A SYSTEMATIC EVALUATION TOOL FOR HERITAGE SHOPHOUSE FACADES

Wan Nordiana Wan Ali[1], A Ghafar Ahmad[2]

[1,2]*School of Housing, Building and Planning,*
UNIVERSITI SAINS MALAYSIA, MALAYSIA
[1]*Department of Built Environment Studies and Technology,*
UNIVERSITI TEKNOLOGI MARA, PERAK BRANCH, MALAYSIA

Abstract

Heritage shophouses are the architectural asset that becomes a landmark of many heritage areas, particularly in major towns in Malaysia. This cultural heritage needs to be preserved or conserved to prolongs its life. However, there is still a need for in-depth study on the architectural part as to add knowledge about this heritage treasure. Thus, this paper tends to develop a definitive list of the architectural characters of the heritage shophouse façades according to its elements. The definitive list was outlined by referring and comparing data extracted from the local government reports, books, articles, and research undertaken by scholars in architecture and conservation. Furthermore, a fieldwork had been conducted at the Heritage Area of Ipoh involving 121 shophouses by using a checklist to support the secondary data. Thematic analysis was applied by sorting all architectural characters into five main categories of elements that include structural, building enclosure, opening, fenestration, and ornamentation. Later, a matrix taxonomy of architectural styles was developed to form an evaluation tool as an innovation to the existing inventory and documentation method for the heritage shophouses. The paper concludes that the concise data of architectural characters are significant to differentiate the styles of the heritage shophouse façade. Further research at other heritage areas in Malaysia should be conducted to gain more data of other architectural styles.

Keywords: Conservation, heritage shophouse, architectural styles, façade, evaluation tool

---

[1] Phd Candidate at USM, Senior Lecturer at UiTM Email:wandiana2005@gmail.com

INTRODUCTION

The British had occupied Malaya for 160 years, introduced the classical vocabulary from their world and adapted the proportion and detail within a Malay vernacular framework (Mohamad Tajuddin, 2015). During the British administration period, many Chinese and Indians migrated to Malaya, though Chinese traders have been in Malaysia since the 15th century. From 1869 to 1877, new tin mines were discovered and explored in Perak and Selangor which led to the growth of small towns and later, encouraged mass migration of Chinese labourers, who brought with them their traditional hybrid building form of dwelling and commercial purposes known as shophouse which then became common in all new towns. These shophouses incorporated architectural vocabulary from the West, China, India and Malay Archipelago from the 18th – 20th century (Fee, 1998). A large number of heritage shophouses could be found in major historical towns such as Malacca, George Town, Ipoh, Taiping and Kuala Lumpur (A Ghafar, 1997) with various architectural styles of facade. However, according to Mohd Jaki and Muhammad Firzan (2020), the Malay identity is seen to be the most prominent style of the heritage shophouse facades in small town.

The conservation of heritage buildings demand determination and dedication to preserve its cultural, historical and architectural significance (Nur Shahirah & Junainah, 2021). Heritage buildings are fragile and often unwittingly destroyed or lost due to the rush of modernisation, globalisation (Bandarin et al., 2011), growth in the tourism industry (Roders and Oers, 2011), the effect of enormous market pressures, as well as regenerating of development and survival of business by the building owners. Thus, these factors lead to the need for intervention such as physical alterations or distortions to the heritage buildings. Such interventions are mostly improper changes done on the elements of the heritage shophouse facades. For instance, incompatible building forms and styles in a state of neglect (Ummu Liyana & Noordeyana, 2021) negatively impact the architectural styles and characters that eventually lose their sense of place (Nur Raqena et al., 2020).

The architectural characteristics of a heritage building are slightly significant, not only in conveying memory and identity but also the values and sense of a place for future generations (Dogan, 2019). Unfortunately, by referring to initial interviews conducted with local authorities, one of the problems faced by these heritage properties is incomprehensive management in controlling various interventions that have taken place in the heritage building. This statement is consistent with Roders and Van (2011), who stated that there is a gap between theory and practice of management of cultural heritage, which in practise there is a significant delay in switching to a more holistic approach, where planning and management were concerned, most certainly by local governments.

While development and modernisation are necessary, there is a need of a comprehensive conservation management plan for heritage buildings (Wan Nordiana & A Ghafar, 2021a) including an information management system such as inventories that are essential tools for recognising and assessing the safeguarding of cultural heritage (Myers et al., 2016). The inventories shall include information on building, site location, physical features, function, material, and providing definitive lists that used to identify condition and values of the elements that contribute to the cultural significance (Carlisle and Lee, 2016) which is supported by photographs (Khushi, 2016). Furthermore, stakeholders also can engage in more efficient and informed decision making (Vileikis et al., 2012) and also for documentation purpose as an integral part of the nomination and management of a World Heritage property. Thus, it is significant to conduct research related to heritage shophouse, particularly the building façade as this part is subjected to the local authority rules and regulations. However, previous researches only provide a general description of the shophouse façade. In addition, there is a need to refer to a complete and standard data regarding the architectural styles and materials other than the implementation of the conservation approaches to maintain the design (Wan Nordiana & A Ghafar, 2021b). Therefore, this paper discusses and propose a definitive list of the heritage shophouse façades elements and its architectural characteristics to develop a matrix taxonomy as a reference and evaluation tool for the purposes of documentation in the information management system.

RESEARCH BACKGROUND

Located in the Southeast Asia Region, Malaya was colonised by western powers for over 300 years began with the arrival of the Portuguese and the Dutch in Malacca and later the European to the federal states, all of which have an influence on the nation's buildings' architecture. Later, Malaysia's economic growth was then supported by trade and tin mining industry and rubber planting on a large scale. Consequently, the British government bring in immense number of immigrants from China and India to carry on economic activities together with their architecture skills and knowledge. Today, rapid development is concentrated in urban areas, and the demand for housing has increased. These, encourages the construction of mixed-use buildings called shophouses that are used for residential and business. The buildings still exist today in the city centre and have become a cultural heritage asset for the urban tourism industry. At present, George Town and Malacca have been successfully declared as UNESCO World Heritage Site. The declaration has a positive impact on the local economy, which encourages other local authorities in Malaysia to preserve their cultural heritage asset for regeneration. The redevelopment in the heritage area rapidly increases and it threatens the survival of the heritage buildings. Ipoh, for instance, has gazetted its Heritage Area as stated in Special Area Plan of Ipoh City 2020

(2014) on 18th December 2014 due to the provision of Town and Country Planning Act (Act 172).

LITERATURE REVIEW
Heritage shophouse facade

Façade means the front exterior elevation or face of a building (Tyler, 2000), especially the principal front (Curl, 2006), as seen from the street or other public places (Comerma, 2008). As shown in Table 1, the elements of the façade are divided into groups relating to the structural, building enclosure, opening, fenestration, and ornamentation. Façade is the most important architectural element and capable of conveying a building's function and defines the interior space that it shelters (Comerma, 2008).

Table 1: Elements of heritage shophouse facades.

	Source	Data	Category		Elements of facade
1.	Burden (1996, 2003)	Wall surface	Building enclosure	ii	
		Structural	Structural	i	
		Fenestration	Fenestration	iv	
		Ornament	Ornament	v	
		Entrance	Opening	iii	
		Stylistic details	Ornament	v	
2.	Curl (2006)	Wall surface	Building enclosure	ii	i. Structural
		Fenestration	Fenestration	iv	ii. Building enclosure
		Opening	Opening	iii	iii. Opening
		Enclosure	Building enclosure	ii	iv. Fenestration
3.	Ahmad Sanusi & Shaiful Rizal (2012)	Motive decoration	Ornament	v	v. Ornament
4.	Hopkins (2013)	Wall	Building enclosure	ii	
		Opening	Opening	iii	
		Roof	Building enclosure	ii	
5.	Wooi (2015)	Roof	Building enclosure	ii	
		Wall	Building enclosure	ii	
		Opening	Opening	iii	

According to Fee (1998), four main influences have contributed to the building traditions of Malaysia. These influential factors are; Malay, Southern Chinese, Sino-European, and Anglo-Indian cultures. The mix of cultural influences can be seen at the heritage shophouse façade on the elements that clearly can be referred to distinguish the architectural pattern. The series of evolution or transitional changes are part of the process in the adaptation of climates, local cultural, economic demands, fashion influence, and introduction of new technologies (Wooi, 2015). However, after World War II, according to Nor Hayati (2017), the architectural diversity or traditional style that established

during the colonial periods had to be ended to unite the people through a more modern architecture that were constructed to serve public needs, totally utilitarian, and express a national vision for the future. Figure 1 shows the characters for traditional and modern styles of heritage shophouse façade.
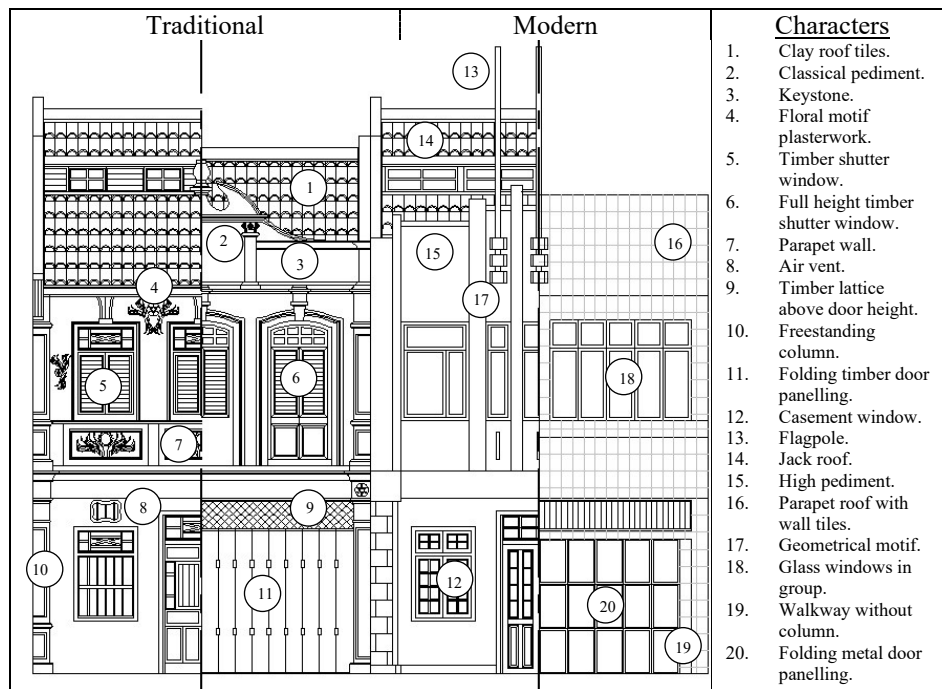

Traditional	Modern	Characters

Characters:
1. Clay roof tiles.
2. Classical pediment.
3. Keystone.
4. Floral motif plasterwork.
5. Timber shutter window.
6. Full height timber shutter window.
7. Parapet wall.
8. Air vent.
9. Timber lattice above door height.
10. Freestanding column.
11. Folding timber door panelling.
12. Casement window.
13. Flagpole.
14. Jack roof.
15. High pediment.
16. Parapet roof with wall tiles.
17. Geometrical motif.
18. Glass windows in group.
19. Walkway without column.
20. Folding metal door panelling.

Figure 1: Characters of traditional and modern heritage shophouses façade.

Heritage Building Inventory
According to the Ipoh City Council, the Special Area Plan of Ipoh City (2014) documentation was prepared to create an urban design that combines the urban development and conservation of heritage buildings. One of the important tasks that needs to be made continuously in the process of preservation of the cultural heritage is to prepare an inventory of heritage buildings to be the primary reference in; i) Planning and building control, ii) Preserving significant heritage buildings, iii) Mapping the history of the building and the area, and iv) Preserving cultural heritage and urban activities. Myers et al. (2016) highlighted that the design and development of the heritage building inventory has to consider the inclusion of following items; i) Identification, ii) Analysis and research, iii) Control, iv) Conservation plan and activities, and v) Precise information.

METHODOLOGY

This research begins with the collection of articles, relevant documents, reports, reference books, and others to extract required data that cover conservation of heritage buildings, Malaysia's architectural history, and an in-depth description of heritage shophouse facades. At this stage, the data of the elements that formed and diversified the architectural style is extracted, and the list of the key elements of the heritage shophouse façade was obtained by setting the theme codes, which are structural, building enclosure, opening, fenestration, and ornamentation. There are three key elements that are broken down into sub-elements, namely: structural - beam and column; building enclosure – roof and external wall; Opening - door, window, and air vents. By indicating these elements, then the attributes that form the heritage shophouse façade were obtained. A taxonomy matrix was drafted, and general characteristics of the architectural styles were extracted from the literature study by using content analysis and are summarised to fill in the draft of the taxonomy matrix.

FINDING AND DISCUSSIONS

Architectural styles and period

From the analysis of previous research, nine researchers have conducted research and published data concerning the architectural style of heritage shophouse facades in Malaysia. Their research content is grouped according to the scope of the area that includes architectural styles that generally cover Malaysia, UNESCO World Heritage Site of Melaka and George Town, Heritage Area of Taiping and Kuala Lumpur. The architectural styles of the heritage shophouse facade at the historic areas are different based on the historical background, the construction era and the town development. Table 2 and Table 3 show the scope of research areas by authors and the architectural styles of heritage shophouse facades in Malaysia. The architectural styles are coded as P1 for Transitional, P2 for Eclectic, P3 for Neo-Classical, P4 for Art Deco and P5 for Modern.

Table 2: Scope of research areas by authors.

Code	Authors. Year & Title	Scope
A1	Fee (1998) - *Architecture*. The Encyclopedia of Malaysia, Vol 5.	(i) Malaysia
A2	Elnokaly and Fui (2014) - *Demystifying Vernacular Shop Houses and Contemporary Shop Houses in Malaysia; A Green-Shop Framework*.	
B1	Teuling (2009) - *Rebirth of the Malacca Shophouse, A Typological Research. Traditional Values in a Contemporary World*.	(ii) Melaka
B2	Noorfadhilah et al. (2012) - *Documentation and Conservation Guidelines of Melaka Heritage Shophouses*.	
C1	Rozliani et al. (2012) - *Classification of Inheritance Shop Houses in George Town, Penang – UNESCO WHS.*	(iii) George Town
C2	Wooi (2015) - *Penang Shophouses; A Handbook of Features and Materials*.	
C3	Omar & Muna (2016) - *Penang / George Town's Shophouse Façade and Visual Problems, Analytic Study*.	
D	Gurstein (1990) - *Malaysian Architectural Heritage Survey: A Handbook*.	(iv) Kuala Lumpur

E	Nur Farhana, et al.(2017) - *Character-Defining Elements of Shophouses Buildings in Taiping, Perak.*	(**v**) Taiping

Table 3: Classification of architectural styles of heritage shophouse facades.

Period		Architectural Styles	i		ii		iii			iv	v	
			A1	A2	B1	B2	C1	C2	C3	D	E	
1600-1700		Dutch		•		•						2
1700-1800		South China		•		•						2
1800-1900		Early		•		•	•					3
1790-1850		Early Penang						•	•			2
1800-1900		Utilitarian								•	•	2
1840-1900		Early Transitional		•		•	•					3
1840-1900	**P1**	South China Eclectic						•	•			2
1890		Transitional	•									1
1890-1920		Palladian									•	1
1880-1920		Early Straits Eclectic		•	•	•	•	•	•			6
1900-1940	**P2**	Late Straits Eclectic		•	•	•	•	•	•			6
1901-1910		Straits Eclectic									•	1
1800-1930	**P3**	Neo-Classical	•	•	•		•			•	•	6
1930		Dutch Patrician	•	•								2
1930-1960	**P4**	Art Deco	•	•	•	•	•	•	•	•	•	9
1920-1990	**P5**	Early Modern		•	•	•	•	•	•		•	7
1950-1990		Modern	•							•		2
		Total	5	10	5	8	7	6	6	4	6	57

Characters of Architectural Styles

There are 17 architectural styles that represent the shophouse facades as listed by the authors. An analysis of the construction era and similarity in pattern of architectural characters shows varieties of them that were outlined in Table 4. Then, a fieldwork had been conducted to validate the content listed. New data collected were added in the table before a matrix taxonomy of architectural styles is developed.

Table 4: Characters of architectural styles outlined by authors and fieldwork.

Elements		Characters	P1	P2	P3	P4	P5
Structural	Beam	Timber beam	•	•	×		
		Reinforced concrete				•	•
	Column	Engaged column at the upper façade and free-standing column below	•	•	•	×	•
		Five-foot walkway without column					
		Curvatures building corners without column					•
		Used of Greek and Roman order	•		•		
Enclosure	Roof	Pitch roof	•	×	•	×	•
		Greek-style pediment			•		
		High pediment				•	
		Parapet wall			•	•	•
		Terracotta roof tiles	×	•	×	•	×
	Wall	Paint in pastel or white colour	•	×	•	×	×
		Paint in vibrant colour		×			
		Paint in shade colour				×	×
		Shanghai plaster				•	
		Wall tiles		×			

(Cont'ed…)

Element	Sub-element	Character					
Opening	Door	Steel shutters	×				
		Solid timber shutters	•	×	×		
		Casement shutters				×	
		Removable or folding vertical timber panelling	•	•	×	•	
		Metal folding paneling or roller shutter				•	•
	Window	Louvred or solid timber shutter	•	×	×		
		Casement window				•	•
		Glass louvres window					×
		Flat arched transom infilled with glass, timber carved or louvres	•	×	×	×	×
		Arched transom light infilled with glass,timber carved or louvres	•	•	×		
		Semi circular fanlight infilled with glass, timber carved or louvres	•	×	×		
		Vertical or horizontal concrete shading fin around the windows				•	•
		Glass or steel louvres above window frame	×	×	×		×
	Air-vent	Carved timber or seramic air vent on the ground floor	•	×	×	×	
		Squares, diamond or bat shape between windows at the upper floor		•			
		Porthole air vent or concrete air vent slots				×	•
		Timber/metal lattice above door height at the ground floor	•	•	×	×	×
Fenestration		2-3 bays full height traditional windows	•	•	×		
		4-5 bays of traditional windows.	×				
		2-3 bays or repetitive modern windows				•	•
		4 or more bays of repetitive modern windows.				×	
		Large size of windows arranged in group.					•
Ornamentation		Architrave surround window frame	•	•	•		
		Pilaster column in between the windows	•	•			
		Keystone on top of the window frame	•		×		
		Natural or floral motifs plasterwork	•	•	×		
		Geometrical motifs				•	×
		Cornices or horizontal mouldings along the beam	•	•	×		
		Traditional design with minimal decorations	•			•	
		Possess more decorations and ornamentation		•	•		
		Devoid any decoration or craftsmanship					•
		Flagpoles and embedded building dates				•	

Note: '•' for data from document analysis and 'x' for data from fieldwork.

Fourty-eight characters of Transitional, Eclectic, Neo-Classical, Art Deco, and Modern architectural styles had been listed from the analysis and drafted in a checklist to develop a matrix taxonomy. The matrix is a reference to formulate an inventory form to classify and grade the architectural styles of heritage shophouse facades.

Matrix Taxonomy
The matrix taxonomy is an inventory form with a specific calculation method. Its purpose is to classify and grade the architectural styles of the heritage shophouse façade based on the characters and physical condition seen on the façade. Figure 2 shows the examples of the inventory form template with a list of characters whereby the evaluator will select the relevant characters of the façade for each element. The evaluator needs to select "1" in the box for relevant characters that portray the façade. Figure 3 shows the marks score for each evaluation of facade. The highest score marks indicate the styles that portray the facades. Table 4 is the

indicator for grading the integrity of the architectural styles of heritage shophouse facades. The evaluation tool then was tested on a row of heritage shophouses at Jalan Sultan Iskandar, Ipoh. The analysis is outlined in Table 5.

Elements		CHARACTERISTICS OF ARCHITECTURAL STYLES FOR HERITAGE SHOPHOUSE FACADE		
Main element	**Sub-element**	**Architectural styles:** Select '1' for each character that relevant. Assessor can select more than one (1) character for each element if relevant.	**Code**	**Style**
	Beam (R)	Timber.		1
		Reinforced concrete.	R2	
		Others.	R3	
Structural	Column (TG)	Engaged column at the upper façade and free-standing column below.	TG1	1
		Used of Greek and Roman order.	TG2	
		Five-foot way without columns.	TG3	
		Curvatures building corners without column.	TG4	
		Others.	TG5	
	Roof (B)	Pitch roof.	B1	1
		Terracotta clay roof tiles.	B2	
		Greek style pediment.	B3	
		Parapet wall.	B4	
		High pediment.	B5	
Building Enclosure		Others.	B6	
	Wall (D)	Painted in pastel or white colour.	D1	
		Painted in vibrant colour.	D2	
		Granulated render known as Shanghai plaster.	D3	
		Wall tiles finishing.	D4	1
		Others.	D5	

Note: callout "Select value 1 for relevant" points to the Style column.

Figure 2: Example of the evaluation process of matrix taxonomy for architectural styles of heritage shophouse façade.

Score for Architectural Styles of Façade				
Architectural Styles		Relevant Character	(%)	Fill in the value of the highest percentage score (%).
Traditional	**Transitional** (1880-1900s)	7	50	
	Eclectic (1890-1930s)	11	73	73
	Neo-Classical (1880-1920s)	6	40	
Modern	**Art Deco** (1925-1950s)	4	27	Architectural Styles
	Early Modern (1910-1970s)	4	31	
	Modern (1970s)	3	23	Eclectic
	Others -	0	0	
Note: Select architectural style according to the highest score marks and fill in the percentage value. 'Others' represents the architectural styles other than listed and maximum score marks is 39 only.				

Figure 3: Example of the evaluation score for heritage shophouse façade.

Table 4: Indicator for grading of heritage shophouse facades.

Grade	Indicator for grading
A	Architectural style of façade is easily recognised and unique in term of architecture. Thus, it needs to be preserved and conserved. The original building materials and design elements should be retained, and restoration work must comply with the composition and method of original construction and preservation approach through regular maintenance.
B	Architectural style of facade can still be recognised and has a few special elements that need to be preserved and conserved. The original building materials and design elements should be retained. Conservation approach that

	complies with the principles should be carried out on significant elements of the facade as to improve the grade quality of the façade.
C	Architectural style of facade is difficult to be identified. Efforts should be made to retain the façade. The original building materials and design elements should be retained. Conservation approaches in various techniques should be implemented and other alternatives may be considered if the preservation is not practicable.

Table 5: Grading analysis of architectural styles for heritage shophouse facades.

	Architectural styles, grade, nos. & %	
A	6	50%
B	5	42%
C	1	8%

A	A	A	B	B	B	C	A	B	A	A	A	Grade	
	•						•	•	•	•	•	6	Transitional
												0	Eclectic
												0	Neo-Classical
												0	Art Deco
•		•	•	•	•							5	Modern
						•						1	Others

CONCLUSION

The matrix taxonomy of architectural styles of heritage shophouse has added valuable information and knowledge that can be used in the inventory or re-inventory of heritage buildings, especially the shophouse for a systematic documentation purpose. Local authorities can apply the matrix taxonomy in other heritage areas in Malaysia by replicating the procedure and customising the information of architectural styles at that particular heritage site. The evaluation generated from the taxonomy matrix in the inventory form will give systematic analysis results thus facilitating documentation work. Most importantly, this reference can be used as a guide and indicator by the stakeholders to retain or preserve the integrity of the heritage shophouse façade. Furthermore, the grading recognition may encourage the shareholders to increase effort in conserving the heritage assets as the continuity of the legacy for future generations. In conclusion, heritage buildings need to be sustained, preserved, and conserved to face global challenges and surrounding development. At the same time, they need to be able to emerge in the face of pandemic Covid-19, economic crisis, inflation and others.

ACKNOWLEDGEMENTS

REFERENCES

A Ghafar, A. (2010). *Pemuliharaan bangunan warisan di Malaysia; Pengalaman dan cabaran masa depan*. Siri Syarahan Umum Pelantikan Profesor. Pulau Pinang: Penerbit Universiti Sains Malaysia.

Ahmad Sanusi Hassan & Shaiful Rizal Che Yahaya. (2012). *Architecture and Heritage Buildings in Georgetown Penang*. Pulau Pinang: Penerbit Universiti Sains Malaysia.

Bandarin, F., Hosagrahar, J., & Albernaz, F. S. (2011). Why development needs culture. *Journal of Cultural Heritage Management and Sustainable Development*, Vol. 1 No. 1, pp 15-2.

Burden, E. (1996). *Building facades: Faces, figures, and ornamental detail*. London: McGraw-Hill.

Burden, E. (2003). *Illustrated dictionary of architectural preservation*. New York, United States: McGraw-Hill Companies.

Carlisle, P. & Lee, E. (2016). Recording the past:Heritage inventories in England, *Journal of Cultural Heritage Management and Sustainable Development*, Vol. 6 No. 2.

Comerma, B. I. (2008). *Visual dictionary of architecture & construction*. Singapore: Page One Publishing Pte Ltd.

Curl, J. S. (2006). *A Dictionary of Architecture and Landscape Architecture (2nd ed.)*. New York: Oxford University Press.

Dogan, H. A. (2019). Assessment of the perception of cultural heritage as an adaptive re-use and sustainable development strategy. *Journal of Cultural Heritage Management and Sustainable Development*, Vol. 9 No. 3.

Elnokaly, A., and Wong, J. F. (2014). Demystifying vernacular shophouses and contemporary shophouses in Malaysia; A Green-Shop Framework. *In the 30th International PLEA Conference*. Ahmedabad: CEPT University.

Fee, C. V. (1998). *Architecture*. The encyclopedia of Malaysia, Vol 5. Singapore: Archipelago Press.

Gurstein, P. (1990). *Malaysian architectural heritage survey: A handbook*. Kuala Lumpur: Badan Warisan Malaysia.

Hopkins, O. (2013). *Reading Architecture: A Visual Lexicon*. London: Laurence King Publishing Ltd.

Ipoh City Council (MBI). (2014). *Special Area Plan of Ipoh City (Rancangan Kawasan Khas Pekan Ipoh; Bandar Warisan Bijih Timah 2020)*. Laporan Cadangan Pembangunan (Jilid I & Jilid II). Perak: Jabatan Perancangan Bandar dan Desa Perak Darul Ridzuan (JPBD Perak).

Khushi, S. (2016). Creation of cultural heritage inventories: Case of the historic city of Ahmedabad. *Journal of Cultural Heritage Management and Sustainable Development*, Vol. 6 No. 2.

Mohamad Tajuddin, M. R. (2015). *Colonial architectural heritage of Malaysia*. Kuala Lumpur: Dewan Bahasa dan Pustaka.

Mohd Jaki, M. & Muhammad Firzan, A. A. (2020). The entity – Identity relationships of old shop houses in Perak through façade design. *Journal of the Malaysian Town Planners*, Vol. 18 Issue 3, 51-70.

Myers, D., Dalgity, A., & Avramides, I. (2016), The arches heritage inventory and management system: A platform for the heritage field. *Journal of Cultural Heritage Management and Sustainable Development*, Vol. 6 Issue 2.

Noorfadhilah, M. B., and Shamzani, A. M. D. (2012). Documentation and conservation guidelines of Melaka heritage shophouses. In the AcE-Bs 2012 Bangkok ASEAN Conference on Environment-Behaviour Studies, *Procedia-Social and Behavioral Sciences*, 50, 192–203.

Nor Hayati, H. (2017). Nation building and modern architecture in Malaysia. Modern Southeast Asia; Documentation and conservation of buildings, site and neighbourhoods of the modern movement. *Docomomo Journal*, Issue 57-2017/02, 30-37.

Nur Farhana, A., Yong, A. S. H., Azlan, S. A., Siti Farrah, Z., & Muhammad Farris, A. (2017). Character-defining elements of shophouses buildings in Taiping, Perak. *Journal of Design and Built Environment: Special Issue 2017*, 139-149.

Nur Raqena, M. R., Mimi Zaleha, A. G. & Yazid, S. (2020). Architectural heritage values and sense of place of Kampung Morten, Melaka. *Journal of the Malaysian Institute of Planners*, Vol. 18 Issue 4, 33-46.

Nur Shahirah, J. & Junainah, M. (2021). Application of machine learning in analysing historical and non-historical characteristics of heritage pre-war shophouses. *Journal of the Malaysian Institute of Planners*, Vol. 19 Issue 2, 72-84.

Omar, A. S. and Muna, H. A. S. (2016). Penang / Georgetown's shophouse façade and visual problems, analytic study. *In the Proceeding of 4th International conference on Liberal Arts and Social Sciences 2016 (ICOLASS'16)*, 96-105.

Roders, A. P., & Oers, R. V. (2011). World Heritage Cities Management. *Facilities*, Vol. 29 Iss 7/8.

Rozliani, M, Md Azree, O. M., Norazmawati, M. S., Ruhizal, R. and Hasnanywati, H. (2012). *Classification of Inheritance Shop Houses in George Town, Penang – UNESCO World Heritage Site*. Analele University "Eftimie Murgu" Resila Anul XIX, NR. 1, 2012, ISSN 1453 – 7397.

Teuling, M. D. (2009). *Rebirth of the Malacca shophouse, A typological research. Traditional values in a contemporary world*. Delft University of Technology.

Tyler, N. (2000). *Historic preservation; An introduction to its history, principles, and practice*. New York: W.W. Norton & Company.

Ummu Liyana, H. & Noordeyana, T. (2021). Awareness of community on the conservation of heritage buildings in George Town, Penang. *Journal of the Malaysian Institute of Planners*, Vol. 19 Issue 1, 114-126.

Vileikis, O., Cesaro, G., Quintero, M. S., Balen, K. V., Paolini, A., & Vafadari, A. (2012). Documentation in world heritage conservation: Towards managing and mitigating change – The case studies of Petra and the Silk Roads. *Journal of Cultural Heritage Management and Sustainable Development*, Vol. 2 No. 2.

Wan Nordiana, W. A. & A Ghafar, A. (2021a). New norms: Reviving the heritage shophouse facades at Batu Gajah, Perak. *Journal of Malaysian Townplan*, Vol. 11 Issue 1, 57-64.

Wan Nordiana, W. A. & A Ghafar, A. (2021b). Systematic inventory for heritage shophouse facades in Ipoh, Perak, Malaysia. *Journal of the Malaysian Town Planners*, Vol. 19 Issue 5, 108-120.

Wooi. T. Y. (2015). *Penang Shophouses; A handbook of features and materials*. Pulau Pinang, Malaysia: George Town World Heritage Incorporated.