture showcases a distinctive blend of Indian, Persian, and Turkish architectural styles, creating a unique Indo-Islamic identity.
- The construction of diverse structures, including majestic gates, forts, mausoleums, palaces, mosques, and sarais, reflects the architectural versatility of the Mughal era.
- Red sandstone and white marble were the primary materials used, contributing to the striking visual contrast and durability of the structures.
- The Charbagh garden layout, characterized by a quadrilateral design with water channels, was a prominent feature, symbolizing paradise in Islamic tradition.
- Bulbous domes, often large and pronounced, became a hallmark of Mughal architecture, enhancing the grandeur of structures like the Taj Mahal.
- Slender turrets or minarets placed at the corners of buildings added both decorative and structural elegance.
- Broad and imposing gateways served as both functional entrances and symbolic representations of power and authority.
- Exquisite decorative elements such as intricate calligraphy, arabesque designs, and geometric patterns adorned pillars, walls, and domes, showcasing refined artistic sensibilities.
- Palace halls were often supported by elaborately carved pillars, enhancing the aesthetic appeal and structural integrity of the buildings.
- Mughal architecture emphasized symmetry, balance, and proportion, creating visually harmonious and architecturally sound structures.

- The combination of monumental scale with intricate detailing reflects the Mughals' ability to balance grandeur with artistic finesse.
- Mughal architectural features continue to influence modern Indian architecture, demonstrating the enduring legacy of their design principles.

Objective 3: To Identify the Architectural Development Under Various Mughal Rulers

- Babur's reign marked the introduction of Persian garden concepts to India, notably the Charbagh layout, as seen in the Ram Bagh in Agra. His contributions were limited due to his short reign and focus on military campaigns.
- Humayun's era saw the emergence of early Mughal tomb architecture, with Humayun's Tomb being the first grand Mughal mausoleum in India. It incorporated Persian design elements with Indian craftsmanship, setting the foundation for future Mughal architectural styles.
- Akbar's rule was a period of architectural experimentation and fusion, blending Persian, Central Asian, and indigenous Indian elements. His constructions, such as Fatehpur Sikri and Agra Fort, reflect a synthesis of Islamic and Hindu architectural features, emphasizing grandeur, symmetry, and robust structures.
- Jahangir's reign focused more on decorative arts and garden design rather than large-scale architecture. The use of Pietra Dura (Parchin Kari) became prominent, as exemplified in the tomb of Itimad-ud-Daula. His love for nature influenced the creation of beautiful gardens like Shalimar Bagh.
- Shah Jahan's period represents the peak of Mughal architecture, characterized by refined elegance, symmetry, and elaborate ornamentation. Iconic structures like the Taj Mahal, Red Fort, and Jama Masjid exemplify the sophisticated artistry, intricate inlay work, and balanced proportions of this era.
- Aurangzeb's reign marked a shift towards architectural simplicity and austerity, with less focus on monumental construction. The decline in artistic patronage led to fewer elaborate structures, reflecting his conservative and orthodox approach.
- Later Mughal rulers (1707–1857) experienced a decline in architectural innovation as the empire weakened. However, Mughal architectural influences persisted regionally, blending with Rajput, Sikh, and Deccan styles, giving rise to hybrid forms in provincial architecture.
- Across all reigns, common architectural features included extensive use of red sandstone and white marble, domes, arches, minarets, and intricate decorative elements such as calligraphy, geometric patterns, and floral motifs.
- Mughal architecture significantly impacted the development of Indian architecture, with its legacy visible in forts, palaces, mosques, and gardens that continue to influence modern architectural designs in the region.

Objective 4: To Focus on Development of Mughal Architecture Skills in the Mughal Emperors Period

- *Evolution of Building Materials:* Early Mughal architecture under Akbar and Jahangir prominently used red sandstone, while Shah Jahan's reign marked a shift towards the extensive use of white marble, exemplified by the Taj Mahal.
- *Advancements in Dome and Arch Construction:* The Mughals perfected the use of double domes, enhancing both structural stability and aesthetic grandeur. Refined arches with intricate carvings and inlay work became prominent features, as seen in Jama Masjid and Humayun's Tomb.
- *Mastery of Symmetry and Geometry:* Mughal architects emphasized perfect symmetry, axial alignments, and geometrical precision in their designs. The Charbagh garden layout became a hallmark of Mughal architecture, especially in mausoleums and gardens.
- *Innovations in Water Management:* Advanced water management systems, including fountains, canals, and reflecting pools, were skillfully integrated into architectural designs to enhance beauty and provide natural cooling, as seen in Shalimar Gardens and Nishat Bagh.

- *Intricate Ornamentation and Decorative Arts:* Mughal architecture showcased detailed ornamentation through calligraphy, floral motifs, pietra dura (semi-precious stone inlay), and jali (lattice screens). The Taj Mahal is a prime example, featuring exquisite inlay work and Quranic inscriptions.
- *Fusion of Hindu and Islamic Architectural Elements:* Akbar's reign marked a fusion of Rajput, Persian, and Timurid styles, evident in structures like Buland Darwaza and Panch Mahal. Later Mughal buildings, such as Badshahi Mosque, reflected stronger Persian architectural influences.
- *Development of Fortifications and Urban Planning:* The Mughals excelled in constructing large, fortified complexes like the Red Fort, Lahore Fort, and Agra Fort, blending military strength with architectural elegance. Planned cities like Shahjahanabad (Old Delhi) showcased sophisticated urban planning and design.
- *Legacy of Technical and Artistic Mastery:* Mughal architectural skills left a lasting impact on Indian architecture, influencing later styles and continuing to inspire modern architectural practices with their blend of functionality, aesthetic brilliance, and cultural integration.

CONCLUSIONS

The development and legacy of Mughal architecture in India represent a remarkable blend of artistic ingenuity, cultural integration and technical mastery. Rooted in Persian, Turkish, and Indian traditions, Mughal architecture evolved through the contributions of successive emperors, each leaving a distinct mark on its style and sophistication. From Babur's introduction of Persian garden designs to Shah Jahan's architectural zenith with the construction of the Taj Mahal, the Mughals showcased an extraordinary progression in design, materials, and construction techniques.

Key architectural features such as the extensive use of red sandstone and white marble, the perfection of double domes, refined arches, intricate ornamentation, and the harmonious fusion of Hindu and Islamic elements reflect the Mughals' commitment to both grandeur and artistic finesse. Their innovations in symmetry, geometry, urban planning, and water management not only enhanced the aesthetic appeal of their structures but also demonstrated advanced engineering skills.

While Aurangzeb's reign marked a decline in architectural patronage, the legacy of Mughal architecture continued to influence regional styles, blending with Rajput, Sikh, and Deccan traditions. Even today, Mughal architectural principles are evident in modern Indian architecture, urban planning, and decorative arts. Iconic monuments like the Red Fort, Jama Masjid, and Taj Mahal stand as enduring symbols of the Mughal Empire's cultural and architectural heritage.

In essence, Mughal architecture is more than a historical achievement—it is a timeless testament to the empire's vision, creativity, and lasting impact on the architectural landscape of India and beyond.

Limitations of the Study

- *Limited Availability of Primary Sources:* Many original architectural records, blueprints, and historical documents have been lost or damaged over time, restricting access to comprehensive primary data for detailed analysis.
- *Subjectivity in Interpretation:* The interpretation of architectural styles, symbolism, and cultural significance can vary among scholars, leading to subjective conclusions influenced by personal or cultural biases.
- *Impact of Modern Restorations:* Numerous Mughal monuments have undergone restoration, which may have altered original designs. This makes it challenging to distinguish authentic features from modern modifications, affecting the study's accuracy.
- *Geographical Scope Constraints:* The study focuses mainly on prominent sites in India, potentially overlooking lesser-known Mughal structures in regions like Pakistan, Bangladesh, and Afghanistan, which limits a holistic understanding of Mughal architecture.
- *Limited Focus on Socio-Political Context:* While the architectural aspects are emphasized, the study does not deeply explore the socio-political, economic, and religious influences that shaped Mughal architectural development, leading to an incomplete contextual analysis.

Recommendations and Suggestions

- *Preservation and Conservation of Heritage Sites:* Implement advanced conservation techniques and regular maintenance to protect Mughal monuments from environmental damage and structural deterioration.
- *Promotion of Mughal Architectural Heritage:* Organize educational programs, cultural festivals, and heritage tours to raise awareness and promote Mughal sites as key cultural tourism destinations.
- *Integration of Mughal Design Principles in Modern Architecture:* Encourage modern architects to incorporate Mughal elements like symmetry, geometric precision, and sustainable water management systems in contemporary design.
- *Digital Documentation and Virtual Preservation:* Create detailed 3D models, virtual tours, and digital archives to ensure the global accessibility and long-term preservation of Mughal architectural heritage.
- *Community Involvement and Heritage Education:* Involve local communities in conservation efforts and integrate Mughal architectural history into educational curricula to foster cultural pride and responsibility.
- *Legal Protection and Sustainable Tourism Development:* Strengthen legal frameworks for heritage protection and promote eco-friendly tourism practices to minimize environmental impact while enhancing visitor experiences.

Future Implications of the Study

- *Preservation and Conservation of Heritage:* The study underscores the importance of robust conservation strategies to protect Mughal architectural monuments, ensuring historical accuracy and structural integrity in restoration projects.
- *Inspiration for Modern Architecture:* Mughal design principles like symmetry, geometry, and ornamental details can inspire contemporary architectural projects, integrating traditional elements like arches, domes, and gardens into modern spaces.
- *Urban Planning and Sustainability:* Lessons from Mughal urban planning, including efficient space utilization, water management, and green spaces, can inform the development of resilient, functional, and aesthetically pleasing cities today.
- *Cultural and Educational Enrichment:* Incorporating Mughal architecture into educational curricula and research can deepen cultural understanding, fostering pride and interdisciplinary studies in history, art, engineering, and environmental science.
- *Technological Integration in Heritage Preservation:* Digital technologies such as 3D modelling, VR, and AR offer new ways to preserve and recreate Mughal monuments for research, education, and tourism, ensuring their legacy for future generations.

By understanding the development and legacy of Mughal architecture, future generations can draw from its rich traditions to inspire sustainable, culturally meaningful, and aesthetically innovative architectural practices worldwide.

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