



# Criteria for Adaptive Reuse of Heritage Shop Houses Towards Sustainable Urban Development

Muhamad Shahril Mohd Abdullah<sup>1</sup>, Azeanita Suratkon<sup>1\*</sup>, Syed Burhanuddin Hilmi Syed Mohamad<sup>1</sup>

<sup>1</sup>Jamilus Research Centre, Faculty of Civil Engineering and Environmental,  
Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Batu Pahat, Johor, MALAYSIA

\*Corresponding Author

DOI: <https://doi.org/10.30880/ijscet.2020.11.01.005>

Received 01 June 2019; Accepted 15 February 2020; Available online 24 April 2020

**Abstract:** Pre-war shop houses in some town areas of Malaysia are among national heritage buildings that require conservation efforts through adaptive reuse. Adaptive reuse, in line with sustainability principles, is a process of revitalising or reinventing disused or ineffective existing buildings (including old or historical buildings) for new use, purpose or function. This paper provides a discussion on the criteria of adaptive reuse potential (ARP) for existing and heritage buildings that can be applied for the old shop houses. The criteria are classified into six aspects: economic, environment, social, architecture, technology, and legislative. With the intention to contribute to the attempts of ensuring that pre-war shop houses can be conserved in a sustainable manner, a list of the criteria is used, and further studies are proposed to develop a decision-making methodology that will be useful for key parties: owners, the government and architects (conservation specialist leaders). This will facilitate the determination for the adaptive reuse of potential buildings, as well as possible alternatives (new functions).

**Keywords:** Adaptive reuse criteria, conservation, heritage building, shop houses, sustainability

## 1. Introduction

Heritage buildings are structures with certain characters that offer intrigue concerning the people and culture that had produced them (Feiden, 2000). These buildings were built in the past and have high historical and architectural relevance; they require continuous care and protection to preserve their historical, architectural, aesthetic, archaeological, spiritual, social, political and economic values (Harun & Kamal, 2002). Heritage buildings can be one or more separate or connected buildings which, due to their architecture, homogeneity or location on the landscape, are of outstanding universal value from the viewpoint of history, art or science (National Heritage Act, 2005). It is clear from the foregoing definitions that heritage buildings are valuable assets for a country due to numerous factors, making it crucial to conserve and preserve them.

Heritage buildings can become inappropriate for their original purpose or function due to many aspects and reasons (such as obsolescence for example) and can become redundant due to changes in demand for their service (Langston & Lauge-Kristensen, 2002). In conserving and preserving heritage buildings, adaptive reuse is one of the interventions that can be employed. Adaptive reuse is the process of exploring options for buildings; either seeking extremes of demolition or turning the structure into new use (Office for Design and Architecture, Government of South Australia (ODASA, 2014). It is also a process that can transform a disused or ineffective existing building to one with new life which can be employed for different purposes (Bullen & Love, 2010; Yung & Chan, 2012). Although heritage buildings are usually

very old, like other existing buildings, it is still possible that their basic structure and fabric are intact and can be maintained (Langston et al., 2008), which allows for sustainable conversion since building materials can be reused (Remoy et al., 2007) for new functions or purposes.

A sustainable concept can only be achieved by carefully and equally addressing the existing and heritage building's stock to new buildings stock (Mohamed & Alauddin, 2016). Adaptive reuse is an important strategy for achieving sustainability as it can extend the life of the building and avoid demolition wastes, promoting the reuse of contained energy (Yung et al., 2014). Sustainable urban development can be achieved through this approach since adapted buildings can be retained as national heritage sites that carry environmental and social benefits (Langston et al., 2008), allowing for the morphological structure of an urban area to be maintained (Remoy et al., 2007). Besides the mentioned benefits, this approach has the potential to significantly improve the financial, environmental and social performances of existing assets (National Heritage Act, 2005, Bullen & Love, 2011), bringing economic benefits to the community (National Heritage Act, 2005).

Malaysia has numerous heritage buildings that are under threat; one of them being the old shop houses in numerous old town centres (Wan & Shamsuddin, 2005). They have great potential for adaptive reuse. To determine an optimal adaptive reuse alternative for these shop houses, owners, government officials and architects (as leaders of conservation specialists) have different concerns on what should be considered. Therefore, this paper discusses the criteria for evaluating the adaptive reuse potential of existing and heritage buildings. This paper suggests further studies to ascertain the suitability of the criteria to determine the adaptive reuse potential and alternatives for heritage or old shop houses.

## 2. Reuse as Part of Conservation and Preservation of Heritage Buildings

A series of levels of intervention (types of change) to historic buildings were identified by (Wan & Shamsuddin, 2005); as summarized in Table 1. Adaptive reuse was listed as one of the intervention approaches for heritage buildings. According to the National Heritage Act (Act 645), preservation aims to halt further deterioration, decay or the state of dilapidation; providing structural safety and well-being. Conservation includes preservation, restoration, reconstruction, rehabilitation and adaptation or any combination. 'Adaptive restoration' is part of the restoration scope involving all or a portion of exterior restoration, with the interior adapted to a modern functional use (National Heritage Act, 2005). Adaptive re-use work involves conservation works, modification, repair, maintenance and consolidation (Australia International Council on Monument and Site (ICOMOS), 2017). In adapting and restoring buildings to new use, it is important to adhere to conservation principles in order to retain the intrinsic character and historical value of the buildings. Restoration and adaptation of heritage buildings to new use require an understanding of their nature and value from the traditional aspect, their construction method and their interaction to various elements (Wan & Shamsuddin, 2005). From these foregoing scopes, it is clear that adaptive reuse is a form of conservation and preservation of heritage buildings.

**Table 1 - The level of intervention in heritage buildings (Fitch, 1992)**

Level of Intervention	Objectives
Preservation	Maintaining a building in its current physical condition
Restoration	Returning a building to its previous stage of life (physical condition)
Refurbishment (consolidation/conservation)	Physical intervention in the building's fabric to continue its performance
Reconstitution	Building's piece by piece re-assembly (in-situ/ new site)
Adaptive reuse (conversion)	Adapting a building to accommodate a new use
Reconstruction	Recreating vanished buildings on their original site
Replication	Constructing an exact copy of an existing building
Facadism	Preserving a building's facade with a new building behind it
Demolition and redevelopment	Demolishing a building and clearing the site for a new development

### 3. Heritage Shop Houses in Malaysia

Old shop houses, built and used during the pre-war era, and found in most old town centres (particularly in Kuala Terengganu, Alor Setar, Kota Bharu and Batu Pahat) are part of heritage building stocks that are under the threat of destruction (Wan & Shamsuddin, 2005), left in poor condition and are invaluable (Ahmad, 2009). These old shop houses are typically two or three storeys high; they consist of a business or some form of trade on the ground floor and the shop owner’s residence on the first floor. They are still a standard feature in the centres of Malaysian towns and cities (Wan & Shamsuddin, 2005, Yeang, 1992, Heritage of Malaysia Trust, 2003-2004, Mui et al., 2008). Typically constructed between the 1800s to 1970s, with contiguous blocks and common party walls, the design and materials used in constructing heritage shop houses vary according to architectural style of the buildings. There are five styles identified: Early Shop House, Early Transitional Shop House, Strait Eclectic Shop House, Art Deco Shop House and Modern Style Shop House; as summarized in Table 3.

**Table 3 - Styles of heritage shop houses in Malaysia (Heritage of Malaysia Trust, 2003-2004)**

Shop house style	Years	Typical built
Early Shop House Style	1800-1850s	1-2 Storey Terrace Shop House
Early Transitional Style	1840-1900s	2-3 Storey Terrace Shop House
Straits Eclectic Style	1890-1940s	2-3 Storey Terrace Shop House
Art-Deco Style	1930-1950s	Terrace Shop House/ House/ Commercial
Modern Style	Post war 1950-1970s	Terrace Shop House/ House/ Commercial

### 4. Criteria for Adaptive Reuse

An extensive literature review was carried out to identify and establish the criteria that will influence the decision on the adaptive reuse of existing and heritage buildings. Previous studies lay out the definitions, scopes, groups or categories, and applications of the criteria in theoretical and practical contexts. Therefore, critical literature review is a must in establishing the criteria, before a research instrument can be constructed to ascertain the significance of the criteria for adaptive reuse of heritage shop houses. Through this review, the criteria, together with their definitions and insights considered in previous related research works can be carefully listed and critically analysed to establish the decision-making criteria. A list of criteria from previous studies for such adaptive reuse is summarized in Table 4. The potential market, financial investments, subsidies, incentives and benefits of exemption are among the economic criteria repeatedly emphasised by previous researchers. This indicates that economics is a very important aspect to be considered in the adaptive reuse project, such as in any construction project. Social aspects (particularly, the social value and the contribution of the building in enhancing the role of communities) also gain much attention from many researchers; they should be carefully addressed in any adaptive reuse effort. Structural and architectural conditions, space layout and the character of a building also appear among the technically inclined criteria frequently highlighted in previous works.

**Table 4 - Criteria on adaptive reuse of existing buildings from previous research**

No.	Criteria	[10]	[22]	[23]	[13]	[24]	[25]	[26]	[27]	[28]	[9]	[29]	[30]	Freq.
1	Potential market	/		/	/	/	/	/					/	7
2	Vacancy					/					/			2
3	Financial & investment	/	/	/	/	/	/	/			/		/	9
4	Subsidies/ incentives and benefits of exemption	/		/	/	/	/	/			/		/	8
5	Building location					/			/		/	/	/	5
6	Available facilities/site amenities					/					/		/	3
7	Building value	/		/	/		/	/						5
8	Neighbourhood condition	/		/	/		/				/			5
9	Scenic/ contextual value		/	/	/	/	/							5
10	Environmental effect			/		/	/						/	4
11	Reduction of resources consumption	/			/		/	/						4
12	Reduce use of greenfield sites	/			/									2
13	Public interest	/		/	/	/	/							5

**Table 4 - Criteria on adaptive reuse of existing buildings from previous research (Continued)**

No.	Criteria	[10]	[22]	[23]	[13]	[24]	[25]	[26]	[27]	[28]	[9]	[29]	[30]	Freq.
14	Social value	/	/	/	/	/	/	/	/	/	/			8
15	Enhancing the role of communities	/		/	/	/	/	/						6
16	Compatibility of newly introduced use with existing					/	/							2
17	Retaining a sense of place	/	/		/			/						4
18	Renovation & maintenance					/				/		/		3
19	Physical condition					/	/							2
20	Structural condition	/	/	/	/	/	/				/	/		8
21	Space gain & change					/	/							2
22	Building services					/	/			/		/		4
23	Materials & decoration					/	/			/				3
24	Regional development policies	/			/	/	/							4
25	Official plan and zoning regulation	/		/	/	/		/						5
26	Building code, regulation and heritage design requirement	/		/	/		/	/						5
27	Condition of integrity & authenticity	/	/		/		/							4
28	Building system/ technologies value	/		/	/		/							4
29	Architectural condition and space layout	/		/	/		/	/		/				6
30	Site layout	/			/									2
31	Building suitability	/						/			/			3
32	Building character	/		/	/	/	/	/						6

With the aim to facilitate the adaptive reuse potential-related decisions, determining the need (or suitability) for adaptation, selecting viable new functions and identifying the improvements or changing points to suit the selected future use of existing buildings, (Suratkon & Ando, 2010) listed various criteria categorised within four aspects: environmental, economic, social and technological. Mohamed & Alauddin, (2016) have described further classified the criteria into five: economic, environmental, social, architecture and legislative. With the consideration of two studies and other previous works, as tabulated in Table 4, this paper, identified and grouped six aspects for adaptive reuse; i.e. economic, environment, social, architecture, technology and legislative as shown in Table 5.

**Table 5 - Criteria of adaptive reuse selection**

No.	Aspects	List of criteria
1	Economic	Potential market; vacancy; financial and investment; subsidize and benefit of exemption; building location; available facilities/site amenities; building value
2	Environment	Neighbourhood condition; scenic/ contextual value; environmental effect; reduction of resource consumption; reduce use of greenfield sites
3	Social	Local’s perception; social value; compatibility of newly introduced uses with existing; retaining a sense of place; enhancing the role of communities;
4	Architecture	Architectural and physical condition; space gain and change; site layout; building suitability; building character;
5	Technology	Renovation and maintenance; structural condition; building system/technological values; building services; materials and decorations;
6	Legislative	Regional development policies; official plan and zoning regulation; building code, regulation and heritage design requirement; conditions of integrity and authenticity

The descriptions of the criteria under each aspect group that are considered relevant for adaptive reuse of existing or heritage buildings, including historic or old shop houses, were further explained in the following subheadings.

### 4.1 Criteria for Economic Aspects

Economic viability and economic return are definitely factors for serious consideration in any adaptive reuse project. Table 6 lists the criteria for economical aspect and its description.

**Table 6 - Criteria for economical aspect**

No.	Criteria	Description
1	Potential market	Demand for the use of spaces/buildings for specific function (Remoy et al., 2007; Suratkon & Ando, 2010; Wang & Zeng, 2010; Shipley et al., 2006)
2	Vacancy	Vacant spaces that are adaptive reused can be occupied, subsequently preventing crime and security problems such as theft and vandalism (Remoy et al., 2007, Suratkon & Ando, 2010 )
3	Financial and investment	Loan and investment facilities provided by banks, etc. for purpose of adaptive reuse of building (Langston et al., 2008; Wang & Zeng, 2010; Shipley et al., 2006)
4	Subsidize and benefit of exemption	Subsidies, incentives and tax exemptions provided by government for building adaptive reuse initiative (ICOMOS, 2017; Suratkon & Ando, 2010; Wang & Zeng, 2010, Shipley et al., 2006)
5	Building location	Building is situated at strategic location (e.g. high density areas, near to public transport access) or non-strategic location (e.g. too many old buildings are concentrated in the location) (Langston et al., 2008; Remoy et al., 2007; Suratkon & Ando, 2010; Lepel, 2006)
6	Site amenities /facilities	Public and leisure amenities, open space, retail and transport facilities on or surrounding the building site (Suratkon & Ando, 2010; Kincaid 2002; Langston et al., 2013; Wilkinson & Remoy, 2017; Heritage Office New South Wales, 2008)
7	Building value	Market price of building (Mohamed & Alauddin, 2016; Suratkon & Ando, 2010)

As more new buildings are occupied, the vacancy rate of old and heritage buildings will increase. This will further affect the potential market of these buildings. An increase in vacancy rates highlights a need to renew these buildings. Nearby locations and available amenities and facilities are the two main criteria that will greatly influence the market price of these buildings. With the support of loans and investment facilities by banks, along with subsidies, incentives and tax exemptions by the government, adaptive reuse projects can become more viable and smooth.

Historic environments, especially buildings, have an important part to play in boosting local economies (Suratkon & Ando, 2010). Building value lies in its existing fabric. Major cost saving in an adaptive reuse project can be formed through value placed in the existing fabric. The character and narrative embedded within can be borrowed from, and associated with, new use. This can, in return, increase real end value of the project (Office for Design and Architecture, Government of South Australia (ODASA), 2014). A study conducted by (Yung & Chan, 2012) proved that the adaptation of old buildings will improve many issues, including economic vitality and diversity.

### 4.2 Criteria for Environmental Aspects

The environmental aspect must be integrated into the evaluation of adaptive reuse potential of existing buildings since it is critical in ensuring sustainable urban development. Criteria related to the environmental aspect that are important in the decision making of adaptive reuse potential are listed in Table 7.

Criteria on neighbourhood condition and scenic/contextual are focused on maintaining a good relationship between people and the environment to create comfort. Careful consideration of activities that may affect the environment, reduction of resources and energy consumption should be prioritised in any adaptive reuse project. Avoiding the use of new and greenfield sites is an approach that can materialise in most adaptive reuse projects; therefore, this should be a must, with no compromise.

**Table 7 - Criteria for environmental aspect**

No.	Criteria	Description
1	Neighbourhood condition	Condition and quality of neighbourhood (e.g. level of air and water and environment quality/pollution that affecting the comfort of residents (Remoy et al., 2007; Wang & Zeng, 2010)
2	Scenic/ contextual value	The relationship between building and local contexts such as topography and landscape, setting and views (Remoy et al., 2007; Wang & Zeng, 2010; Hickey, 2005; Heritage Office New South Wales, 2008)
3	Environmental effect	The effect of existing local activities such as construction work and industrial activity to environment (Suratkon & Ando, 2010; Lepel 2006; Architectural Institute of Japan. (2007)
4	Reduce resource consumption	Reduction of resource and energy consumption (Suratkon & Ando, 2010; Bullen & Love, 2010)
5	Reduce use of greenfield sites	Prevent uses of new and greenfield site (Bullen & Love, 2010)

### 4.3 Criteria for Social Aspects

Social aspect is one of main criteria in the decision to adaptive reuse potential of heritage buildings. Transformation or adaptation of heritage buildings should be carefully planned to ensure they maintain positive social consequences in terms of wealth distribution, safety and healthy social environments (Suratkon & Ando, 2010). Table 8 outlines five (5) criteria that are relevant to social aspect. It is necessary to involve the public with the decision-making process concerning the future of their towns or places as they are the end-users to every regeneration scheme; they are also the party responsible for maintaining the sustainability of the area (Said et al., 2013). Community self-reliance, individual well-being and satisfaction of basic human needs can be achieved through the adaptation old buildings (Yung & Chan, 2012).

**Table 8 - Criteria for social aspect**

No.	Criteria	Description
1	Local's perception	Significance of the building perceived by the local to address public interest (Suratkon & Ando, 2010; Wang & Zeng, 2010; Remoy et al., 2007)
2	Social value	Capability of the building in promoting a safe and healthy social environment (Remoy et al., 2007; Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage. 2008).
3	Compatibility of newly introduced uses with existing	New uses to be compatible with existing uses that are significant to be retained (Wang & Zeng, 2010; Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage, 2008)
4	Retaining a sense of place	Maintain the characteristics and identity of the place that are meaningful to the local (Yildirim, 2012)
5	Enhancing the role of communities	The building has certain function, influence or role in the community (Wang & Zeng, 2010; Architectural Institute of Japan, 2007; Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage, 2008)

Retaining a sense of place is about appreciating the overall significance and importance of a place in the sense that it provides meaning, understanding, definition and recognition of cultural significance and values (Farhana et al., 2015). By not breaking evident links to the past, and the former lives of buildings and places, cohesive social bridges can be maintained and enhanced. Maintaining these links while encouraging diversity can be achieved through adaptive re-use projects that layer new and old meanings together (ODASA, 2014). With the sense of place and the links, the influence that heritage buildings have on society and how they hold a certain role in the community can be illustrated. Public

awareness and role of communities in implementing adaptive reuse for heritage buildings can be enhanced through the involvement and support from relevant bodies, such as the World Heritage (Wang & Zeng, 2010).

#### 4.4 Criteria for Architectural Aspects

Architectural aspect is critical for deliberating any adaptive reuse decision. Table 9 summarises five (ODASA, 2014) criteria for adaptive reuse from the architectural aspect and its descriptions. Architecture style on heritage buildings such as openings, colours and material uses that are basically influenced by individual expression (Aranha, 2013), culture and other factors must be conserved in order to appreciate past workmanships (artistic), historical features and values (Mydin et al., 2014). Architectural and physical condition including façade, building envelope, interior, finishes, building function and site layout must be carefully evaluated to determine the necessary interventions. Space layout should be designed to allow spatial flexibility for future reuse.

**Table 9 - Criteria for architectural aspect**

No.	Criteria	Description
1	Architectural and physical condition	Facade, building envelope, interior and finishes (Sato et al., 2005; Tweed & Sutherland, 2007; Tweed & Sutherland, 2007; Cantell et al., 2005; Barrette, 2009 )
2	Space gain and change	Efficient and flexible building dimension and size, space layout and function within the building that can accommodate necessary future changes (Wan et al., 2005; Lepel 2006; Langston & Shen 2010)
3	Site layout	Appropriate site layout (Said et al., 2013)
4	Building suitability	Potential and suitability of the building to be adapted reuse for a particular purpose of use (ODASA, 2014; Tweed & Sutherland, 2007; Cantell et al., 2005; Barrette, 2009)
5	Building character	Building features such as artistic value and historical value (Wilkinson et al., 2009; Sato et al., 2005; Cantell et al., 2005)

#### 4.5 Criteria for Technological Aspects

The technological aspect is commonly considered as first point before deciding on adaptive reuse of heritage buildings (Suratkon & Ando, 2010). Criteria for technological aspect are briefly described in Table 10.

**Table 10 - Criteria for technological aspect**

No.	Criteria	Description
1	Renovation and maintenance	Records of renovations and maintenance in the past (Lepel 2006; Akasah et al., 2011)
2	Structural condition	Building structure is in good or poor condition (Suratkon & Ando, 2010; Hickey, 2005; Architectural Institute of Japan. 2007, Barrette, 2009)
3	Building system/ technological value	Building systems and methods of construction, technological value (technological transformations and developments that building may represent with the passage of time) (Architectural Institute of Japan, 2007)
4	Building services	Condition and performance of building services components e.g. indoor temperature control, energy efficiency, noise/acoustic and fire safety (Langston et al., 2008; Lepel, 2006; Hickey, 2005; Architectural Institute of Japan, 2007)
5	Materials and decorations	Quality of building materials, finishes, fabrics and decorations (Architectural Institute of Japan, 2007; Barrette, 2009)

Identifying the building condition through past renovation and periodic maintenance processes is needed to ensure building performance for future use (Akasah et al., 2011). The existing building structure condition must be properly examined to determine any existing decay, erosion or structural flaws that require upgrading or replacement. Quality and performance of existing building systems, building services, materials and decorations should also be thoroughly examined for the same purposes. According to the study conducted by Architectural Institute of Japan. (2007), they have further highlights the appreciation of buildings' technological value by viewing it in relation to a historical path in terms of what technological transformations and developments in a given building specimen may represent.

#### 4.6 Criteria for Legislative Aspects

Four (4) criteria of the legislative aspect are listed in Table 11 when considering the relationship of heritage buildings with government policies and legislation. Local authorities, federal and state governments, along with agencies, boards, councils, and commissions within these levels of government (both individually and collectively) have control over and/or regulate the use of land and the buildings situated on them. Through the means of official plans and zoning regulations, building codes, as well as regulation and heritage design requirements, the reuse of heritage buildings is controlled and encouraged.

**Table 11 - Criteria for legislative aspect**

No.	Criteria	Description
1	Regional development policies	Requirement to be followed under the regional development policy (Lepel, 2006)
2	Official plan and zoning regulation	Building renovation are subject to official plans and zoning development (Shiplely et al., 2006)
3	Building code, regulation and heritage design requirement	Comply with relevant laws, act and regulations set by authorized parties such as national heritage department and UNESCO (Suratkon & Ando, 2010, Building Act 2004)
4	Condition of integrity and authenticity	Authenticity of building materials, design, workmanship and setting (Wang & Zeng, 2010, Jabatan Warisan Negara, 2012)

#### 5. Conclusion

Adaptive reuse as one of the interventions that can be utilised in conserving and preserving the heritage buildings was described in this paper. One of Malaysia heritage buildings is pre-war shop houses that can be found in many old town centres; they have great potential to be adaptively reused. This paper briefly described their basic features and style. The criteria for adaptive reuse heritage buildings were listed and classified into six aspects: economic, environment, social, architecture, technology, and legislative. Using these criteria, the decision of determining the need and suitability for the adaptation of heritage buildings, including historic old shop houses, can be facilitated. Through the careful planning and implementation of adaptive reuse of these old shop houses in town centres, sustainable urban development maybe achieved since the life of these buildings can be extended. The national heritage and morphological structure of town centres will be preserved to carry benefits to locals and the environment.

#### 6. Further Study

A study with the working title "Adaptive Reuse Potential (ARP) of Heritage Shop Houses in Bandar Penggaram, Batu Pahat, Johor" is proposed. The old shop houses in Batu Pahat town are among the 214 premises that have been identified by Yayasan Warisan Johor as heritage buildings (The Star, 2012). Rows of pre-war shop houses constructed between 1900s and the 1950s, with Chinese, English and Malay architectural elements, can be found around Batu Pahat town area; also called Bandar Penggaram by the older generation of locals. It was observed that, there has been a recent spate of refurbishment or renovation of the pre-war shop houses in Batu Pahat town. Some had been torn down and completely rebuilt, while others had their interiors redone and were given a new coat of paint, some were adapted as hotel (Utusan Online, 2015), and some may have the potential to be transformed into specialty retail stores or food and beverage outlets (Musa, 2013).

Buildings' owners, the government and architects are the main stakeholders with different concerns that may influence the decision of adaptive reuse alternatives for these heritage shop houses. Therefore, this study aims to develop a decision-making methodology that could integrate their perceptions, preferences and judgement. Criteria for the



adaptive reuse decision and potential reuse alternatives for heritage shop houses that can be adopted for the decision-making purpose will first be identified and ascertained through questionnaire survey and structured interview among stakeholders. Next, a making-decision methodology for selecting optimal adaptive reuse alternatives for heritage shop houses capable of evaluating the interdependent priorities of the criteria, as well as the priority of the reuse alternatives will be developed. A case study on one selected heritage shop house in Batu Pahat town area will be carried out to validate the developed decision-making methodology.

## Acknowledgement

This work is supported by Ministry of Higher Education, (MOHE) and Universiti Tun Hussien Onn Malaysia (UTHM) under Postgraduate Research Grant (GPPS) Vot No U933.

## References

- Ahmad, G.A. (2009). Urban Conservation in Malaysia, Safeguarding Cultural Heritage. Available at [www.hbp.usm.my/conservation](http://www.hbp.usm.my/conservation) Accessed on 30th May, 2010.
- Akasah, Z. A., Abdul, R. M. A., & Zuraidi, S. N. F. (2011). Maintenance Management Success Factors For Heritage Building : A Framework, 118, 653–658.
- Aranha, J. (2013). The Southeast Asian Shophouse as a Model for Sustainable Urban Environments. *International Journal of Design & Nature and Ecodynamics*, 8(4), 325-335.
- Architectural Institute of Japan. (2007). Guidelines for building assessment, preservation and utilization. Architectural Institute of Japan
- Australia International Council on Monument and Site (ICOMOS). ICOMOS International Cultural Tourism Charter: Principles and Guidelines for Managing Tourism at Places of Cultural and Heritage Significance. Victoria: Australia International Council on Monument and Site (ICOMOS) Incorporated.
- Barrett, K. J. (2009). The key issues when choosing adaptation of an existing building over new build. *Journal of Building Appraisal*, 4(3), 215–223
- Bullen, P. A., & Love, P. E. D. (2010). The rhetoric of adaptive reuse or reality of demolition: Views from the field. *Cities*, 27(4), 215–224.
- Bullen, P., & Love, P. (2011). Factors influencing the adaptive re-use of buildings. *Journal of Engineering, Design and Technology*, 9(1), 32–46.
- Bullen, P. and Love, P. (2011). A new future for the past: a model for adaptive reuse decision - making. *Built Environment Project and Asset Management*, 1 (1), 32-44. <https://doi.org/10.1108/20441241111143768>
- Building Act 2004, Reprint (August 2010). Part 2, Requirement to comply with Building Code.
- Cantell, S. F., & Huxtable, A. L. (2005). *The Adaptive Reuse of Historic Industrial Buildings*, (May), 2–10.
- Department of the Environment and Heritage, Australia Government DoEH, (2004). *Adaptive Re-use. Industrial Heritage Re-Tooled: The Guide to Industrial Heritage Conservation*.
- Fitch, M, 1992, *Historic Preservation, Curatorial Management of the Built World*, University Press of Virginia, Charlottesville and London. In Carmona, M, 2003, *Public Places Urban Space, The Dimension of Urban Design*, Architectural Press, Oxford.
- Feiden, B.M. (2000). *Conservation of Historic Buildings*. Oxford: Architectural Press.
- Harun, S.N. and Kamal, K.S.: (2002) *Building Research Methodology in the Conservation of the Historic Buildings in Malaysia*. International Symposium Building Research and the Sustainability of the Built Environment in the Tropics, University Tarumanagara, Jakarta Indonesia.

- Hickey, B. (2005) AIA, Adaptive Reuse for Multifamily Housing in Implication: Vol.04, Issue 10. Article can be accessed at [www.informedesign.umn.edu](http://www.informedesign.umn.edu)
- Heritage Office New South Wales. (2008). *New Uses For Heritage Places: A guide for the adaptation of historic buildings and sites.*, 49.
- Intergovernmental Committee for the Protection of the World Cultural and Natural Heritage. (2008). *Operational guidelines for the implementation of the world heritage convention.* United Nations Educational, Scientific and Cultural Organisation, World Heritage Center
- Kincaid, D. (2002). *Adapting buildings for changing uses. Guidelines for Change of Use Refurbishment*, Spon Press.
- Lepel, A. (2006). Changing the function of industrial buildings: Survey. *FactaUniversitatis - Series: Architecture and Civil Engineering*, 4(45), 71–84.
- Langston, C., & Shen, L. Y. (2010). Application of the adaptive reuse potential model in Hong Kong : A case study of Lui Seng Chun. *International Journal of Strategic Property Management*, 11(October 2014), 193–207.
- Laws of Malaysia, National Heritage Act 2005 (Act 645)
- Langston, C., Yung, E. H. K., & Chan, E. H. W. (2013). The application of ARP modelling to adaptive reuse projects in Hong Kong. *Habitat International*, 40, 233–243.
- Langston, C. and Lauge-Kristensen, R. (2002), *Strategic Management of Built Facilities*, Butterworth-Heinemann, Oxford.
- Langston, C., Wong, F.K.W., Hui, E.C.M., and Shen, L.Y. (2008) Strategic assessment of building adaptive reuse opportunities in Hong Kong.*Journal of Building and Environment*; 43: 1709 -1718
- Mohamed, N., & Alauddin, K. (2016). The Criteria for Decision Making in Adaptive Reuse Towards Sustainable Development, 92.
- Musa, Z. (2013, July 1), State wants owners to come forward and assist in data compilation, *The Star Online*, retrieved from <http://www.thestar.com.my>
- Mui, L. Y., Meng, L. L., Yusof, N. A., & Fern, T. S. (2008). Georgetown as a Heritage City: The Voices of the Residents. *Heritage*, 1930(January), 20–23.
- Mydin, M. A. O., Keling, N. A., Sani, N., & Abas, N. F. (2014). Assessment of Adaptive Reuse of Heritage Shop Houses for Sleep Lodging in Malaysia : Fulfilment of Conservation Guidelines. *SHS Web of Conferences*, 4, 1–9.
- Office for Design and Architecture, Government of South Australia (ODASA), (2014) *Adaptive Re-use Re-using existing buildings for new functions*, (July), 1–12
- Remøy, H. T., & Voordt, T. J. M. Van Der. (2007). A new life: conversion of vacant office buildings into housing. *Facilities*, 25(3/4), 88–103.
- Suratkon, A. (2010). *Criteria to Evaluate Adaptive Reuse Potential of Existing Buildings.*
- Shiple, R., Utz, S., & Parsons, M. (2006). Does Adaptive Reuse Pay? A Study of the Business of Building Renovation in Ontario, Canada. *International Journal of Heritage Studies*, 12(6), 505–520.
- Wilkinson, S. J., & Remoy, H. (2017). Adaptive reuse of Sydney offices and sustainability. *Sustainable Buildings*, 2, 6. <http://doi.org/10.1051/sbuild/2017002>
- Said, S. Y., Abbas, M. Y., Aksah, H., & Ismail, E. D. (2013). Heritage Conservation and Regeneration of Historic Areas in Malaysia. *Procedia - Social and Behavioral Sciences*, 105, 418–428
- Farhana, A. N., Ahmad, F., & Shah Ali, A. (2015). Heritage place inventory: A tool for establishing the significance of places. *Journal of Design and Built Environment*, 15(1), 15–23.

- Sato, K. Matsumura, S. Ando, M. Kohata, S. and Ishizuka, K, (2005). An open building approach to revitalizing building stock – converting offices into dwellings. The 2005 World Sustainable Building Conference, Tokyo, 27 – 29 September 2005.
- Tweed, C., & Sutherland, M. (2007). Built cultural heritage and sustainable urban development, 83, 62–69.
- The Star (2012, December 13), 214 Heritage Sites Identified in Johor, The Star, retrieved from [jsic.com.my](http://jsic.com.my).
- Utusan (2015, October 24), Nafas baharu Bandar Penggaram, Utusan online, retrieved from <http://www.utusan.com.my>.
- Wan Ismail, W.H. and Shamsuddin, S. (2005). The old shop houses as part of Malaysian urban heritage: the current dilemma. The 8th International Conference of the Asian Planning Schools Association, September 2005.
- Wang, H. J., & Zeng, Z. T. (2010). A multi-objective decision-making process for reuse selection of historic buildings. *Expert Systems with Applications*, 37(2), 1241–1249.
- Wilkinson, S. J., James, K., & Reed, R. (2009). Delivering sustainability through the adaptive reuse of commercial buildings: the Melbourne CBD challenge. *Proceedings of the Pacific Rim Real Estate Society 15th Annual Conference, Pacific Rim Real Estate Society (PPRES)*, (June 2008), 1–19.
- Yeang, K. (1992). *The Architecture of Malaysia*, Amsterdam: Pepin Press.
- Yildirim, M. (2012). Assessment of the decision making process for re-use of a historical asset: The example of Diyarbakir Hasan Pasha Khan, Turkey. *Journal of Cultural Heritage*, 13(4), 379–388.
- Yung, E. H. K., & Chan, E. H. W. (2012). Implementation challenges to the adaptive reuse of heritage buildings: Towards the goals of sustainable, low carbon cities. *Habitat International*, 36(3), 352–361.
- Yung, E. H. K., Langston, C., & Chan, E. H. W. (2014). Adaptive reuse of traditional Chinese shophouses in government-led urban renewal projects in Hong Kong. *Cities*, 39, 87–98.