

Preliminary Review of Adaptive Reuse Practice for Heritage Buildings

Maszuwita Abdul Wahab^{1*}, Maizatul Naqiyyah¹, Feng Yuan^{1,3*}, Nor Aini Salleh²,
Cheong Peng Au-Yong⁴

¹ Centre of Real Estate Studies, College of Built Environment, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia

² Centre of Real Estate Studies, College of Built Environment, Universiti Teknologi MARA, Perak Branch, Malaysia

³ Academy of Civil Engineering & Architecture, Nanyang Normal University, Nanyang, China

⁴ Centre for Building, Construction & Tropical Architecture (BuCTA), Department of Building Surveying, Faculty of Built Environment, Universiti Malaya, Malaysia

*Corresponding Author: maszuwita@uitm.edu.my , 2021534435@student.uitm.edu.my

Received: 28 February 2024 | Accepted: 12 April 2024 | Published: 30 April 2024

DOI: <https://doi.org/10.55057/ijbtm.2024.6.1.50>

Abstract: *The economy is measured based on the development of a city and the new development will involve costs for material, energy, and time which also generates high carbon emissions. It is important to have guidelines to retain and sustain the heritage development and reduce the reality of climate change due to the urgency towards sustainability. This paper aims to provide knowledge contribution and awareness of the adaptive reuse for heritage buildings in line with heritage preservation and sustainable design. Besides, important factors to be considered for adaptive reuse in heritage buildings that can be focused as one of the important maintenance strategies for heritage development. The method used in this research is qualitative method which is by carrying out semi structured interview, case study, and observation. The observation has been done towards the case study to identify the principles and processes of adaptive reuse applied. The findings existing factors of adaptive reuse practices in the case study, significant factors of reuse for heritage buildings, and recommendations to develop awareness to protect heritage buildings. Many factors influenced the implementation of adaptive reuse, including the building's state, ineffective management, and the building's purpose should be considered to improve the preservation process for better value of the building.*

Keywords: Adaptive reuse, Heritage Buildings, Sustainability, Operation, Maintenance

1. Introduction

Along with the modernization, most of the heritage buildings had been abandoned due to the design and structure of buildings itself which are not relevant to the development growth. However, heritage buildings are important and need to be preserved due to the historical value that will be passed on to future generations. Therefore, the historical building can be preserved by adaptive reuse. Reusing rather than replacing buildings is generally the most resource-effective strategy to provide accommodation, especially if a conservation strategy is incorporated into the design (Ball, 1999; Douglas, 2002). The economy is measured based on the development of a city. However, new development and construction will involve costs for

material, energy, and time which also generates high carbon emissions. Therefore, new guidelines are needed to keep the pace of development and in the meantime also can reduce the reality of climate change due to the urgency toward sustainability. Moreover, Monsù Scolaro & De Medici (2021) stated that achieving a minimum environmental impact from the process of adaptive reuse of buildings requires an improvement in the performance of building technology and maximizing the resources and energy that originated in the buildings. It was proven the environmental impact can be reduced by reducing the production of demolition waste and adding up the new materials. This can be achieved by keeping in more quantity of materials that are still relevant and by increasing their life cycle.

2. Adaptive Reuse

According to Douglas, adaptive reuse can be defined as a change of use that includes any work to a building over and above maintenance to change its capacity, function, or performance. It is also can be any intervention to adjust, reuse, or upgrade a building to suit a new condition or requirements (Douglas, *Building Adaptation*, 2006). The change of use might also require refurbishment of existing buildings or structures and also involve major internal space reorganization. On the other hand, a small amount of restoration work could allow the buildings to change their intended use (Bullen and Love, 2011). Adaptive reuse, according to the Department of Environment and Heritage, is a method that entails physically changing the function of an abandoned or ineffective structure into a new building, but occasionally the item's usage remains unchanged. Moreover, reuse also does not always include changing what is used, therefore it can also refer to rehabilitation, renovation, or restoration projects (Holyoake & Watt, 2002). Through rehabilitation, which includes renovations and new construction, buildings are recycled (Douglas, 2002). The current structure may need to undergo considerable structural changes as part of the rehabilitation process, as well as modernization and extension work (Douglas, 2006). Renovation alters a structure so that it complies with contemporary standards and codes without changing its intended purpose, while restoration restores a building to the state it was in when it was first constructed (Douglas, *Building Adaptation*, 2002). Additionally, according to the Heritage Council of Victoria (2013), adaptive reuse is not only applicable to historic or old structures but also to cities and big urban areas. Therefore, adaptive reuse focuses on addressing building redundancy and obsolescence. It also involves protecting structures that are in danger of deterioration, vacancy, or demolition. The examples of various types of adaptive reuse initiatives are shown in Figures 1 to Figure 3. Figure 1 shows the theatre that has been changing its function to be an Arcade Bar in San Francisco. In the beginning, the building was known as The Harding Theatre. It is a movie and music theatre that first opened in 1926 and hosted performances by The Grateful Dead and other bands before shutting its doors forever and remaining vacant for many years. The building was changed and reused after the city claimed it as a landmark to prevent developers from demolishing it. The building's historic façade was preserved and its interior was renovated for the building to adapt creating a contemporary and enjoyable environment to play vintage video games (BigRentz, 2022). Figure 2 illustrates another example of adaptive reuse in Los Angeles. The airplane hangar that Howard Hughes built in 1943 was for the development of the Hercules IV airplane also known as Spruce Goose. However, the Hangar was left vacant after the airplane had been transferred elsewhere. The adaptive reuse approach instead of demolishing had been taken by the space purchaser, Google. Therefore, the building had undergone changes of purpose from the hangar to the office. The structure of the building, both internal and external especially the wood has been preserved (Baldwin, 2018). Figure 3 illustrates how an abandoned Victorian pool and baths were transformed into a five-bedroom

seaside luxury mansion using the adaptive reuse method. It is situated in the Welsh Town of Penarth. The building's features and ornamental brickwork are being preserved in order to maintain the building's worth.



Figure 1: Conversion of Theater into an Arcade Bar
 Source: www.emporiumarcadebar.com



Figure 2: Conversion of Airplane Hangar into an office
 Source: www.archdaily.com



Figure 3: Conversion of a swimming pool into a Luxury Home
 Source: Tom (2013)

2.1 Adaptive Reuse Principle

According to Heritage Council Victoria (2013), a clear document is needed as a supporter of adaptive reuse to guide the redevelopment and future use. In Australia, the basic principles and procedures based on the Burra Charter principles state about preservation, restoration, reconstruction and adaptation of heritage places (OEH, 2012). The guiding principles are:

- The cultural significance of the place, its fabric and its use will guide adaptation and the preferable to a new use;
- The minimal amount of change is required to significant fabric necessary to achieve the requirements of the new use;
- The heritage significance should continue after the adaptation of the place and the authenticity of a place should be revealed;
- Adaptive reuse is a vital component of sustainable development practice and has environmental, social and economic benefits;
- New additions in the vicinity of a place of heritage significance should be in harmony with the existing structure with a high-quality design and materials.

The early stages of adaptation should be viewed as an investment and part of the budget (Heritage Council Victoria, 2013). As a result, the process of adaptation needs to be carefully planned while taking into account the significance and value of the heritage, conservation planning, environmental impact assessments, and governmental approvals (OEH, 2012). Feasibility studies should be included in the documents to investigate the reuse options (Heritage Council Victoria, 2013).

2.2 Heritage Buildings

According to The Local Government Heritage Places Guidelines (2002), heritage can be defined as a place's natural or other significance, for current and future generations of Australia. Heritage buildings also can be defined as cultural icon and their preservation affect community well-being, sense of place and therefore social sustainability (Bullen and Love, 2011). Therefore, the local communities have a reason to look after their local environment and lead to a sustainable lifestyle. Besides that, Iron (2013) stated that heritage value is formally known as part of the environment while built heritage is tending to get the benefit from physical maintenance or replacement and from management strategies. Other than that, for industrial heritage sites, it can play an important role in urban regeneration, reinforcing urban character and identity, providing tourism attraction, increasing amenities and acting as the focus of economic development (Heritage Council Victoria, 2013). Therefore, preservation is important but it is not only necessary to make sure the building is in good condition but to make sure the building is less damaged while restoration is the intent to control further deterioration (Irons, 2013). However, the heritage buildings are not being valued based on the age of the building as it is no longer a sole measure of heritage worth.

One of the contributors to heritage building economic view is heritage tourism. It was identified as the fastest growing and highest yielding factor of the tourism market and heritage tourism is a significance of visitors tending to stay longer and to spend more. The heritage tourism tends to get a higher return than other tourism (Irons, 2013). Other than that, in the environmental aspect, the heritage buildings that practice minimizing demand for energy will assist with reducing carbon emissions (Irons, 2013). Heritage Building can be defined as a construction with its own significance structural, artistic, historical or cultural value that is officially recognized by the local or competent authority under whose region of authority it is located (Suriyani H. et.al, 2019). As mentioned by Syahirah Ani (2022), historic structures should be

carefully preserved for the benefit of current and future cultural interests. Hence, heritage building is a valuable belonging to society as it carries its own value of history and cultural value from previous times. Heritage buildings can be mainly classified into two categories, value and type. 5 types of heritage buildings are archaeological, built, landscape, movable collection and conservation area (Zayed T. et.al, 2020).

Figure 4 shows the building was first established in the year 1912 at Padang Merdeka, Kota Bharu as one of the first modern banks ever constructed. It was the first building made from concrete in Kelantan where the safety features were considered high during the era. The function had undergone changes over time where it started from as a Bank to a Japanese Headquarters and jail in World War 2 (WWII). Then it changed the function to British Bank to Banking Corporation of Hong Kong & Shanghai Banking to art and craft gallery in 1981. Lastly, during the year 1922, it finally changed into a war Museum.



Figure 4: Bank Kerapu in Kota Bharu, Kelantan was converted to War Museum
 Sources: muzium.kelantan.gov.my

Figure 5 shows Istana Jahar or Jahar Palace was built for Sultan Mahmud II's grandson, Long Kundur as a royal residence in 1887. It features magnificent woodcarving that displays the Kelantanese great craftsmanship. Other than that, the rich and complex legacy of Kelantan could also be presented aside from pictures, relics, and traditional handicrafts. Today, the palace is protected from modern construction and is conserved through the adaptive reuse method. Hence turned into a museum in order to share its uniqueness and beauty.



Figure 5: Jahar Palace, Kota Bharu, Kelantan transformed into the Museum of Royal Traditions
 Sources:kelantan.attractionsinmalaysia.com

Figure 6 shows the building was built in 1822 and then bought by Tan Kim Seng in 1840. Originally, the building (now known as Puri Hotel) functioned as an ancestral home of Tan

Kim Seng’s descendants. Now, the building is developed into a hotel after intensive care and repairs were done while conserving the original structure.



Figure 6: Hotel Puri, Melaka
 Sources: hotelpuri.com

Figure 7 shows that the mansion was managed to be purchased by a small group of Penang conservationists. After years, the building then was restored to its original splendor. Now, the mansion functions as a boutique hotel which attracts a lot of tourists. Due to Penang’s excellent heritage conservation and protection efforts, this building remained standing. Moreover, it was granted an award by UNESCO as the Most Excellent Project in the Asia Pacific Heritage Award in 2000.



Figure 7: Cheong Fatt Tze Mansion, Pulau Pinang
 Sources: cheongfattzemansion.com

2.3 Factors That Consider the Building to Be Adapted

Adaptive reuse of heritage buildings should include criteria that ensure that adaptive reuse will not affect the heritage values of the building. The factor to be considered is important to know the effectiveness of adaptive reuse to achieve sustainability and the characteristics that make a heritage building suitable or unsuitable for adaptive reuse. (Bullen and Love, 2011). Therefore, Douglas stated that there are specific characteristics in the conversion process of adaptation and the risk of adaptation depending on a number of variables selected. The variables include:

- The location of the property;
- The condition of the building and the extent of work required to repair any defects;

- The length of time the conversion work will take;
- The general state of the economy, which impacts on interest rates;
- The level of demand for the use proposed at the time the property is marketed;
- The degree of legal and planning restraints operating over the property;
- The proposed cost of the change of use;
- The projected value of the converted building.

According to Bullen and Love (2011) research, the adaptive reuse decision-making includes the environmental sustainability, heritage significance, the ability of the building to adapt and cultural significance. Therefore, the decisions needed to be based on options that lead to the most effective use of land such as increased density. Moreover, in terms of economic viability, the cost of demolishing is more expensive than the cost to improve the building. Douglas (2002) stated that another factor that needs to be considered is the cost effectiveness as a practical strategy for delivering buildings for new uses. Adaptive reuse of heritage buildings has been successfully applied in different cities as well, as it has been seen as necessary for sustainable development, for instance, in the USA, Canada, Australia, Hong Kong and Malaysia. Basically, in metropolitan cities in the United States like New York, San Francisco, and Los Angeles, adaptive reuse of old buildings has become a popular strategy for regeneration (Ali et al., 2018). Adaptive reuse of buildings has become a primary role to play towards sustainable development of communities in Australia. Meanwhile, improving the quality of life, neighborhood revitalization, enhancement of economic growth, lowering consumption of resources as well as adverse environmental effects and preservation of cultural and historical value are supposed to be attained via adaptive reuse and regeneration.

The government plays an essential and active role in expanding stakeholders and regulating knowledge of sustainable development. Adaptive reuse of the old building involves different risks and uncertainties, yet in some cases, these buildings can bring high returns through innovative renovation. According to Ali et al. (2018), adaptive reuse extends the lifespan of a building as well as lowers waste demolition and the carbon footprint. Furthermore, Boynton & Zmud (1984) established an adaptive reuse of potential (ARP) model in order to rank the old buildings in accordance with their potential adaptive reuse. Ball (1999) established the fuzzy adaptive reuse selection model in order to assist the decision-makers in assessing different alternatives for the adaptive reuse of old buildings. Tan et al. (2014) explained that various factors have led to the renovation of old buildings in Malaysia. The change in climate in Malaysia has led to urgency in lowering the carbon emissions as well as planning the low carbon cities. Moreover, Zhang (2005) states that the construction of new buildings has been found to consume large amounts of energy and raw materials, as well as the generation of higher emissions of carbon. Mohamed & Alauddin (2016) point out that many buildings in a city are responsible for the usage of more than 40 percent of energy. Also, these buildings generate a third of the global international emission of gases from the greenhouse. Additionally, the building and construction of new houses account for about 136 million tons of waste materials which act as pollution to the environment (Zulkanain et al., 2021). For instance, the construction of new building in towns leads to more congestion in towns; hence, Tan et al. (2014) concludes that re-innovating or reconstructing old building would save more space and raw materials from being used.

Further, Zhang (2005) points out that adaptive usage is one of the significant sustainable urban regenerations since it extends the life of the building as well as helps in the avoidance of demolition of waste, motivates the reuse of embodied energy and offers significant economic

and network benefits in the society. Adaptive reuse has become the primary strategy to ameliorate the building's environmental, social and financial performance. Market demand is one of the factors identified and ranked as the essential key success factor for adaptive reuse, offering a fast way and increasing demand. According to Zulkanain et al. (2021), various examples have been sampled to reflect the housing demand in Malaysia. Another critical factor that has led to adaptive reuse is the commitment towards sustainability, which needs to lower the existing buildings' negative environmental impacts. Based on the 2009-2010 policy address, the Chief executive of Malaysia stated that there were plans and directions for developing the six main old buildings in Malaysia. These buildings were to be renovated for medical services, environmental industries, cultural centers, educational services and many others. Also, there was a need to increase the demand for offices which would be one big solution for lowering the waste of materials. The increment of the need for more houses, as well as the reduction of waste of materials and energy, has been a factor that has led to the renovation of old houses. Besides, the adaptive reuse of an old building offers the best and quick solution. Nonetheless, some of the challenges that have been found with the adaptive reuse of old buildings in Malaysia is that various owners in the flatted industrial buildings make it a challenge for every owner to attain decisions so as to redevelop or convert these buildings. Also, Highfield & Gorse (2009) points out that the owners have a challenge of raising enough money for conversion or redevelopment. Moreover, some owners are deterred by the need to pay the market premium in full for the lease modification for the renovation into other uses or even the waiver fees in converting into other uses. However, there is a significant potential for the adaptive reuse of the old building in Malaysia.

2.4 Sustainability

Investopedia defines 'sustainability' as the power of protecting a process along with time (Mollenkamp, 2022). Sustainability also brings the meaning of achieving our own needs without risking the effort of the future generation to achieve their own needs. Sustainability is not only about protecting, maintaining and preserving the nature component. It is also frequently associated with its three main cores: economic, environmental, and social. 'Environmental' has always been the mainstream of sustainability, but economic and social are just as important to be sustainable. These three main cores are focusing on three different things. However, their objective is closely related, which is to protect future needs. The concept of 'economic sustainability' fixates on maintaining economic production by protecting the main supply of its physical inputs, natural resources. Meanwhile, the concept of 'environmental sustainability' focuses on the environment or the chain of our life support system. For instance, the soil, the air, rivers and forests. Basically, the environmental sustainability is to protect the earth as the home for the human life. The concept of 'social sustainability' mainly emphasizes human relativity to the impact of economic systems (Mollenkamp, 2022).

2.4.1 Sustainability in Heritage Building

For the past few years, there have been a lot of heritage buildings that have been demolished due to the high cost of adapting them to a new use (Ge, X. J., Ding, G., Philips, P., 2012). Thus, the preservation of heritage buildings is very important as heritage is the identity of a country. Heritage proves the existence of civilization and evolution, economic and social (Ervis Liusman, Daniel C. W. Ho., Janet X. Ge, 2013). In addition, the conservation of heritage buildings into new uses, will contribute to less energy and material which will be impacting on the economy and environment. With this, it is only logical that sustainability and conversion of built buildings are compatible and need to work in unity for both goals can be achieved (Rodwell, 2003).

There are several approaches to preservation strategies that have been refined to face various kinds of cases of heritage building, involving different levels of physical intervention (Ehab Okba, M. Mohga Embaby, E., 2013). According to (F.,2003), the preservationist will have ranked in seven degrees from the most conventional to most radical which are:

- Prevention of deterioration (PD);
- Preservation (Pr);
- Consolidation (Con);
- Restoration (Res);
- Rehabilitation (Reh);
- Reproduction (Rep);
- Reconstruction (Rec).

2.4.2 Sustainability After Implementation Of Adaptive Reuse

As stated, the relationship between sustainability and conversion of built buildings or adaptive reuse are very close as both depend on each other to reach their own goals. There are several suggested measures to sustain the converted buildings by improving energy efficiency (Ehab Okba, M. Mohga Embaby, E., 2013). The following are the suggested measures:

i. Embodied Energy Conservation (EEC)

Embodied energy is the total energy required to construct any product or final product, contemplating the energy embodied in the final product (Embodied energy, 2022). In this context, it includes the manufacturing, and transportation of materials and equipment. Since the embodied energy of traditional building materials is lower than modern building materials, the existence of heritage buildings not only protects the conserves embodied energy but also, helps in saving energy consumption (Ehab Okba, M. Mohga Embaby, E., 2013).

ii. Optimizing Existing Traditional Building Performance (OETBP)

Optimizing or upgrading an existing traditional building performance has a huge impact on the ecology, reduces energy and enhances the social life of the residents (Zou, Yukai & Zhan, Qiaosheng & Xiang, Ke., 2021). Continuous and precautionous maintenance will help the traditional building to be sustained and add to its longevity (Ehab Okba, M. Mohga Embaby, E., 2013).

iii. Reducing Energy Consumption in Existing Buildings (REC)

Energy consumption in existing buildings especially for the comfort of residents, for instance, water heaters, water tanks, and any more systems requires high energy (Ehab Okba, M. Mohga Embaby, E., 2013). Estimated, about 20% of energy used by commercial buildings in the United States, is mainly for heating and cooling systems (Reducing energy consumption in commercial buildings, 2022).

iv. Maximizing Energy and Water Efficiencies in New Work to Existing Buildings (MEWE)

Energy and water efficiencies have been one of the most important parts of planning and designing a building for comfort and safety. Few considerations should be taken to ensure the energy and water efficiency could be sustainable (Ehab Okba, M. Mohga Embaby, E., 2013).

v. Monitoring of Energy and Water Consumption (MEWC)

A plan to monitor the energy and water consumption is just as important as designing to maximize energy saving and water sustainability in new work. It is also an act of maintaining

the energy and water so the aim of energy efficiency and sustainability can be obtained (Ehab Okba, M. Mohga Embaby, E., 2013).

2.5 Challenges / Barriers of Implementation of Adaptive Reuse in Heritage Building

Table 1 shows the list of barriers to adaptive reuse. Since barriers and challenges are common in any new situation, identifying them correctly and developing the best solution to overcome them is crucial. Moreover, maximizes the benefits in order to spread awareness of adaptive reuse building throughout the world.

Table 1: List of barriers to adaptive reuse
Sources: (Adapted from Conejos et al.,2016)

Barriers of Adaptive Re-use	Brief Description	Identified Research Study
Physical restriction	Existing floor layouts, number of columns/walls and structural system layouts	Bruce et al. (2015), Bullen and Love (2011), Bullen (2007), Cox (2004) Reyers Mansfield (2001)
Economic consideration	Direct and indirect costs of conservation	Douglas (2006), Bullen (2007), O'Donnell (2004), Reyers and Mansfield (2001), Shipley et al. (2006), Yung and Chan (2012), Wang and Zeng (2010), Cox (2004)
Social consideration	Intangible and non-economic perspectives of maintaining day-to-day lives of people who are attached to the place	Bond (2011), DEH (2004), Yung and Chan (2012)
Building codes and regulations/legal constraints	Requirement of complying with current building codes, regulation, conservation guidelines, licensing and planning requirements	Bruce et al. (2015), Bullen and Love (2011), Bullen (2007), Copper (2011), Douglas (2006), Shipley et al. (2006), Wilkinson et al. (2009)
Limited response to sustainability agenda	Limited support received from building owners and commercial property markets to make buildings sustainable	Ellison and Saxce (2007), O'Donnell (2004), Pivo and McNamara (2005)
Complexity and technical difficulties	Refurbishment techniques, technical installations and innovative solutions required	Ball (1999), Bruce et al. (2015), Bullen and Love (2011), El Kerdanx(2002), Kronrnburg(2007), Shipley et al. (2006)
Maintenance issues	High cost of maintenance and repair due to physical deterioration and defects	Bullen and Love (2011), Bullen (2007), Remox and van der Voordt (2007), O'Donnell (2004)
Lack of awareness on the adaptive reuse opportunities	Lack of awareness and misconception	Bulen and Love (2010), Remoy a van der Voordt (2007), Bullen (2007,2004), Shipley et al.,(2006)

Financial and technical perceptions	Nation that adaptive reuse being expensive, demolition only will provide reasonable profits	Bruce et al. (2015), Bullen and Love (2011a), Shipley et al., (2006), Yung and Chan (2009)
Commercial and technical perception	Lengthy and difficult renovation or reuse often leading to reduced profits	Bruce et al. (2015), Bullen and Love (2011a), Shipley et al. (2006)
High re-mediation costs and construction delay	Contamination by hazardous materials in building; in additional costs and time delay	Bruce et al. (2015), Bullen and Love (2011a), Bullen (2007), Wilkinson et al., (2009)
Inaccuracy of information and drawings	Lack of accurate information on defects or dimensional and material inconsistencies and drawing of heritage buildings	Cox (2004), Remox and Van der Voordt (2007), Reyers and Mansfield (2001)
Classification or zoning change	Scope and classification changes of buildings requiring code and zoning compliance	Bullen and Love (2011a), Cox (2004), Langston et al. (2007), Reyers and Mansfield (2001)
Inertia of production and development criteria	Challenges posed by developmental criteria of cities on urban regeneration or re-development approaches	Bromley et al. (2005), Bullen and Love (2011a)
Creative value compared to redevelopment	Creative outside appearance and finishing of the building	Bullen (2007,2004)

3. Methodology

3.1 Development Processes of Cost Breakdown Structure (CBS)

In this paper, qualitative research has been adopted to achieve the objectives and it involves the analysis of data such as words from interviews, pictures from videos or objects of artifacts. Telekom Museum was chosen as the case study for this research. A Semi structured interview was applied in order to collect information about the building's prior role, problems, advantages, methods, and principles of execution of the adaptive reuse process. Coding system has been applied to analyses the data to foresee the future trend of the application of adaptive reuse in heritage buildings.

4. Findings and Discussion

4.1 Existing Factors of Adaptive Reuse Practices in Case Study

To summarize, not each of the respondents has the knowledge and familiarity with the term of building adaptive reuse in heritage buildings. According to the interview session, respondents R1 and R2 cannot give insight on the method compared to the respondent R3 and R4. It has been claimed by the respondent R3 and R4.

“Transforming the function of building for example this building was an office before a museum today” (R3)

“A type of conservation method that allows the buildings to be recycled and expand its life cycle” (R4)

Meanwhile, the statements from R3 and R4 show that the knowledge of adaptive reuse is supported by the definition that the basic goals of preservation are to increase a building's

lifespan and shield it from harmful elements (Hanafi et al.,2019). However, according to Hanafi et al., (2019), technical and experience characteristics from both managerial and technological factors are essential towards the successful and effectiveness of adaptive reuse. Therefore, new approaches and developments need to be done in order to increase knowledge.

4.2 Effectiveness on the Adaptive Reuse in Case Study

From the interview session, it can be analyzed that the effectiveness of adaptive reuse for the building is a positive aspect. Changing the use, function and purpose of the building had contributed to the income and accessibility to the people. Therefore, the advantage of this conservation work is effective. As claimed supported by the respondent R1 and R4.

“Compared to the office building, the museum can generate income through the event collaboration and number of visitors” (R1)

“After the conservation work, the building from office to museum is accessible to the public for everyone to observe the architecture design” (R4)

Due to the potential for economic, social, and environmental benefits, adaptive reuse is receiving a lot of attention (Mat Hasan et al., 2019) showing that the statement from R1 is supported by the previous study. Moreover, the influence of site location, development cost, and architectural style on urban development pressure (Zamri & Abdullah,2018) also has been identified as one of the reasons for the effectiveness of adaptive reuse for the buildings.

4.3 Significant Factors of Adaptive Reuse for Heritage Buildings

Briefly, based on the interview session, each respondent has a different point of view regarding the sustainability of heritage buildings. Sustainability will align with the three significant elements which are economic, social and environmental which have been identified. As claimed by the respondent:

“The building still restores its original structure contributing towards saving the environment and less pollution” (R1)

“Regular monitoring, reviewing and reporting. Any defects or maintenance work will need to be approved by the National Heritage Department as the building has been gazetted and bound with guidelines to restore the structure” (R2)

“The museum to generate income, we apply the collaboration of events with the locals. By doing so, the museum can sustain, have participatory from the local and become one of the community hubs” (R3)

“Accessibility to the public allows the museum to receive visitor and generate income” (R4)

The responses from R1, R2 and R3 show that the contribution from local authorities is required to achieve authenticity in the adaptive reuse of historic structures because, in the end, it improves the social and economic climate (Mat Hasan et al.,2019). The statement by R4 also could justify that the adaptive reuse method can give attention to economic benefits (Mat Hasan et al., 2019). However, the practice also can be influenced by external circumstances such as

funding availability, construction technology, and the length of the development process for internal forces that affect the development (Zamri & Abdullah,2018).

4.4 The Most Significant Factors that Applied for Heritage Building

Referring to the respondent's transcript, the significant factors that can be applied are based on the keywords of the respondent for economics, government, community and social. According to the respondent:

“Economics is the most significant factor since museums are aligned with the tourism industry. The number of visitors will be dependent on the uniqueness of heritage buildings for visitation and income to maintain the museum.” (R1)

The above statement from the R1 respondent has proven the study from (Hanafi et al., 2019) that the gradual modification of the building's purpose will encourage new local activities. Additionally, improving the building's functionality is important and usually done for profit and financial gain.

4.5 Recommendation to Develop Awareness for Heritage Buildings

Referring to the transcript from the respondent, the awareness guideline for heritage to encourage developers and investors can be done through collaboration and policy development besides marketing tools the least. As claimed by the respondent:

“Collaboration between any party such as the museum and schools can give education and spread awareness” (R1)

“The collaboration of developer and non-profit organization (NGO)” (R4)

Based on this opinion, collaboration can be seen as one of the effective tools in spreading the awareness as parties involved with the activity and event have their own followers. Therefore, this suggestion can reach as many people as possible. Moreover, this kind of activity also can be considered as community service and the company or any party involved can get their point for community service responsibility (CSR).

“Strict policy development and strategies that encourage adaptive reuse and the ongoing sustainability of building.” (R3)

“Come out with solution to increase education awareness for history to develop a generation that values art” (R4)

Moreover, according to the research by Wan Ismail (2018), the locals agreed that the local government must implement regulations on historic structures to prevent them from undergoing pointless alternation and to guarantee their preservation. Therefore, it can support the R3 opinion to let the government support policy development. This can be done by strengthening the rules regarding the demolition of historic structures for commercial use and promoting the idea of adaptive reuse as a new business model. Also, outlining strategies with the crucial steps in the adaptive reuse process will facilitate efficient decision-making (Hanafi et al.,2019).

5. Conclusion

In general, the adaptive reuse principle is applied differently depending on the building's new function. However, the heritage buildings in Kuala Lumpur are being fully exploited and all conservation processes and principles are being followed in order to preserve their historical worth. However, the findings discovered that many factors influenced the implementation of adaptive reuse, including the building's state, ineffective management and the building's purpose. From the analysis, the current building condition is well-conserved by the management of Telekom Museum. There is no additional structure or changes have been made to the fact the building is under the national gazette. Economic, social, and environmental factors have become the main factor for heritage buildings such as the Telekom Museum to remain sustained as it is. Therefore, the case study for heritage buildings in Kuala Lumpur has contributed to a sustainable environment by implementing adaptive reuse. The principle of adaptive reuse was viewed as a noble means of protecting historic buildings in order to make them more sustainable. By following the conservation procedure and philosophy, the building can adapt to a new use. In order to preserve the building's worth, the authorities, and building owners should have a competitive strategy in place to preserve and interpret the heritage assets.

Acknowledgement

The authors would like to thank Universiti Teknologi MARA, Universiti Malaya, Nanyang Normal University and Asian Network Scholars for the continuous support and collaboration.

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