

Sanskrit Treatises and The Construction of Candi At The Kampung Baru Archaeological Site, Kedah, Malaysia

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Abstract

The construction of religious structures, such as the *candi* at the Kampung Baru Archaeological Site, was guided by ancient Sanskrit treatises such as the *Manasara* and *Mayamata*. The discovery of an ancient structure at the excavation site of Kampung Baru Kota Kuala Muda, Kedah, has opened up new opportunities for research into the monuments of Ancient Kedah. The brick structure, known as Candi Kampung Baru, bears traces of wall carvings that are remarkably well-preserved. The present study analyses whether the Candi Kampung Baru was built in accordance with these treatises. This study employed archaeological excavations, literature reviews, visual analyses, and digital reconstruction techniques. The findings indicate that the ancient Sanskrit treatises had some influence on the construction of the *candi*, particularly in the selection of the site and soil. However, in other aspects, local elements were incorporated, resulting in a fusion of foreign and local elements, as the builders had their own interpretation of the treatises. The presence of local elements in this temple serves as evidence that the community in Ancient Kedah did not wholly embrace foreign influences, particularly those from India.

Keywords: Kedah; Protohistory; Kampung Baru Archaeological Site; *Candi*; Kuala Muda

Introduction

The Kampung Baru Archaeological Site is located in Kedah, one of several Malaysian states with abundant archaeological sites (see Figure 1). The unexpected discovery of an ancient religious monument at Kampung Baru has provided an opportunity for a more extensive investigation into the archaeology of Ancient Kedah. The excavation revealed a Buddhist *candi* (temple, see Figure 2) and numerous other artifacts, including earthenware, beads, glass, and ceramics. The term *candi* used in Ancient Kedah refers to religious structures that were used by the community for Buddhist-Hindu teachings. According to Supian, it is also used to differentiate between ancient temples and new Buddhist or Hindu temples, particularly in Malaysia.¹ Essentially, a *candi* is a place for religious ceremonies or activities, whether they are conducted daily or celebrated annually. This article delves into the influence of Sanskrit treatises, such as the *Manasara* and *Mayamata*, on the construction of the *candi* at Kampung Baru, particularly in site selection and material use. It further explores how local elements were integrated into the *candi*'s design, reflecting a unique blend of foreign and indigenous practices.

Background

Ancient Kedah, also known as the Bujang Valley, was a Malay polity that existed prior to the establishment of the Malacca Sultanate in the 13th century AD.² Archaeological and written sources, particularly from Indian, Chinese, and Arabic-Persian sources, suggest that Ancient Kedah existed as early as the 2nd century AD. However, the adoption of the title of king as the highest social hierarchy within the kingdom only occurred in the 5th century AD, as evidenced by the remains of *candi* built specifically for royal use or dedicated to the king at the Sungai Mas Archaeological Site (Site 32/34).³ Prior to the 5th century AD, Ancient Kedah was led by a chieftain or tribal leader, with the head of the clan referred to as a *datu*. Ancient Kedah was a vast polity that spanned from Takuapa (in modern-day Thailand) in the north to Kuala Selinsing, Matang, Perak, Malaysia in the south.

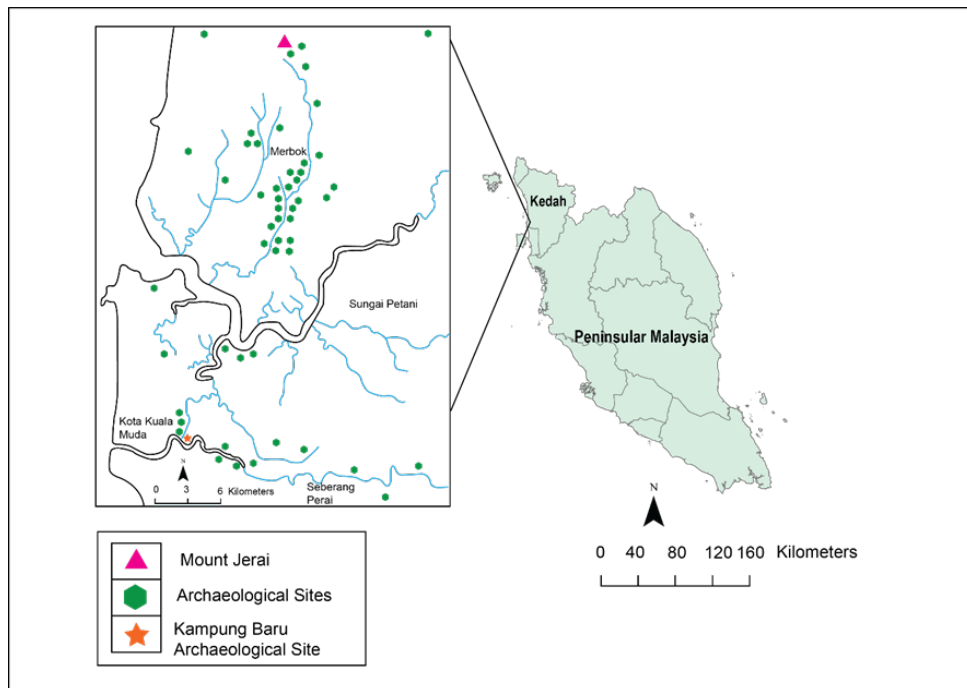


Figure 1: Location of Kampung Baru Archaeological Site.
Source: Muhammad Nu'man, 2019.



Figure 2: The *candi* at Kampung Baru Archaeological Site.
Source: Muhammad Nu'man collection.

The Ancient Kedah was a significant port-polity in Southeast Asia during the Protohistory Age. Arab-Persian, Indian, and Chinese traders traded their goods in Kedah, as recorded in various sources.^{4&5} This trade allowed the local Malays to interact with people from different cultures and regions. The interaction between Malays and Indians had a great impact on local culture and beliefs, with Malays adopting some aspects of Indian culture and fusing them with local culture. Evidence of this can be seen in the discovery of *candi* (ancient Buddhist or Hindu temples) in Kedah. Ancient religious texts, such as the Manasara Silpasastra and Mayamata, were used as references in construction, architecture, rituals, arts, and crafts. The principles of architecture and temple construction in these texts were widely used in India and other regions that had absorbed Indian cultural influence, including Ancient Kedah. While Indian cultural influences are recognisable in Ancient Kedah, it is less clear to what extent the Malays adopted these influences, particularly in the construction and architecture of the *candi*. It is also unclear to what extent the Malays referred to and followed the principles of these ancient religious texts in constructing the *candi*. Furthermore, recent research increasingly analyses ancient Hindu-Buddhist temples, particularly in Indonesia, using the Manasara Silpasastra and Mayamata as frameworks.⁶ However, it remains unclear to what extent such texts were used as guidelines for building *candi* in other parts of maritime Southeast Asia.

The visual details of ancient structures in archaeological sites can often be visually ambiguous and difficult to interpret, as seen in the case of the Candi Kampung Baru. However, such details can be accurately restored and enhanced through the use of digital reconstruction. With the advent of computer vision, 3D documentation using digital photogrammetry has become a fast, low-cost, and precise method for such restoration. When combined with other archaeological data, digital restoration allows structures to be reconstructed to their original form, enabling analysis that would otherwise be impossible to carry out on dilapidated ruins.

Archaeological research in Kedah started in the 1840s when Lt. Colonel James Low, an English administrator in Penang, stumbled upon several archaeological remains in Kedah and Province Wellesley (modern-day Seberang Perai, Pulau Pinang).^{7,8&9} Since then, archaeological research has flourished in Kedah and has been predominantly conducted by non-local researchers, like Irby¹⁰, Evans¹¹, Wales¹², Sullivan¹³, Foong¹⁴, and Lamb^{15&16}. When Quaritch Wales and his wife arrived in Kedah, the region had already been the subject of several expeditions and investigations and was not entirely unfamiliar to researchers. During a 14-month period between 1937 and 1939, they successfully identified 30 sites in the area.¹⁷ Alastair Lamb conducted research in Bujang Valley from 1959 to 1962, using systematic archaeological methods. Site 8, *candi* Bukit Batu Pahat, was a significant site that Lamb reconstructed with the assistance of M. Louis Contant, a member of Conservation d'Angkor involved in the Angkor Wat reconstruction project in Cambodia.¹⁸ Archaeological research in Ancient Kedah initially concentrated on exploring sites and temples, without a detailed examination of the influence of *vastu* treatises on the *candis*.

However, from the 1970s onwards, a more scientific approach has been adopted, and local researchers have played a more prominent role in archaeological research on Ancient Kedah.^{19&20} In recent years, the research scope on the Ancient Kedah *candis* has expanded to include scientific analysis such as XRD and XRF analysis of the bricks and raw materials used in their construction. The findings of these studies suggest that local raw materials, specifically riverbed deposits from Kedah, were used to make the bricks.^{21,22,23,24&25} However, there has been a lack of focused research or discussion regarding the potential relationship between the *vastu* texts and the construction of the *candis*.

Digital approaches provide new and updated methods for studying *candis*, as compared to previous works on Southeast Asian temples that relied on physical structures or ruins for visual analysis, such as Soekmono²⁶, Chihara²⁷, and Degroot²⁸. The works of Datta and Beynon in 2014

have demonstrated that analysis of digital models can reveal the complex association between the ideal form of a temple, according to canonical prescriptions (the *vastu* texts), and archaeological data gathered from temple ruins.²⁹

Excavations at the Kampung Baru Archaeological Site have revealed a large number of artifacts including 7595 fragments of earthenware, 556 fragments of glass, 37 beads, 48 stone tools, 23 iron tools, 33 shells, 3 *batu sondol*, one *dhupa* vessel, 4 resins, 10 pieces of furnaces, 2 stone plinth and 1371 ceramic pieces (see Table 1). The significant quantity and diverse range of artifacts discovered at the site attests to the Muda-Sungai Mas area's importance as a centre for community activities, including religious and trade activities. The large quantity of artifacts also suggests the presence of many people engaged in various activities in the area around Kampung Baru Site and at Sungai Mas. These findings strengthen the notion that the site played a crucial role as a religious centre for the people of Ancient Kedah due to its proximity to Kampung Sungai Mas, the administrative centre and entrepot of Ancient Kedah.³⁰ The construction of the *candi* was driven by the Ancient Kedahan's spiritual needs to devote themselves to their religion while also participating in economic activities such as engaging in trade activities in the Muda-Sungai Mas area.

Table 1: Kampung Baru Archaeological Site Artifacts

Artifact	Quantity
Earthenware	7595
Glass	556
Beads	3733
Stone Tools	48
Iron Tools	23
Shells	33
<i>Batu sondol</i>	3
<i>Dhupa</i> Vessel	1
Resin	4
Furnace	10
Stone Plinths	2
Ceramics	1371
Total	9683

Sources: Muhammad Nu'man, *Penyelidikan dan Ekskavasi Tapak Candi Kampung Baru*, Kota Kuala Muda, Kedah, 2019 and Junko Mori, *Kepelbagaian Jenis Seramik Asing di Tapak Candi Kampung Baru*, Kota Kuala Muda, Kedah, 2020.

Materials and Methods

The research methods utilized in this study include archaeological excavation, literature review, visual analysis, and digital reconstruction. The literature review was conducted on ancient Indian religious texts, specifically the *vastu* texts - *Manasara Silpasastra*³¹ and *Mayamata*^{32&33}. These two canons of the southern school of Indian architecture were written between the 5th and 7th century and extensively discuss mouldings. The purpose of this method was to determine whether the Candi Kampung Baru was constructed entirely according to the texts, or if local elements had influenced its construction. The visual analysis of the moulding is a comprehensive process that began with extensive documentation during the excavation phase of the Candi (Figure 3). Documentation was conducted manually and digitally to ensure that all visual details were accurately recorded and archived in case

of dilapidation or structural collapse due to the compromised integrity of the unprotected structure.

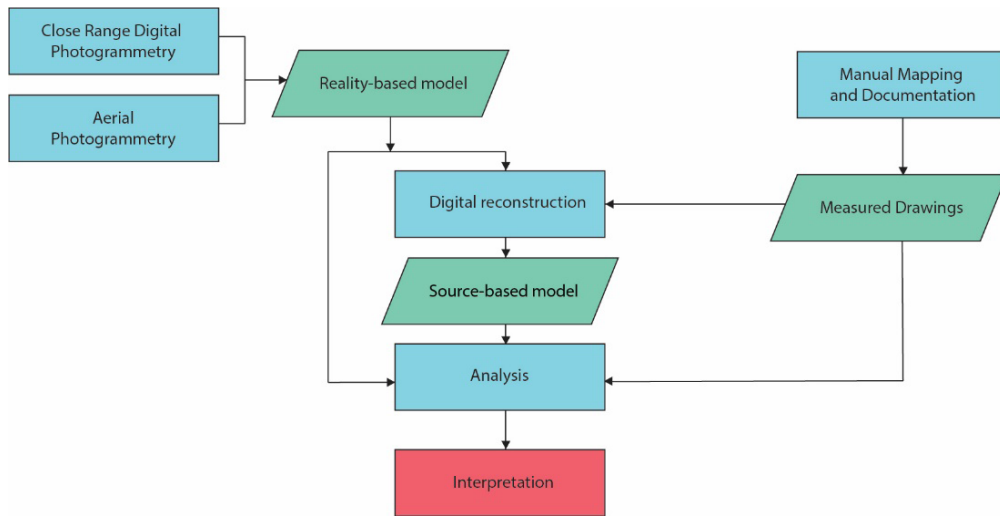


Figure 3: Flow of the visual analysis done on the mouldings.
Source: Mohd Shamsul Bahari.

Digital documentation was accomplished using aerial and close-range digital photogrammetry to produce a series of point clouds. These clouds were then transformed into a 3-dimensional reality-based model of the ruins using AliceVision's Meshroom software. The resulting 3D model, stored in OBJ file format, was utilized for subsequent processing, manipulation, and reconstruction. Manual documentation of the bricks and wall profile was employed to complement the digital method, as experience revealed limitations in the latter technique when extrapolating blank spaces between closely located objects, despite its high precision (± 2.5 cm) measurements. The generated 3D model was imported into Autodesk 3DS Max for processing and manipulation, ultimately resulting in a source-based reconstruction of the *candi* in its complete form, which was compared to *vastu* prescriptions using sectional models obtained by dissecting both the reality and source-based models (Figure 4).

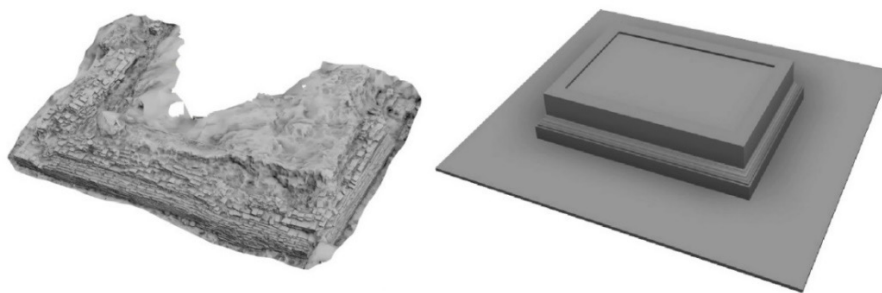


Figure 4: The reality-based model of the candi (left) and the digitally reconstructed source-based model (right).

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

Structure and Moulding of the Candi Kampung Baru

The Candi Kampung Baru is a unique structure that was built entirely using bricks, displaying remarkable strength in its construction despite its location near the Muda River and frequent exposure to floods. This feature provides an accurate identification of the structure's robustness. Excavations have revealed the rectangular walls of the *candi*, measuring 12 meters by 11 meters with a height of approximately 1.5 meters.³⁴ The orientation of the *candi* is north-south facing Mount Jerai. Based on several factors, the Candi Kampung Baru has been identified as a Buddhist structure. These factors include the absence of *vimana*-*mandapa* structures, north-south orientation, and the discovery of a *dhupa* vessel. In contrast, the Hindu *candis* of Ancient Kedah are typically oriented east-west and contain *vimana* and *mandapa* structures, such as those found at Site 19, Site 16 Kampung Pendi, Site 5 Sungai Batu Estate, Site 11 Kampung Sungai Batu, and Site 50 Kampung Bendang Dalam.

The identification of the *candi* as a religious structure was based on the discovery of two plinth bases made of granite for statues of deities (Figure 5). Devotees circled the *candi* as part of the *pradakshina* or *prasavya* ritual, which is often performed in an anti-clockwise manner by Buddhist followers.³⁵ The *candi*'s structure is closed and lacks any entrance, exit or staircase structure. Therefore, it is believed to be a *stupa* structure of the *chaitya* type. Other structures in India, such as the Sanchi Temple 40, also support the existence of a rectangular *chaitya* used for religious rituals like the *pradakshina*. The Temple 40, located just south of the Sanchi Complex, is the most significant structure in the area. The Temple 40 has a rectangular structure, with pillars to support the *stupa* structure located at the top of the *candi*.³⁶

The wall structure of Candi Kampung Baru was constructed using the brick stacking technique, which involves placing bricks without any adhesive between them. This technique is a common feature of the construction of Ancient Kedah *candis*, and requires precision in calculating the weight of each brick to ensure the stability and durability of the structure. Brick stack technique is a distinctive aspect of building construction in the Malay World, particularly in Ancient Kedah. The sturdiness of Candi Kampung Baru, which has endured to this day, is a testament to the practicality of this technique in constructing buildings. Moreover, this technique demands that the builders of the *candi*, consisting of architects and engineers, possess extensive knowledge in construction and mathematics (Mayamata 5: 14b-24) since the bricks vary in shape and size.³⁷ Although the architecture of the *candi* appears simple, the skills required to construct it should not be underestimated. Consequently, the ancient bricks of Candi Kampung Baru can bear the entire weight of the monument's structure and have remained intact to this day.

The temple wall comprises 23 layers of bricks and reaches a height of 1.5 meters. It features various layers of wall mouldings that are displayed in Figure 6. According to the *vastu* texts, the ruined structure is identified as the *upapitha* (pedestal) of a building. This was constructed immediately on top of the *garbhanyasa* (foundation) and below the *adisthana* (Manasara XIII:2; Mayamata 13:1).^{38&39} Although the deteriorated structure produced a model with slightly vague and deformed mouldings, a much clearer visualization is presented in the 3D reconstruction based on extrapolated digital documentation and manually measured data. The *upapitha*'s moulding profiles are arranged as follows from bottom to top: A) a *janman* (plinth) of seven layers of bricks, B) a *kampa* (lower fillet) of one layer of bricks, C) a *padma* (cyma) of three layers of bricks, D) a *kumuda* (torus) of one layer of bricks, and E) possibly a *kandhara* (neck). Although the prescribed moulding arrangement theoretically ends with a *vajana* (fillet) that separates the *upapitha* and *adisthana*, no other mouldings are perceptible at the remaining height of the wall.



Figure 5: Plinth base.

Source: Muhammad Nu'man collection.

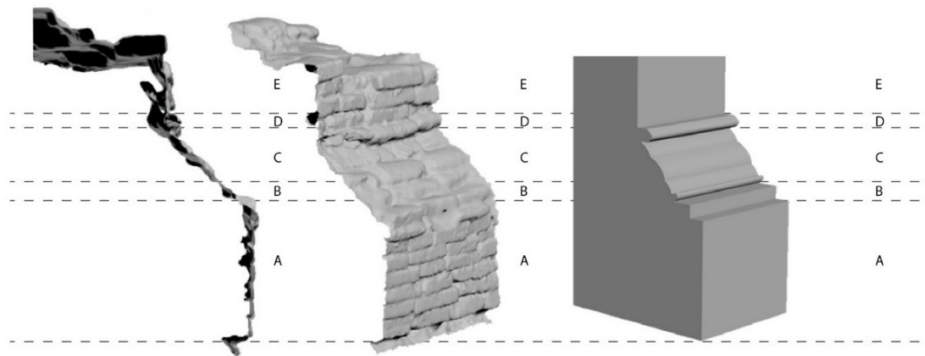


Figure 6: The wall mouldings of Candi Kampung Baru as visualized by the profile view of the digitally documented model (left), sectional perspective view of the model (middle) and the reconstructed model (right).

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

The construction of the *janman* in the temple wall exhibits several irregularities. The mouldings on the northern and western sides consist of seven layers of bricks, whereas only five to six layers are used on the eastern wall. The use of non-standardized brick sizes further contributes to the inconsistencies observed. The width and height of the bricks used in the northern wall vary greatly within the same layer, indicating that the builders did not follow the *vastu* prescriptions regarding the size and proportion of individual bricks. The minimum width of the recorded bricks is about $\frac{1}{4}$ smaller than the prescribed minimum of 7 *angulas* (± 13.34 cm), while the maximum width falls within the limit of 30 *angulas* (± 57.15 cm). The bricks' varying width-to-height ratios make it challenging to relate their dimensions to the prescribed guidelines. The wall's sides are similarly built up to the same height of approximately 44 cm. Therefore, the observed inconsistencies in the *janman* construction are likely connected to the builders' non-adherence to the *vastu* prescriptions and their use of non-

standardized brick sizes.

Although the *janman* was previously established to consist of seven layers of bricks, there are noticeable inconsistencies in its construction. The mouldings on the northern and western sides comprise seven layers of bricks, while the eastern wall has only five to six layers (Figure 7). The variation in the number of brick layers is likely linked to the second irregularity: the usage of non-standardized brick sizes. An analysis of the *janman* of the north wall (Table 2) reveals that bricks of significantly different widths and heights are present on the same layer. Based on this observation, it is clear that the builders did not adhere to the *vastu* prescriptions regarding the size and proportion of individual bricks (Manasara XII:189-193).⁴⁰ The minimum recorded width of 10.13 cm is approximately ¼ smaller than the minimum prescription of 7 *angulas* (±13.34 cm), while the maximum width of 38.53 cm is well within the limit of 30 *angulas* (±57.15cm). Due to the highly varying width-to-height ratio of the observed bricks, any further attempt to relate the recorded dimensions to the prescriptions is deemed futile. All sides of the structure are similarly built up to the same height of approximately 44 cm.

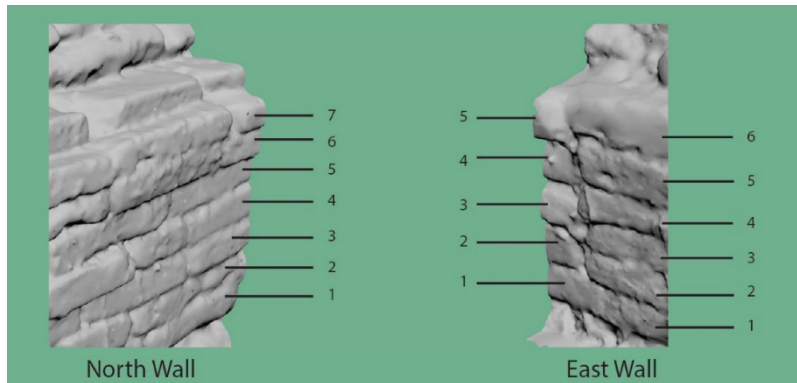


Figure 7: Inconsistency in the number of brick layers on the *janman* of Candi Kampung Baru.

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

Table 2: Analysis of brick size of the *janman* at the north wall

Layer	Height (cm)			Width (cm)		
	Min	Max	Average	Min	Max	Average
1	4.11	10.35	6.24	10.13	38.53	24.65
2	4.6	4.87	5.59	16.4	34.5	25.85
3	5.5	8.52	6.59	15.41	33.14	25.12
4	4.74	7.12	5.61	16.7	33.4	23.23
5	4.83	8.26	6.13	12.6	35.18	24.87
6	5.38	8.83	6.56	14.68	34.17	23.72
7	4.37	7.9	5.71	12.44	32.64	23.85

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

The wall moulding at Candi Kampung Baru has a prominent feature besides the *janman* - the *padma* or lotus. This motif, which is considered sacred in both Hinduism and Buddhism, is situated at a height of around 21 cm and has a perceived depth of 15 cm. It consists of three layers of bricks of two different typologies, as seen in Figure 8: A. The form of a lotus may be difficult to discern on the deteriorated wall. However, the lathe model of the profile outline, illustrated in Figure 8: C, shows an impression of the lotus flower (*Nelumbo nucifera*), with the noticeable protrusion at the base of the bottom brick resembling the sepal.

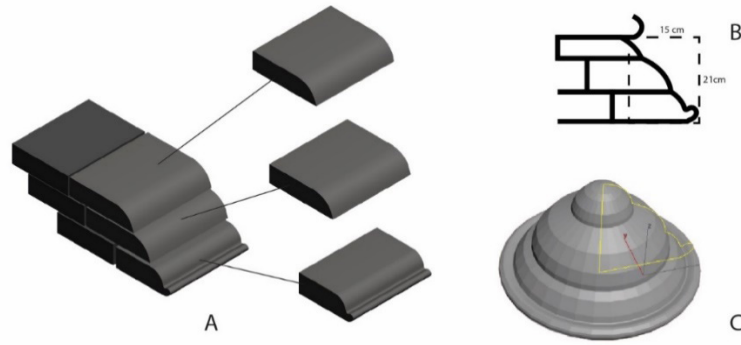


Figure 8: (A) Exploded view showing the bricklaying of the *padma* moulding using 3 layers of bricks. (B) Profile illustration of the *padma*. (C) Lathed model of the profile illustration.

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

To determine whether the mouldings conform to the guidelines specified in *vastu* texts, a moulding ratio analysis is conducted. The first analysis involves examining the ratio of the *janman* to the *padma*, as described in Chapter 13 of both *Manasara* and *Mayamata*, since the *kumuda* is not recommended for the *upapitha* in these texts. Since the *padma* profile can be used at various heights and quantities, such as four times in the first type of *Subhadra* (*Mayamata*, 13:15-17).⁴¹ This study focuses on the first cyma from the bottom, which is typically the most prominent *padma*. It is important to note that the cyma profiles are not exclusively referred to as *padmas* in the texts and can also be called *ambuja*, *abja* or *saroruha*, all of which imply a lotus. These profiles can also be given a superlative or diminutive prefix, such as *mahambuja* (great lotus) and *kshudrapadma* (small lotus). For this study, all variations of the lotus represented by the lower cyma are considered as *padma* since they share the same profile shape and meaning. Additionally, only the lowermost plinth is taken into account for this analysis, despite the different terms used, such as *vapraka*, *janman*, etc. The analysis result is presented in Table 3. The terms *vedibhadra*, *pratibhadra*, *subhadra*, and *machabhadra* according to Acharya are types of pedestals (also can be referred as socle or plinth) that differ from one another in terms of height and mouldings.⁴²

Table 3: The height ratio of the *janman* and *padma* in Candi Kampung Baru (CKB) compared to the prescriptions of *upapitha* in the *Manasara* and *Mayamata*

Subject	Type	<i>janman:padma</i>	Total Parts
		height ratio	
CKB	-	±2:1	-
	Vedibhadra type 2	2:1	12
	Vedibhadra type 3	1:1(1.5:1.5)	12
	Vedibhadra type 4	? (plinth+ <i>ambuja</i> = 2)	12
	Pratibhadra type 1	3:2	26
	Pratibhadra type 2	2:2.5	32
	Pratibhadra type 3	2.5:3	33
Manasara	Pratibhadra type 4	2.5:3	34
	Manchabhadra type 1	1:1(3:3)	30
	Manchabhadra type 2	3:3.5	31
	Manchabhadra type 3	2:2.5	33
	Manchabhadra type 4	3:3.5 (<i>abja</i> + <i>kshudrapadma</i>)	34

	Vedibhadra type 1	2:1	12
	Pratibhadra type 1	1:1	27
	Pratibhadra type 2	2:1	28
Mayamata	Subhadra type 1	1:1 (2:2)	21
	Subhadra type 2	2:3	21

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

The lower part of the wall measures 44 cm *janman* and 21 cm *padma*, with the presence of a small *kampa* (fillet) in between. This measurement roughly adheres to the description of the second type of *Vedibhadra* in the Manasara (XIII:36-52), which prescribes, "...of the twelve parts, the *janman* should be made of two parts, the *padma* of one part..."⁴³ The first variation of *Vedibhadra* described in the Mayamata (13:6-8) and the second type of *Pratibhadra* of the Mayamata (13:12-14) also conform to this proportion.⁴⁴ However, the height to depth proportion of the *padma* (21cm:15cm) does not meet the requirement of the Manasara (XIII:138-139), which stipulates that "...the *padma* should be equal to its height, or greater by one-fourth, half, or three-fourths; or twice..."⁴⁵

The *kampa* that stands in-between the *janman* and *padma* is present in the 8 types of *Pratibhadra* and *Manchabhadra* of the Manasara (Table 4). However, these *upapithas* show a smaller *janman* size compared to the 8:1:4 ratio of the *candi*. Interestingly, the *janman*, *kampa*, and *padma* arrangement is not present in any of the types of *upapitha* in the Mayamata.

Table 4: Placement of *kampa* in-between the *janman* and *padma* in the 8 types of *Pratibhadra* and *Manchabhadra* of the Manasara

Subject	Type	<i>janman:kampa:padma</i> height ratio	Total Parts
CKB	-	±8:1:4 (44:5:21)	-
	Pratibhadra type 1	3:1:2	26
	Pratibhadra type 2	2:0.5:2.5	32
	Pratibhadra type 3	2.5:0.5:3	33
	Pratibhadra type 4	2.5:0.5:3	34
	Manchabhadra type 1	3:0.5:3	30
	Manchabhadra type 2	3:0.5:3.5	31
	Manchabhadra type 3	2:0.5:2.5	33
Manasara	Manchabhadra type 4	3:0.5:3.5	34

(*abja+kshudrapadma*)

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

The final matter to be considered is the evaluation of the *kumuda* situated immediately after the *padma*. This element consists of a single brick with a thickness of 5cm and is proportionally measured to the *padma* and *janman* in a 1:4:8 ratio. As previously mentioned, the *vastu* texts do not prescribe the *kumuda* profile for *upapitha* mouldings. Rather, it is a typical feature of the *adisthana*, where the moulding arrangements are more comprehensively discussed than in the *upapitha* of both texts (refer to Table 5).

Table 5: The height ratio of the *janman*, *padma* and *kumuda* in Candi Kampung Baru (CKB) compared to the prescriptions of *adisthana* in the Manasara and Mayamata

Subject	Type	<i>Janman:kumuda</i> height ratio	<i>Janman:padma:</i> <i>kumuda</i> height ratio	Total Parts
CKB Manasara	-	8:1	±8:4:1	-
	Padabandha type 1	8:7	-	24
	Padabandha type 2	2:7	2:2:7	29
	Padabandha type 3	1:7	1:2:7	27
	Padabandha type 4	2:7	-	28
	Uragabandha type 1	7:6	-	18
	Uragabandha type 2	7:6	-	20
	Uragabandha type 3	7:6	-	22
	Uragabandha type 4	7:6	-	24
	Pratikrama type 2	1:6	1:2.5:6	22
	Kumudabandha	2:3	2:2:3	27
	type 1			
	Kumudabandha	2:3	2:2:3	27
	type 2			
	Kumudabandha	2:1	2:0.5:1	29
	type 3			
	Kumudabandha	1:1	1:0.5:1	29
	type 4			
	Sribandha type 1	1:6	-	26
	Sribandha type 2	1:3(2:6)	-	26
	Sribandha type 3	1:3(2:6)	-	26
	Sribandha type 4	1:6	1:1:6	26
	Manchabandha	1:2 (2:4)	1:2:2 (2:2:4)	26
	type 2			
	Manchabandha	1:2 (2:4)	1:2:2 (2:2:4)	26
	type 3			
	Manchabandha			26
	type 4			
	Srenibandha type 3	2.5:3	2.5:5:3B	23
	Srenibandha type 4	1:3	1:1:3	24
	Padmabandha type 2	3:5	3:1:3	21
	Padmabandha type 3	3:5	3:1:5	21
	Sribhoga type 1	2.5:3	2:5:3:3	27
Kukshibandha type	1:1.5	1:1.5:1.5	19	
2				
Kukshibandha type	1:10	1:1:10	26	
3				
Mayamata	Padabandha	8:7	-	24
	Uragabandha	5:6	-	18
	Pratikrama	1:6	1:1.5:6	21
	Padmakesara	1:1	1:2:1	26
	Puspapuspakala	1:4	1:1:4	19
	Srenibandha	1:4	1:2:4	26
	Padmabandha	1.5:1	1.5:5:1	18
	Vaprabandha	1:2 (2:4)	2:1:4	22

Source: Mohd Shamsul Bahari, Rekonstruksi Digital Candi Kampung Baru, Kota Kuala Muda, 2022.

The analysis reveals that the *kumuda* is specified for 27 types of *adisthana* in the Manasara and 8 types in the Mayamata. However, none of the prescribed ratios in either text matches the 8:1 *janman* to *kumuda* ratio of the *candi*. In contrast to the small *kumuda*, the texts generally assign a much larger one in the moulding arrangements, up to 1:10 in the third type of the *Kukshibandha* class (Manasara XIV:305-346).⁴⁶ Similarly, out of the 23 types of *adisthana* identified to be adorned with both *padma* and *kumuda*, 16 exhibit a larger *kumuda*, 4 have the same height, and only 3 contain a *padma* of greater size. However, none of the prescribed types share the same ratio as the moulding at the *candi*. The most

comparable proportion could be observed in the 5:1 ratio prescribed for the *Padmabandha* of the Mayamata (14:34).⁴⁷

Structure, Construction and Function of Candi Kampung Baru

Archaeological excavations at the Kampung Baru site have revealed that the Candi Kampung Baru structure was rectangular in shape, measuring 12 meters by 11 meters. The unique feature of this *candi* is its location near the Muda River and Sungai Mas. The Sungai Mas was the administrative centre and entrepot of Ancient Kedah, and the proximity of the Kampung Baru site to it emphasizes the significance of the Kampung Baru site to the Ancient Kedahan. The Kampung Baru site is bordered by the Muda River to the south and Mount Jerai to the north. Two main factors led to the selection of this site for the *candi's* construction: community activity and religious and spiritual significance. The Muda River has long been a lifeline for the people of Kedah, providing a major source of water for domestic use, communication, transportation, and food. The river was also the primary route for Ancient Kedahan people to travel from one place to another, and the development of water transportation facilitated their movement.

Settlements have been established near the Muda River since prehistoric times, such as in Guar Kepah, Seberang Perai. During the Protohistory Age, Ancient Kedahan continued to build their buildings, settlements, ports, and administrative centres near rivers. Thus, it is not surprising that Candi Kampung Baru was erected near the Muda River. The construction of the *candi* near the Muda River further emphasizes the importance of the river to Ancient Kedah, as it acted as the trans-peninsula route, as proposed by Ramli.⁴⁸ To the north of the *candi*, Mount Jerai serves as the landmark of the Kedah state and guided the *candi* builder in determining the structure's direction. Mount Jerai is not only important for construction purposes, but also for sailing. Sailors during the Protohistory Age used Mount Jerai as a guide to navigate to the port of Kedah. This highlights the importance of Mount Jerai to the Kedahan at that time as a guide in determining directions, especially in the field of construction and sailing.

The stratigraphical analysis of the Kampung Baru Archaeological Site reveals the identification of seven distinct layers of soil. Manasara and Mayamata, ancient texts that prescribe suitable soil and site types for religious structures, indicate that Candi Kampung Baru was built on appropriate soil and site. According to Manasara (IV: 8, 13-14) and Mayamata (3: 4-7a, 20), the soil must be smooth, compact, pleasing to the eye and touch, and have a yellow or golden colour.^{49&50} The cultural layer soil of the *candi* is yellowish and its soil texture matches the requirements stated in the *vastu* texts. The stratigraphic analysis also suggests a relative dating for this site from the 9th to the 11th century AD based on the associated findings. Absolute dating, based on the shells found in the site, indicates a date of 940 +/- 30 BP.

The wall moulding of the *candi* is an interesting feature due to its intricate shape and composition. Although the structure of the *candi* is simple, the level of detail in the wall moulding is exceptional for an Ancient Kedah protohistoric monument. The use of non-standardized brick sizes in the rudimentary build quality of the structure suggests a possible connection to ancient Buddhist practice. Devotees viewed the erection of religious monuments as an offering that would warrant divine merit, with emphasis placed on the noble intention rather than on quality and durability. As long as the structure was completed, the objective was considered fulfilled. The strong association to Buddhism, the perceived simplicity of the structure, and the absence of stairs all suggest that this *candi* is a *chaitya*, a type of stupa-like structure that was customarily built by Buddhists to commemorate important events.

Although the mouldings of Candi Kampung Baru do not conform entirely to any prescribed rules in existing texts, it is understandable that minor changes and transformations occurred during the development of architecture, as well as through cultural and geographical diaspora. Dravidian architecture evolved over time from ancient Pallavan origins, which, in turn, was influenced by indigenous Indian architecture.⁵¹ While South Indian ideals gradually spread to Southeast Asia during the period of Indianization, elements of Dravidian architecture were assimilated and subsequently adapted by local builders. Therefore, it is expected that deviations from the *vastu* rules would occur as the builders apply their own methods. As demonstrated by Datta and Beynon, it is unlikely that exact replication of South Indian architecture in Southeast Asian monuments would be achieved.⁵²

The construction of the *janman* and *padma* in a ratio corresponding to the *Vedibadhra* type of *upapitha* is not particularly informative regarding the builders or the structure itself. This is because it is a general type that could be prescribed to any building (Manasara XIII: 52).⁵³ However, the use of bricks of varying dimensions to achieve a symmetrical profile height is evidence of the builders' proficiency in bricklaying skills and their in-depth knowledge of *vastu* rules. Although a monument's surface may consist of bricks of irregular widths and depths, the bricks would typically be shaped in the same heights.⁵⁴ Standardizing brick height is important because achieving uniformity of moulding height with bricks of varying thickness is logically challenging. Nevertheless, the builders of the *candi* successfully handled this minor hindrance.

The prescribed dimensions of bricks, as explained in the Manasara (XII: 189-193) and, were seemingly ignored by the builders.⁵⁵ However, there are no textual prohibitions against using bricks of dissimilar dimensions to construct a moulding profile in what might appear to be a haphazard arrangement. Thus, it is evident that the builders prioritized the uniformity of the whole plinth over the individual typology of the bricks. The production of irregular bricks is perplexing, as equally sized bricks would be easier to lay. It is improbable that the same brick makers who produced intricately shaped bricks of uniform heights for the *padma* and *kumuda* were incapable of producing standardized cubes.

The presence of a *kumuda* above the *padma* suggests the development of Dravidian architecture as discussed earlier. The *kumuda*, despite not being prescribed for the *upapitha* in the Manasara and Mayamata, can be found in the Samarangana Sutradhara, a *vastu* text that extensively described Dravidian architecture during the same era when Candi Kampung Baru was constructed in the 11th Century AD.⁵⁶ In fact, the Samarangana prescribes the *kumuda* for all five pedestal types, referred to as *pitha*, and lists the mouldings of the lowermost part as sharing the arrangements of the plinth (*nidavarti/khuraka*), cyma (*padmapatrika*), fillet (*kanika*), and *kumuda* (Samarangana Sutradhara 61:3-62).⁵⁷ However, the size and ratio of the *kumuda* to other profiles in the *candi* suggest local modifications, as even the smallest *kumuda* in all referred texts is markedly larger.

The use of multiple layers of bricks to construct the *padma* at Candi Kampung Baru displays local ingenuity in adhering to *vastu* rules. Typically, single-layered building materials were used to construct a moulding element in Indian monuments.⁵⁸ However, using bricks to create the *padma* would have presented logistical challenges due to their brittleness, mechanical damage, and deformability. To address this, the builders stacked multiple thinner bricks to achieve the desired shape and height. Although the *vastu* texts prescribed the ratio of mouldings, they did not specify the number of bricks required to achieve the desired height. Consequently, the builders exercised their creativity to manage the *vastu* requirements and building challenges by using three layers of bricks in various shapes to construct the *padma*. Thus, while the builders were aware of the *vastu* rules, they used their discretion to create an aesthetically pleasing structure.

The utilization of multiple layers for a single moulding element can be observed in other parts of Southeast Asia, for example, the two-layered *padma* and *kumuda* of Candi Mendut in Java and the multi-layered mouldings of Prasat Kravan in Angkor. However, it should be noted that the other monuments of Ancient Kedah which exhibit layered bricks for a single profile, such as the six-layered *kumuda* of Site 19 and the two-layered *padmas* of Site 21, have been criticized for inaccuracies in their reconstructions and for failing to properly refer to Quaritch Wales's excavation data.^{59,60&61} In contrast, the stacked *padma* of Candi Kampung Baru is the first clear indication of the utilization of such a method in the Bujang Valley of Kedah.

This practice potentially addresses the brahman-builder relation as discussed by Hardy, particularly for the Dravidian-influenced structures of Ancient Kedah.⁶² Candi Kampung Baru's construction could be seen as a demonstration of the synergy between the spiritual philosophies of *vastu* texts and construction practicality. The builders of the *candi* were able to achieve a delicate balance, demonstrating mastery over both aspects. As noted by Chihara, exploring and analysing aesthetic spatial composition requires individuals with a high degree of creativity in construction and recreation.⁶³ It is no surprise, therefore, that the builders in Southeast Asia, who had a bricklaying tradition predating South Indian influence, were inventive in dealing with brick structures of various shapes and forms.⁶⁴ The requirements of *vastu* provided an opportunity for the builders to showcase and immortalize their talents among the bricks of the *candi*, highlighting their knowledge and cultural sophistication in their crafts.

Interpretation of *Vastu* Treatises and the Local Genius of the Ancient Kedahan Malay

The construction of the *candi* is consistent with the guidelines for building houses of worship found in Sanskrit treatises, particularly in the *Manasara* and *Mayamata*. The suitability of the site, soil, and surroundings of the *candi* are in line with the requirements for constructing a temple, as outlined in *Manasara* (IV: 6-7, 8, 11-12) and *Mayamata* (3: 7b-10a, 20).^{65&66} The fertility of the soil in the vicinity of the site is evident as the area was once used for paddy cultivation. Furthermore, the presence of a water source, the Muda River, located about 100 meters south of the *candi*, further enhances the suitability of the site.

The use of ancient Sanskrit texts as a guide in the construction of the Kampung Baru Candi is evidence of the knowledge transformation process between the Ancient Kedah with South Asia as proposed by Ramli.⁶⁷ This transformation of knowledge can be attributed to the trade activities that flourished in the prehistoric age and made Kedah a major trade centre in the Malay World from 500 AD onwards.⁶⁸ The people of Ancient Kedah interacted with foreign traders who came to the port, and the rapid trade activities in Kedah allowed the locals to absorb Indian culture and knowledge. This interaction and knowledge absorption led to the use of the texts as guidelines in the construction of the *candi*.

The absorption of Indian culture and knowledge in Kedah was adapted to local culture and traditions.⁶⁹ Among the absorbed concepts were royalty, Sanskrit, and construction techniques. The local community mastered Sanskrit and South Indian characters, such as the Pallava characters. With this knowledge, they could study and refer to religious texts in Sanskrit, allowing architects to construct *candi* according to religious guidelines. However, Malay architects included local elements in the construction of *candi*, such as the use of pillar plinths with square mortises, seen at Site 4, Site 5, and Site 8 Bukit Batu Pahat in Kedah.⁷⁰ This unique feature was used to support the superstructure of the *candi*. The fusion of local elements with guidance from ancient texts shows that the Ancient Kedahan had their own interpretation of the texts. While some parts of the Candi Kampung Baru were not built in accordance with the texts, this active interpretation demonstrates the builders' mastery and

knowledge of their craft.

The contribution of the Malays, as the local inhabitants of Ancient Kedah, to the prosperity of the region was significant, encompassing a wide range of fields, including science and technology. Their contributions can be observed in areas such as brick and pottery making, the construction of religious structures, and their knowledge of religious texts. Archaeological investigations conducted at the Kampung Baru Archaeological Site have identified two primary clay-based materials: ancient bricks and earthenware. The local people of the time possessed extensive knowledge of brick-making processes and produced bricks in diverse shapes and sizes. The community's expertise is reflected in the aesthetic appeal of the various bricks, which were subsequently used in the construction of the *candi* at the Kampung Baru Site. Although the shape of the *candi* is simplistic, the structure's stability is evident in the arrangement of bricks of varying shapes and sizes. The local community's unique brick-stacking technique, which did not require any adhesives, further demonstrates their skill and knowledge in construction.

The brick stacking techniques used in the construction of the *candi* at Kampung Baru Site required its builders to possess expertise in both calculation and architectural principles. This is because accurate calculations were necessary to ensure that bricks of various shapes and sizes could support the weight of the overall structure and hold it for an extended period. The durability of the *candi* is evidence that its builders had a profound understanding of these principles. Scientific studies have also been conducted to identify the composition of several brick samples used in the *candi*'s construction. These analyses aimed to determine whether the bricks were made from local or non-local raw materials. XRD and XRF analyses of the brick samples concluded that the raw materials used in the construction of the *candi* were sourced from the Muda River basin, the Bujang River basin, the Merbok area, and the Bujang area.⁷¹ The comparison of data obtained from the *candi*'s brick samples with other clay samples in the Bujang Valley further supported this conclusion.

The earthenware found at the Kampung Baru Archaeological Site has its own aesthetic value and was produced locally. The discovery of stone tools and *batu sondol*, a tool used for pottery making in the Malay Peninsula, provides evidence of the existence of pottery making in the vicinity of the site. Past archaeological excavations have also revealed large quantities of pottery in the area around Sungai Mas and Muda River. For instance, in 1981, 4211 fragments of earthenware were found in Sungai Mas, while in 2006, 1209 fragments were discovered.⁷² The discovery of significant quantities of earthenware at the Kampung Baru and Sungai Mas archaeological sites suggests that there was a local pottery industry in Ancient Kedah. It is unlikely that such a vast amount of earthenware was imported from other regions, as it is more fragile than other ceramics, making it more practical for the people of Ancient Kedah to produce their own earthenware, as evidenced by the discoveries at the Kampung Baru Site.

Conclusion

The Kampung Baru Archaeological Site contains a Buddhist *candi* that dates back to the 9th century AD and was used until the 11th century AD. The construction of the *candi* adhered to some of the guidelines for building houses of worship, as described in *vastu* treatises such as the *Manasara* and *Mayamata*. The selection of soil, sites, and surrounding areas of the *candi* reflects the requirements of building a temple as described in these texts. The soil in the vicinity of the site is fertile due to the area's history of paddy cultivation, and there is a water source nearby, the Muda River, which is situated approximately 100 meters south of the *candi*.

Besides that, in the context of Ancient Kedah, local genius refers to the innovative and creative capabilities of the local people in adapting and integrating foreign influences, such as Indianization, into their existing culture and traditions. The concept of Indianisation refers to the process of cultural and religious influence from the Indian subcontinent on Southeast Asian societies, including Kedah. Indianization in Kedah occurred mainly through trade and cultural contacts with India, which had a significant impact on the region's economy, political system, and culture. As a result, Kedah's rulers adopted many Indian cultural and religious practices, such as Buddhism and Hinduism, which were incorporated into the local culture.

However, Kedahan society did not passively accept Indianization but instead adapted it to fit their local context. For instance, the construction of the Candi Kampung Baru demonstrates a fusion of Indian architectural principles and local building techniques, materials, and designs. Kedahan people's local genius enabled them to assimilate and adjust foreign influences, particularly Indianisation, into their culture and tradition. As a result, a distinctive amalgamation of local and foreign components that still exist in contemporary Kedahan society was created.

In summary, the construction of the Kampung Baru Archaeological Site Candi did not completely follow the guidelines of Manasara and Mayamata. Instead, it was influenced by both local elements and those from the Indian subcontinent. The construction and architecture of the *candi* also illustrate that the ancient Kedahans had their own interpretation of *vastu* texts, retaining local elements while adapting to their natural surroundings during construction.

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