

ARCHITECTONIC DEVELOPMENT STUDIES: FROM MAJAPAHIT TEMPLE TO DESIGN OF CONTEMPORARY HIGH-RISE BUILDING IN SURABAYA

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Abstract

Introduction: Urban areas in Indonesia are experiencing significant cultural and architectural shifts towards modernization. This trend is particularly noticeable in major cities where tall, contemporary buildings are becoming more prevalent, reducing the influence of local cultures. For instance, the profound historical legacy of Majapahit culture is gradually fading. The erosion of local cultural identity is exacerbated by fast-paced lifestyles and evolving societal norms, exemplified by the emergence of large, multi-functional buildings that consolidate various functions. Thus, it is deemed paramount to restore fading cultural values. **Purpose of the study:** We aimed to explore the optimal transformation of traditional Majapahit architecture in Indonesia within the context of modern times, as an example of preservation efforts. **Methods:** This qualitative research uses a descriptive-analytical approach to explore the cultural values of Majapahit architecture and modern high-rise buildings. It outlines the scope of their study concerning current developments, with transformation theory as a foundation. Through interpretation approach, it aims to generate potential for local-modern transformations. These transformation possibilities are then selected and visualized in 3D using modeling and rendering applications to clarify their visual outcomes. **Results and discussion:** The 3D visual render of the transformation potential reveals elements that should be preserved in their original form attributed to Majapahit culture and aspects that can be modernized to align with current trends. This serves as a model of modern design integrating local culture to safeguard indigenous heritage.

Keywords: traditional architecture; Majapahit architecture; high-rise building; mixed use; architecture transformation.

Introduction

The architecture in major Indonesian cities tends to reflect the change in its time periods. The architectural styles and shapes predominantly focus on a modern building of universal design which is applied worldwide, inducing a competition with other designs for complete dominance (Parker and Wood, 2013). This modern architectural style tends to impose rigidity on the identity of each region in Indonesia, failing to reflect the characteristics of local communities and culture. Ideally, they should be manifested in an urban landscape with highly distinctive design elements shaping the image of a city (Lynch, 1960).

Indonesia is a diverse nation with a broad spectrum of religions, races, and cultures, each closely embraced by their respective communities. This diversity is reflected in the archetypal patterns of cities, which symbolize the various community entities within them (Lobell, 2018). Particularly in architecture, this distinctiveness is embodied in traditional buildings such as temples (candi) and traditional houses, which represent the unique values of their regions and foster a strong emotional connection between users and their locations (Norberg-Schulz, 1980). The form of traditional Indonesian architecture is believed to be influenced by the kingdoms that previously existed in its territory,

with their impact still noticeable in economic and social values of modern Indonesia (Wijaya, 2014).

The kingdoms in Indonesia emerged and developed alongside the arrival of foreign priests and traders. Majapahit was the largest Hindu-Buddhist kingdom in Indonesia that exerted strong influence on its culture. Its power nearly spanned across the entire Indonesian archipelago. It was established by Raden Wijaya in 1293 after repelling the Mongol forces led by Kublai Khan (Hidayat, 1975).

The buildings from the Majapahit era are typically preserved and maintained as historical cultural heritage, especially in the Trowulan district, the former capital of Majapahit. These structures are divided into residential buildings for habitation and temples as places of Hindu-Buddhist religious worship to honor the gods and goddesses as well as to pay homage to the kings' ancestors. Herwindo (2018) stated that the Hindu-Buddhist sacred buildings from the Majapahit era are divided into several types (Fig.1), including gate/gateways, tower-type temples, stepped-type temples, water sanctuary-type temples, and cave-type temples, each with their own specific features.

The Hindu-Buddhist sacred buildings were built using various types of materials, reflecting the development of technology and the local community, while still adhering to the original cultural values to



Fig. 1. Types of Majapahit Hindu-Buddhist sacred buildings. Source: authors, 2024

support their functions. The materials evolved from andesite stone to red brick due to cost and time considerations, as well as responding to Indonesia's geographical conditions. Eventually, it developed further in Eastern Indonesia, particularly on the island of Bali, where wood materials were used for tiered roofs known as Meru, according to Wijaya (2002).

The Majapahit architecture appears to have deteriorated and disappeared due to colonization and climatic influences. This underscores the importance of making architecture reflect local identity while combining modern achievements and the potential of the existing environment in a cultural preservation movement, according to Frampton (2020). Therefore, in response to present time trends, the cultural values of Majapahit architecture are suitable for application in modern design as symbols of identity and collective memory for the local community, which will influence its social and economic aspects. According to Ching (2007), its design also fits well with the typology of tall buildings today as a response to the identity crisis in modern high-rise design, while also depicting the form of the main temples of ancient times adapted to modern times in preserving cultural symbols, especially in architectural design that refers to the essential elements of its design standards. Alexander et al. (1977) emphasized that any built environment inherently comprises various interconnected patterns that adapt to cultural, environmental, and other contexts.

Traditional Majapahit architecture

Traditional Majapahit architecture embodies distinct characteristics that reflect local cultural values. It serves as a holistic representation of these values, sometimes presenting intricate and even contradictory impressions, as noted by Venturi (1977). Despite these complexities, it maintains a cultural coherence recognizable to its people. The architecture of the ancient Majapahit kingdom in the strategically located Trowulan district exemplifies this through structures like gateways and temples, capturing unique patterns in its design.

Stutterheim, referenced in Gomperts et al. (2008), elaborates on the order of the Majapahit kingdom, evident in the strategic canal network designed to adapt to seasonal changes and ecology, emphasizing water transportation. His mapping of the Trowulan area reveals three main components: the alun-alun (a large open field in front of the palace), the kraton/palace area (a center of royal governance) in north-south direction, and the temple buildings (in west-east direction). These elements are pivotal in comprehending the cultural manifestation of the kingdom, preserved albeit incompletely compared to ancient times (Fig. 2).

Despite the form and arrangement of the Majapahit kingdom area in Trowulan, Majapahit buildings tend to have their exterior divided into three parts: head (Swarloka), body (Bhuvarloka), and foot (Bhurloka). They manifest themselves through physical elements that are present in each of the Majapahit era buildings. The physical elements of Majapahit Hindu-Buddhist sacred buildings (Fig. 3) can be identified as follows:

1. *Molding profile*: continuous horizontal lines surrounding the temple buildings, created with a forward-backward expression.
2. *Kala head*: the statue of a guardian spirit as the protector of the temple building, located above the entrance.
3. *Simbar/Jaladwara*: statues depicting creatures spouting water around the temple's building, usually located at the lower levels of the structure (foot part).
4. *Tiered roof and crown*: the temple's roof narrows towards the top forming a triangle.
5. *Entrance design*: there are elements of doors and stairs as accents, often supported by carved niches or windows.
6. *Stair design*: located in the center, complemented by the Kala head element.
7. *Decorations*: carvings or ornaments emphasizing the sacred form of the building, depicting specific motif concepts.

The design of Hindu-Buddhist sacred buildings is not only limited to the physical elements present in their external appearance, but is also manifested

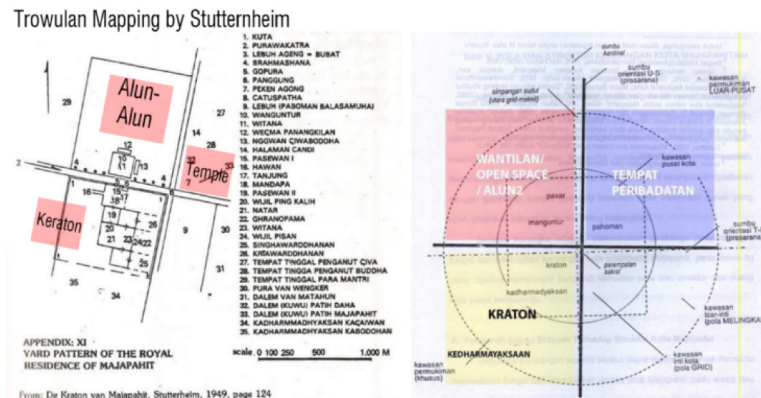


Fig. 2. Trowulan mapping by Stutterheim. Source: Stutterheim, 1948 (left), Hermanislamet, B., 1999 (right)

in a number of essential features, distinctive for this type of buildings. These features must be viewed comprehensively to ensure their integrity in the context of Hindu-Buddhist sacred buildings' design (Table 1).

The architectural values of Majapahit display consistent patterns and aspects applied throughout its building structures, providing a reference for transforming traditional designs. This consistency is also reflected in modern designs, which adhere to standards as outlined by Ching (2007). These standards encompass six ordering principles of architecture: axis, symmetry, hierarchy, datum, rhythm, and transformation. Consequently, traditional temple building designs and modern high-rise architecture share notable similarities, underscoring the relevance of these traditional patterns in contemporary architectural discussions.

Modern tall building architecture

According to Parker and Wood (2013), building design adapts to societal changes and advancements while maintaining cultural identity. In response to such current challenges as population growth and urban density, buildings increasingly take the form of high-rise structures. These designs must integrate local cultural values while meeting contemporary standards for high-rise architecture.

Ashihara (1970) emphasized that modern high-rise buildings adhere to standards encompassing design requirements, typology, structural types, and other criteria. He argued that the external appearance of a building is influenced by elements such as form, color, texture, space, and scale. A space intentionally designed by humans for specific purposes is termed positive space, whereas space that forms spontaneously is considered negative space.

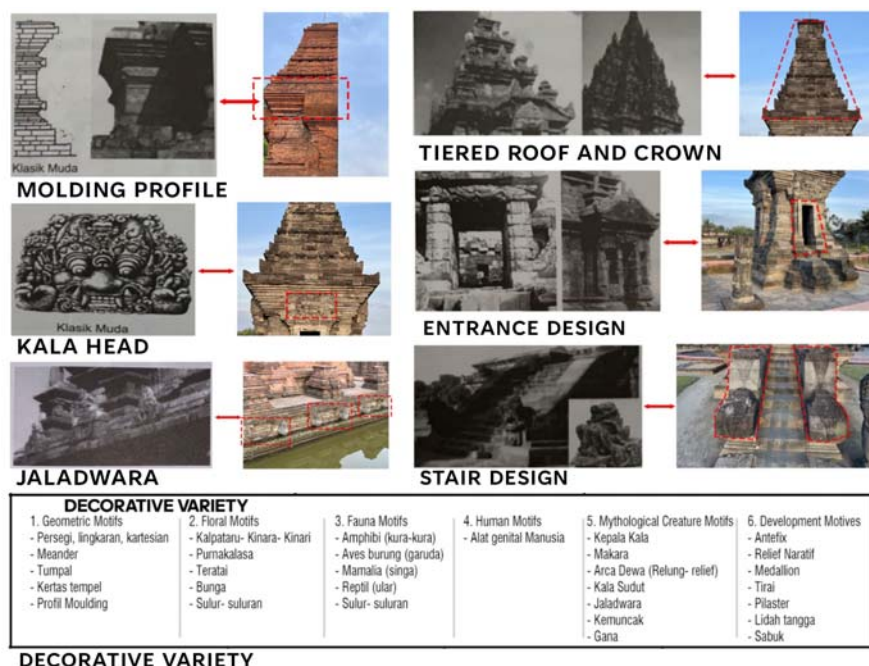


Fig. 3. Physical elements of Majapahit sacred buildings. Source: authors, 2024

Table 1. Distinctive features of Majapahit sacred buildings

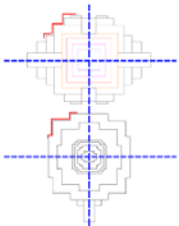
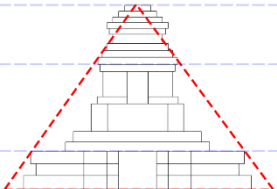
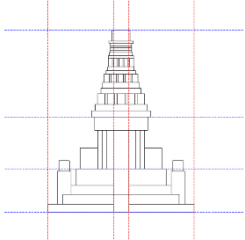
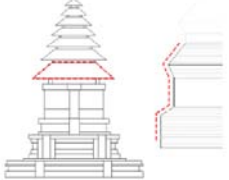
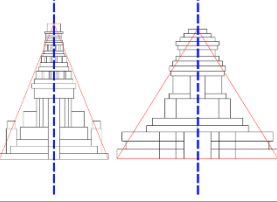
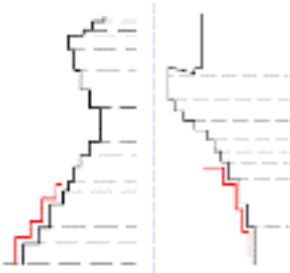
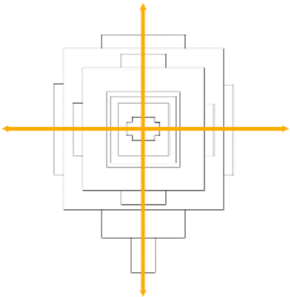
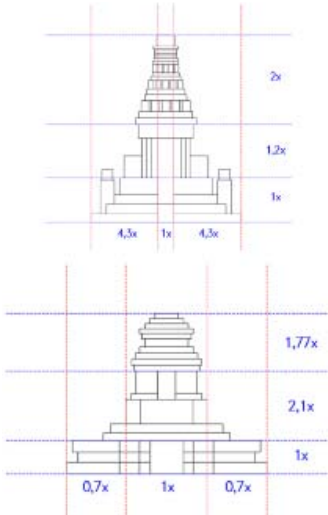
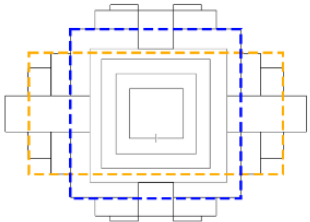
No.	Distinctive features	Status	Meaning and philosophy in Majapahit architecture	Image
1	Majapahit Geometry	Transformation	The heavenly nature of the building is manifested in a cruciform with the use of squares, rectangles, and circles.	
2	Majapahit Volumetric Composition	Preservation	Massive structural elements are combined in a way to emphasize the zoning.	
3	Majapahit Hierarchy – Triangle Shape – Effect of Perspective	Transformation	The shape of the building narrows towards the top to form a triangle as a depiction of the sacred Mount Meru.	
4	Majapahit Tripartition	Preservation	Both vertical and horizontal division into three sections.	
5	Majapahit Rhythm – Repetition	Transformation	Repetition of the head-body-leg elements as a unity in form, color, and material.	
6	Majapahit Symmetry	Preservation	Balanced building form supported by the symmetry of the door element.	
7	Majapahit Mimesis	Preservation	Building elements resemble real objects, for example, Mount Meru, and are usually adorned with carvings and ornaments.	

Table 1. Ending

No.	Distinctive features	Status	Meaning and philosophy in Majapahit architecture	Image
8	Majapahit Texture – Material	Preservation	The use of andesite stone and brick as distinctive materials of Majapahit era.	
9	Majapahit Line Elements – Light-Dark Effects	Transformation / Preservation	The continuous play of horizontal lines with the forward-backward movement forms' shadows within the interior space.	
10	Majapahit Axis	Preservation	The building is oriented in a specific direction, for example, to face important areas during a king's reign.	
11	Majapahit Proportions and Scale	Transformation	The form of a large and cohesive building in terms of its length and width.	
12	Majapahit Duality	Transformation	The combination of two aspects that make a building design complete and cohesive.	

Source: authors, 2024

Modern high-rise building design adheres to various standards, including client needs, cost efficiency, choice between renovation and new construction, technological advancements, materials, and environmental sustainability. Mixed-use building design involves segmented stages with detailed site analysis, encompassing factors like accessibility, functional relationships, land costs, and site dimensions. This approach enables the strategic integration of diverse functions such as offices, hotels, residences, retail spaces, meeting areas, recreational zones, and other activities within mixed-use developments. While certain functions may dominate at times, they typically balance each other out, contributing to a harmonious whole. According to Schwanke (1987), the design of mixed-use areas should sequentially consider the following aspects:

- *The design process and design team*: stages of preliminary design, design development, and final design.

- *Physical and structural configuration*: the types of mixed-use building arrangements include mixed-use tower, multi-tower mega structures, free standing structures with pedestrian connection, and their combinations.

- *External design*: site area, cost, land use allocation, topography, climate adjusted to the appearance of each function's building.

- *Internal design*: the arrangement of spaces equipped with easily understandable signs for users according to the proximity of functions.

- *People-oriented spaces*: there is site processing aimed at gathering points or resting areas for the community within it connected by pedestrian pathways.

- *Parking design*: according to the functional needs based on the scenario as needed.

- *Adaptive use and historic preservation*: development by incorporating local cultural elements and values as inherent cultural identity.

The above aspects serve as guidelines for designing appropriate and effective types of high-rise building structures. According to Ching et al. (2014), common types of high-rise building structures include shear wall cores, rigid frame structures, braced-frame cores, and others. These aspects change over time in response to societal and environmental changes, making current standards a continually evolving benchmark, as noted by Schueller (1977). Therefore, the construction of high-rise buildings not only addresses present-day needs but also anticipates future possibilities.

Local-modern architectural transformation

In the Indonesian dictionary (KBBI), 'transformasi' means the process of changing form or appearance while retaining meaning. In architecture, local traditional cultural values require transformation to be integrated into contemporary designs, adapting

to current trends. Specifically, transforming the traditional cultural values of Majapahit temples into modern high-rise buildings necessitates a strong theoretical basis. This transformation involves two critical elements: 'Penanda' (the physical form of the building) and 'Petanda' (the conceptual idea), shaped by the designer's vision and character. Jencks (1984) classified architectural development into six styles, including: *Historicism* (traditional culture manifested in modern form), *Straight Revivalism*, *Neo-Vernacular* (traditional culture combined with modern elements), *Ad Hoc Urbanism*, *Metaphor and Metaphysics*, and *Post-Modern Space*.

Jencks' architectural styles provide a guideline for understanding the fundamental process of transformation in architecture. Transforming Majapahit's local culture into modernity can be linked to the poetic transformation of architecture as described by Antoniades (1992) which encompasses both tangible and intangible aspects. This includes the Metaphor method, which naturally imitates an object in a way that is widely recognizable. Antoniades further categorizes architectural transformation into three types: Traditional, Borrowing, and Decomposition. This theoretical study of transformation is also supported by Laseau (2001), who categorized the process of architectural form transformation into four types (Fig. 4):

1. *Geometry Transformation*: geometric shapes that change within the same forming scope.

2. *Ornamental Transformation*: changing the existing position, location and composition without changing its form and meaning.

3. *Reversal Transformation (Inversion)*: an object's image is changed to its opposite.

4. *Distortion Transformation (Confusing)*: freedom of transformation according to creativity.

According to Rahadhian (2011), architectural transformation exhibits three characteristic types: *Adoption* (favoring modern influences), *Adaptation* (favoring local influences), and *Assimilation* (finding a balance between the two). Therefore, studying cultural theory alone is insufficient; it must be complemented by an examination of transformation types and their characteristics to ensure effective and appropriate transformations. Furthermore, this process can be informed by precedent buildings, allowing an understanding of past preservation efforts and facilitating further development.

Methods

This qualitative research employs a descriptive-analytical and interpretative approach to study the cultural values and architectural characteristics of Majapahit, focusing particularly on temples, gateways, modern high-rise architecture, and local-modern transformation theory. The study is supported by topics on architectural identity and forms based on literature reviews, field observations,

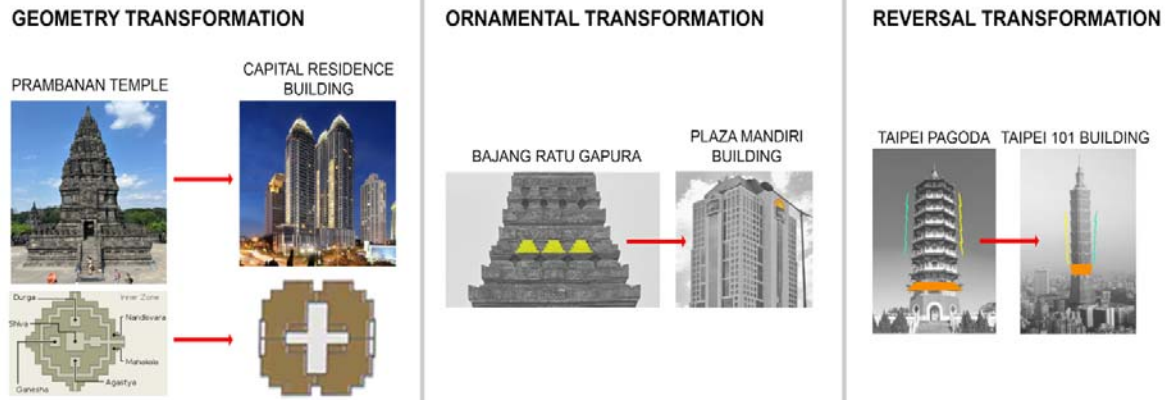


Fig. 4. Examples of local-modern transformation. Source: authors, 2024

and interviews in Trowulan for future development. Thus, this study can produce a good example of the transformation process in the preservation of culture, particularly traditional Majapahit architecture. The research process unfolds in the following stages:

1. Descriptive method: describing traditional Majapahit architecture and modern mixed-use high-rise buildings as foundational elements to establish the scope (physical elements and key aspects of Majapahit architecture concerning modern high-rise design standards).

2. Analytical method: assessing the boundaries established in the descriptive phase within the scope of architectural transformation, specifically focusing on local-modern elements, to generate potential for transformations.

3. Interpretative method: exploring transformation possibilities that are suitable for designing modern mixed-use high-rise buildings. Interpretation of transformation potential includes: studying architectural characteristics of Majapahit, dissecting and analyzing their basic forms, producing diverse potential transformation forms and ornamentation, conducting 3D model simulations of selected potential designs, and drawing conclusions on elements that are essential (immutable) and adaptable (transformable).

Results and discussion

The potential transformation focuses on five iconic buildings from the Majapahit era: Wringin Lawang Gate, Bajang Ratu Gate, Brahu Temple, Penataran Temple, and Jago Temple (Fig. 5). These structures, renowned for their height during their time, typify Majapahit architecture with their use of brick and stone materials. They are well-suited for transformation into modern mixed-use buildings, aligning with planned contextual changes. This transformation aims to highlight the geometric compositions inherent in each Majapahit building, serving as the foundation for creating contemporary architectural forms in mixed-use developments.

Bajang Ratu Gapura building

The Bajang Ratu Gate served as a double-layered entrance leading to the palace or the area of the junior king of Majapahit in ancient times. This grand and monumental structure narrows at the top, featuring a central opening as an entrance. It is adorned with intricate carvings of animals, plants, and other detailed motifs. Architectural studies of Bajang Ratu reveal nine form compositions, creating a triangular perspective effect, with the repeated head elements being the most dominant ornamental feature (Fig. 6).

The transformation of this form can be adapted to emphasize a futuristic appearance for a main



Fig. 5. Selection of Majapahit buildings. Source: authors, 2024

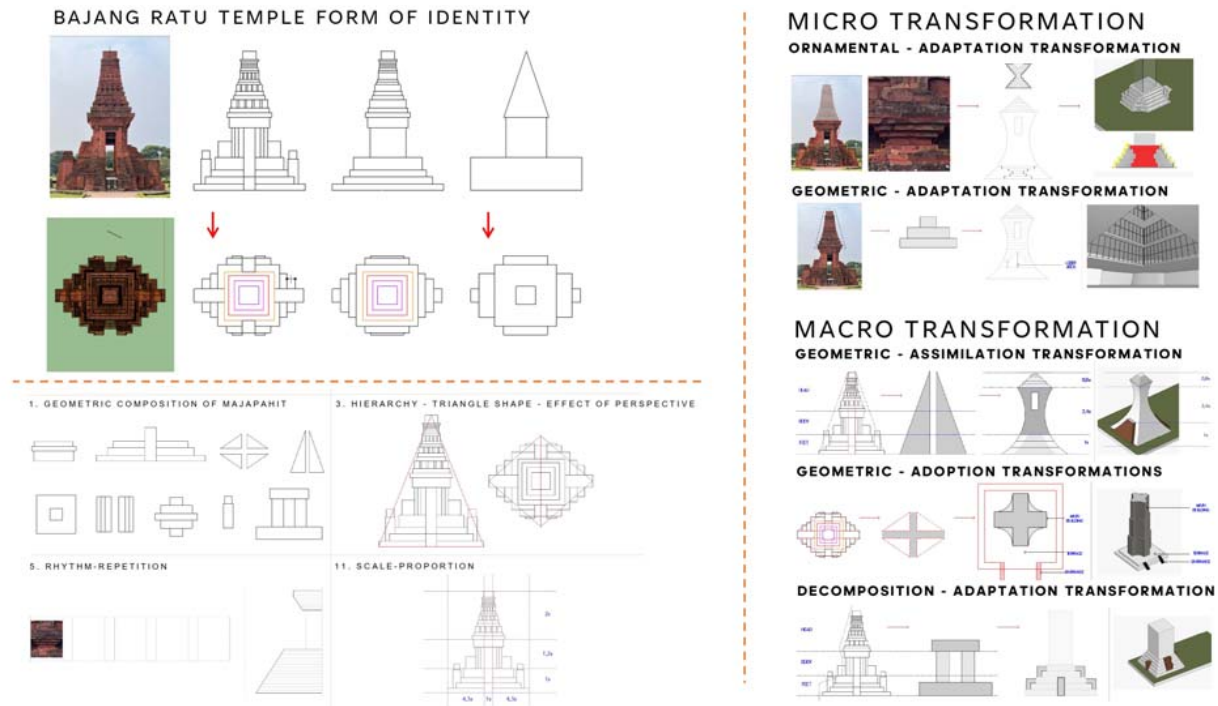


Fig. 6. Characteristics of Majapahit Bajang Ratu and transformation potential. Source: authors, 2024

mixed-use building. On a micro scale, this includes Ornamental-Adaptation, such as stepped patterns on the podium forming a rhombus shape, and Geometric-Adaptation, involving internal spatial manipulation with a void that narrows upwards. On a macro scale, transformations through Geometric-Assimilation, Geometric-Adaptation, and Decomposition-Adaptation reveal a building divided into symmetrical head-body-foot segments, with a prominent entrance design.

The transformation potential of the Bajang Ratu building can be chosen based on the conditions and design needs of the current mixed-use project (Fig. 7). The first photo depicts a macro transformation with a tiered podium as the initial stage and the main tower in the innermost courtyard, featuring a curved form and crowned top visible from all directions. The second photo illustrates a macro transformation of the podium's secondary entrance, responding to Majapahit architecture with a gawangan (gateway)



Fig. 7. Visual form of the local-modern transformation of Majapahit Bajang Ratu. Source: authors, 2024

WRINGIN LAWANG TEMPLE FORM OF IDENTITY

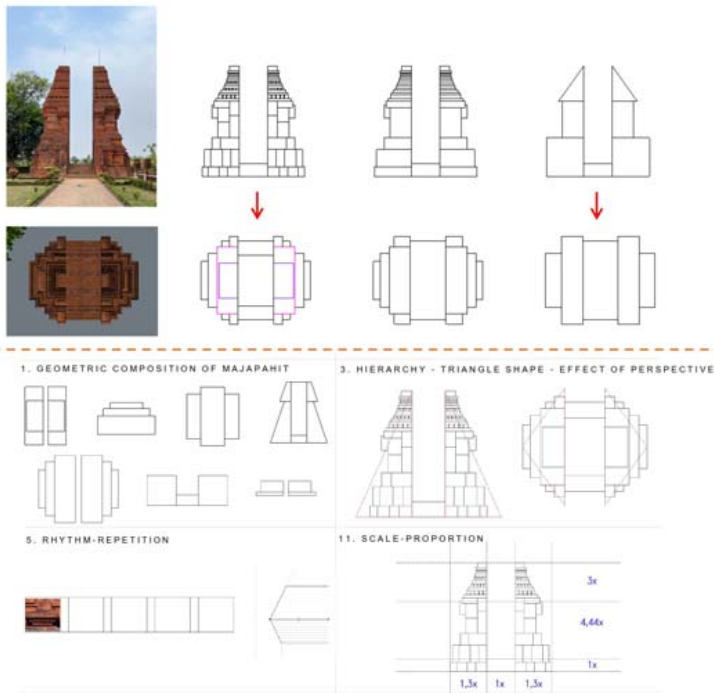


Fig. 8. Characteristics of Majapahit Wringin Lawang and transformation potential. Source: authors, 2024

and balconies oriented towards the east-west axis. The third photo shows a micro transformation of the interior space, forming a tiered void similar to Majapahit interiors, complemented by natural vegetation elements.

Wringin Lawang Gapura building

Wringin Lawang is the first-layer gate of the Majapahit royal complex, symbolized by its iconic large banyan tree. Constructed using red bricks, it appears grand and monumental with intricate carvings and ornaments depicting animal and plant motifs. The study on the characteristics of Wringin Lawang reveals seven form compositions, featuring symmetrical split forms and repeated head elements, as well as horizontal lines across all sides of the building (Fig. 8).

In the design manifestation of mixed-use buildings, on a micro scale, Geometric-Adaptation can be observed in the silhouette shapes of pedestrian bridges (architectural and structural). On a macro scale, we can see potential for enlarging the building at its peak, with consistent division into head-body-foot segments across all sides.

The transformation of the form and characteristics of Wringin Lawang can help create integrated designs in modern mixed-use buildings (Fig. 9). The first image depicts micro-scale transformation, where the modernized rendition of the Wringin Lawang Gate supports the multi-functional aspect of bridge-building. Meanwhile, the second image shows a distinct separation between the left and right sides of the entrance, serving as an inviting

focal point for an upscale and sophisticated shopping center.

Brahu Temple building

Candi Brahu is a 15th-century religious building from the reign of King Hayam Wuruk, originating from the Javanese language meaning “blessing”, and symbolizing gods or ancestors. The structure appears simple with horizontal lines in the head-body-foot elements made of red brick. The study on the characteristics of Candi Brahu (Fig. 10) describes seven form compositions with perspective effects and triangular shapes (narrowing at the top).

Its form is suitable for the design of a monumental mixed-use tower (single building mass). Micro-scale transformation potential can be achieved through Geometric-Adaptation, such as playing with cruciform silhouette shapes in interior elements and tenant stands. Meanwhile, the macro scale shows stepped building forms with curved accents, depicting symmetrical arrangements in the head-body-foot structure.

The transformation potential of the Majapahit architecture in the Brahu Temple is apparent in the interior layout tailored for tenant spaces, marked by tiered platforms that vary in size to delineate commercial sections. Furthermore, the building's structure incorporates a play of advancing and receding elements, echoing the architectural style of the Majapahit Brahu Temple (Fig. 11).

Penataran Temple building

Penataran Temple is the largest and most significant monument of the Majapahit era, featuring



Fig. 9. Visual form of the local-modern transformation of Majapahit Wringin Lawang. Source: authors, 2024

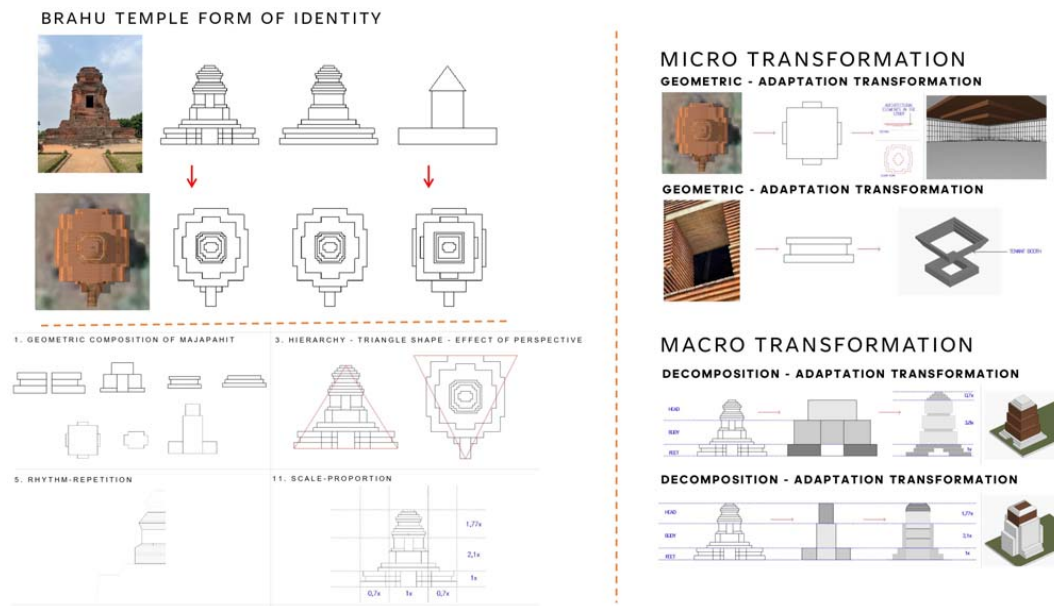


Fig. 10. Characteristics of Majapahit Brahu Temple and transformation potential. Source: authors, 2024

multiple temples within its complex with the main structure located in the innermost courtyard. It is built from andesite stone. The temple is renowned for its detailed carvings and decorations, including unique medallion motifs. Its architectural design incorporates six distinct forms that utilize perspective effects to create triangular shapes.



Fig. 11. Visual form of the local-modern transformation of Majapahit Brahu Temple. Source: authors, 2024

Its transformation potential inspires futuristic designs in contemporary architecture (Fig. 12). This includes Ornamental-Adaptation on a micro scale for interior elements and diamond/cruciform patterns reflecting Majapahit symbolism. On a macro scale, Decomposition-Adoption leads to modern buildings with symmetrical divisions and curved, tiered structures. Ornamental-Adaptation also includes base elements with tiered landscape ornaments, echoing Majapahit aesthetics, and reinterpretations of Majapahit motifs on modern facades.

As an aspect to strengthen the local-modern design, the transformation of Penataran Temple is very effective and robust (Fig. 13). One example is shown in the first image, depicting a macro transformation with a tiered canopy structure forming triangles and carvings depicting Majapahit stories; it is accompanied by tiered landscaping resembling a cruciform shape at the base of the curtain wall adorned with medallion ornamentation. The subsequent images illustrate micro-scale transformations: skylights in cruciform shapes

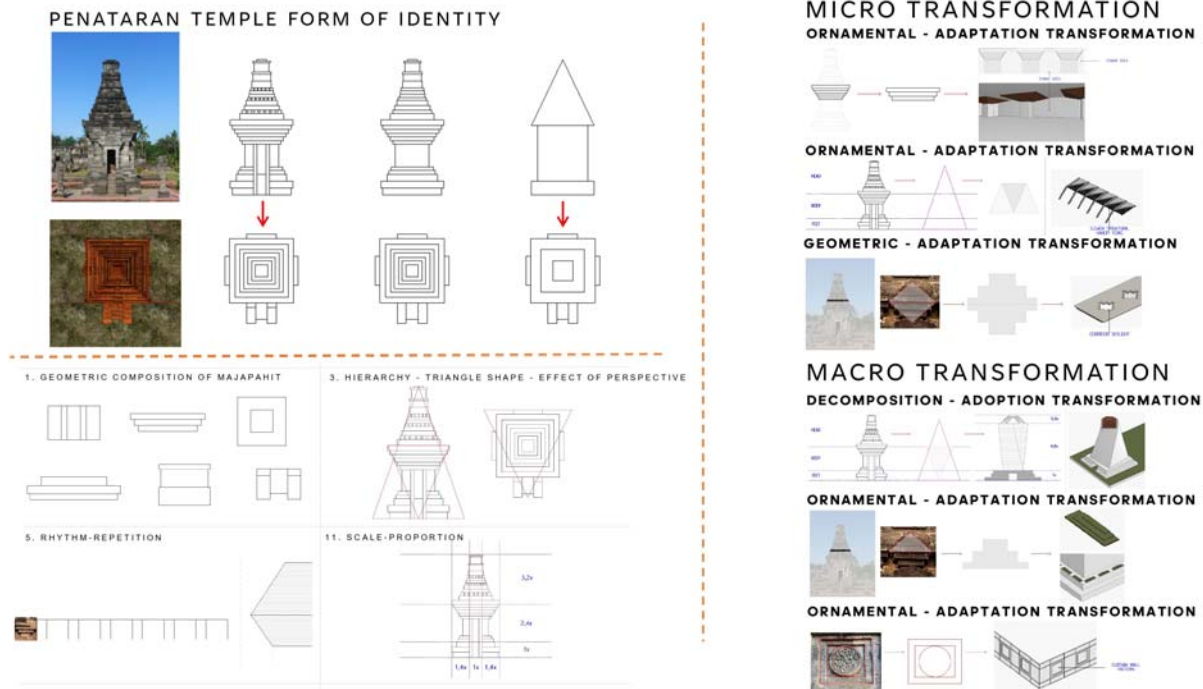


Fig. 12. Characteristics of Majapahit Penataran Temple and transformation potential. Source: authors, 2024

on bridge areas, and interior spaces showcase apartment room lights shaped similarly to Surya Majapahit motifs.

Jago Temple building

Jago Temple is a Meru style structure that evolved alongside the Majapahit kingdom, responding to cost, construction time, and Indonesian climate demands, while using the same system as its predecessors. Jago Temple's design is characterized by tiered roofs with an odd number of layers, symbolizing the sacred Mount Meru and associated with Hindu deities. Jago Temple itself features eight form

compositions creating triangular perspective effects and symmetrical shapes.

The potential transformations, seen at a micro scale through Geometric-Adaptation, include building silhouette forms as architectural columns, as well as raising platforms and entrances. At a macro scale, Decomposition-Adaptation manifests in unique building forms with head-body-foot elements, featuring stepped terrace treatments as entry areas that enhance aesthetics. They are also crowned by tiered roofs in response to the traditional tiered roof design (Fig. 14).



Fig. 13. Visual form of the local-modern transformation of Majapahit Penataran Temple. Source: authors, 2024

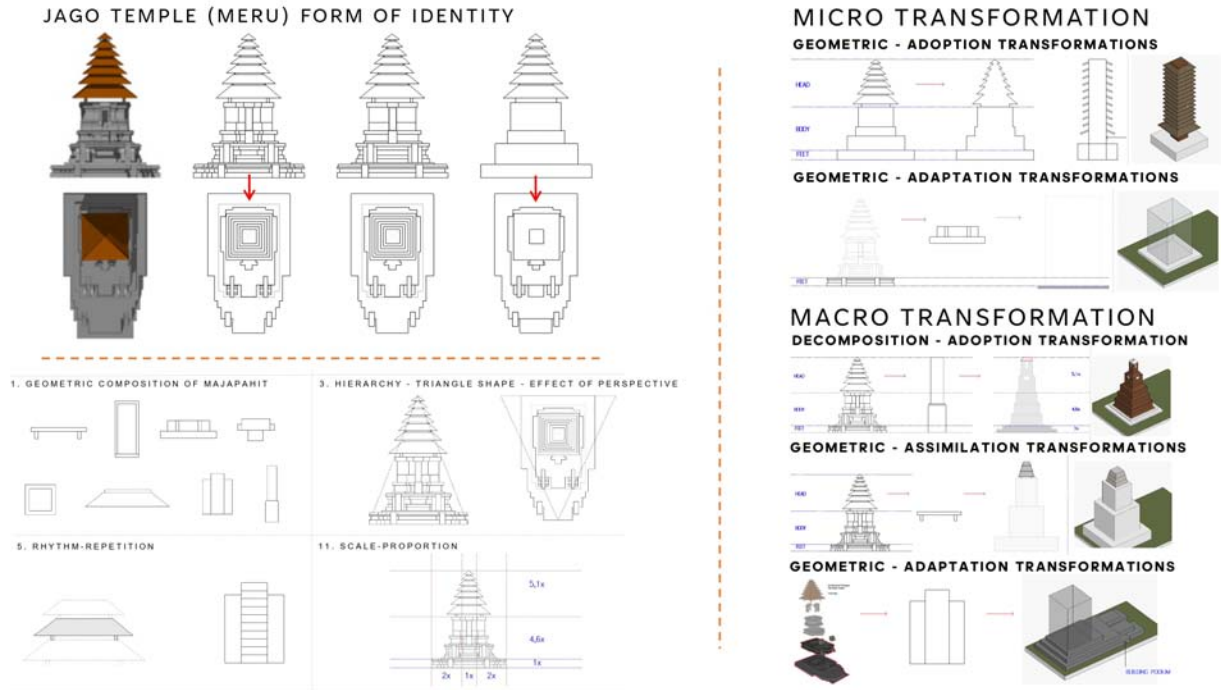


Fig. 14. Characteristics of Majapahit Jago Temple and transformation potential. Source: authors, 2024

Modern mixed-use building architecture takes cues from Jago Temple, an early precursor to the Meru style in Bali (Fig. 15). The first image illustrates a macro transformation with a stepped layout and terraces, forming the foundation for a mall area. Another macro transformation (seen in the second picture) is evident at the top of the building tower, housing a private restaurant and Mechanical Electrical Service Floor (Building Sustainability Utilities). This design incorporates tiered roof steps reminiscent of evolving tiered roof architecture of Majapahit, adapted over time to respond to environmental factors like climate.

Conclusion

Exploring potential transformations in mixed-use building design rooted in Majapahit architecture offers extensive opportunities for designers to innovate creatively in line with modern development

trends. Emphasizing authentic cultural preservation over simplistic judgments of good or bad allows for nuanced evaluation of transformation potential. This approach spans both micro and macro scales, integrating complementary elements to enhance ambiance and atmosphere, thereby enriching spatial experiences with the essence of Majapahit culture.

The sought-after transformation is not confined to individual aspects of single buildings; rather, it can integrate diverse elements from various structures to form a unified whole. Traditional cultural architecture typically retains consistent and cohesive foundational values, despite variations in function and form. Therefore, transforming these cultural values through design involves more than just modernizing their appearance; it should infuse them with spirit to create a robust design arrangement that serves as the binding identity of the city. In the context of



Fig. 15. Visual form of the local-modern transformation of Majapahit Jago Temple. Source: authors, 2024

the aforementioned transformation of Majapahit architecture, this can be summarized as follows:

1. It is essential to preserve the manifestation of Majapahit cultural elements that cannot be transformed, such as Volumetric Composition – solid-void, Tripartition, Symmetry, Mimesis, Texture – Material, Line Elements – Light-Dark Effects, and Axis – Convergence.

2. Modern designs should still involve the head-body-feet division.

3. The scale and proportion of the building can be adjusted by referring to the original, considering the form of the mixed-use tower (single mass) or mixed-use buildings with pedestrian access (multiple masses).

4. It is important to maintain the triangular perspective effect with a form that gradually narrows at the top, as well as enlarge the floor area at the junction of the body and the top of the building.

5. A symmetrical or centralized form should be both in plan and elevation.

6. The main building is positioned at the innermost part and is equipped with circulation paths leading towards it.

7. Pedestrian and human circulation with landscape features such as ponds or canal flows should be prioritized over vehicle transportation.

8. Strict and comprehensive orientation in the east-west (values of the Majapahit temples) and north-south (Majapahit city planning) direction.

The identified aspects of transformation function as core design principles, embodying the essence of Majapahit culture in a definitive and essential way. These guidelines provide a foundation for developing impactful and suitable transformation designs that respond to evolving societal demands and changing times. Therefore, exploring the transformation of Majapahit culture alongside modern influences is not confined to current aspect but can be expanded. This includes exploring opportunities to transform other traditional cultures in Indonesia, highlighting their cultural richness, and reinforcing local socio-economic values to bolster regional identity.

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ИССЛЕДОВАНИЕ РАЗВИТИЯ АРХИТЕКТОНИКИ: ОТ ХРАМА ЭПОХИ МАДЖАПАХИТА ДО ПРОЕКТИРОВАНИЯ СОВРЕМЕННОГО ВЫСОТНОГО ЗДАНИЯ В СУРАБАЕ

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Аннотация

Введение. Городские районы Индонезии переживают значительные культурные и архитектурные изменения на пути к модернизации. Эта тенденция особенно заметна в крупных городах, где высокие современные здания появляются все чаще, снижая влияние местных культур. Например, богатое историческое наследие культуры Маджапахита постепенно исчезает. Размывание местной культурной идентичности усугубляется быстрым темпом жизни и меняющимися общественными нормами, примером чего является появление больших многофункциональных зданий, объединяющих различные функции. Таким образом, восстановление угасающих культурных ценностей приобретает особую важность. **Цель исследования.** Целью данного исследования является изучение оптимальной трансформации традиционной архитектуры Маджапахита в Индонезии в контексте современности в качестве примера сохранения культурного наследия. **Методы.** Мы использовали описательно-аналитический подход метода качественного исследования для понимания культурных ценностей архитектуры эпохи Маджапахита и современных высотных зданий. Основываясь на теории трансформации, мы определили объем их исследования с учетом современных достижений в архитектуре. Посредством интерпретационного подхода мы стремились создать потенциальные варианты локально-современных трансформаций. Затем мы отобрали и визуализировали в 3D возможные варианты трансформации при помощи приложений для моделирования и рендеринга для понятной иллюстрации готовых проектов. **Результаты и обсуждение.** 3D-визуализация потенциальных трансформаций выявляет элементы, которые необходимо сохранить в первоначальной форме культуры Маджапахита, и аспекты, которые можно модернизировать для соответствия современным тенденциям. Они служат образцом современного дизайна, включающего элементы местной культуры для сохранения наследия коренного населения.

Ключевые слова: традиционная архитектура; архитектура Маджапахита; высотное здание; многофункциональное проектирование; архитектурная трансформация.