



PLANNING MALAYSIA:

Journal of the Malaysian Institute of Planners

VOLUME 24 ISSUE 5 (2026), Page 297 – 311

DEVELOPING A HERITAGE BUILDING REVITALISATION MANAGEMENT FRAMEWORK FOR COMMERCIALISATION

**Umi Kalsum Zolkafli @Zulkifly¹, Norhanim Zakaria², Maisarah Makmor³,
Loo Siaw Chuing⁴, Ali Sunandar⁵**

^{1,2,4,5}*Department of Quantity Surveying, Faculty of Built Environment,
UNIVERSITI MALAYA*

^{1,2,4}*Centre for Building, Construction and Tropical Architecture,
Faculty of Built Environment, UNIVERSITI MALAYA*

³*Centre of Surveying and Management (Quantity Surveying),
Faculty of Built Environment, UNIVERSITI TEKNOLOGI MARA*

⁵*Department of Civil Engineering, Faculty of Engineering,
UNIVERSITAS MERCU BUANA*

Abstract

Heritage buildings represent valuable cultural and economic assets that can generate long-term social and financial benefits when managed effectively. However, many heritage buildings continue to deteriorate because of neglect, high maintenance costs, limited management guidelines, and insufficient understanding of conservation practices, creating significant technical and economic uncertainty. This study aims to identify the value added generated through heritage building revitalisation by developing a management framework to support sustainable commercialisation. A qualitative research design was adopted, comprising a review of conservation contract documents for heritage shophouses and two rounds of Delphi discussions involving 10 to 15 experts to refine and validate the framework. The findings identified six key characteristics influencing commercialisation potential, namely location, historical significance, aesthetic value, architectural value, tourist attraction, and economic and social value, with location emerging as the most influential factor. The analysis further identified five interrelated management variables consisting of revitalisation scope, construction cost, maintenance, operational cost, and value appreciation. Building works accounted for the largest proportion of construction costs at 68 percent, while value appreciation was demonstrated through social, political, aesthetic, historical, cultural, and economic dimensions, including substantial improvements in rental and capital values following revitalisation. The proposed framework provides a practical decision support tool for investors and practitioners involved in heritage shophouse revitalisation by balancing heritage conservation with commercial viability while supporting the long-term preservation of cultural, historical, social, and architectural values.

Keywords: Commercialisation; Cost Analysis; Heritage; Revitalisation Management Framework; Shophouses

¹ Corresponding author. Email: umi@um.edu.my

INTRODUCTION

Heritage buildings constitute important cultural assets that preserve historical identity while contributing to social, cultural, and economic development through tourism, adaptive reuse, and urban regeneration. When managed effectively, these assets generate long-term economic benefits by increasing property values, attracting investment, and supporting local businesses. Consequently, conserving heritage buildings has become an important strategy for achieving sustainable development while safeguarding cultural significance for future generations. Despite their importance, the conservation of heritage buildings is a highly complex and unique process (Chami, 2026; Wang et al., 2025; Wang et al., 2026). Heritage conservation involves considerable technical and economic uncertainties, including hidden structural defects, undocumented building conditions, difficulties in sourcing traditional materials, specialised workmanship requirements, unpredictable repair interventions, cost overruns, and extended project durations (Dişli & Ankaralıgil, 2023; Ma et al., 2024). Consequently, professionals often cannot accurately predict the actual condition of heritage buildings until conservation works commence (Xu et al., 2025). Furthermore, Marmaya et al. (2025); Penjor et al. (2024) reported that technical knowledge and specialised training among conservation professionals remain insufficient. These challenges are further aggravated by inadequate maintenance and management guidelines, resulting in poor maintenance practices that accelerate the deterioration of heritage buildings (Chen et al., 2025; Marmaya et al., 2025; Zaid et al., 2021).

Balancing heritage conservation with contemporary development therefore remains a major challenge. Through appropriate revitalisation and adaptive reuse strategies, heritage buildings can continue to fulfil modern economic functions without compromising their cultural significance. In Malaysia, effective collaboration among relevant stakeholders has the potential to enhance heritage asset values while generating economic returns through heritage tourism and commercial activities. Nevertheless, despite the recognised economic contribution of heritage buildings, commercialisation should not be viewed solely as a mechanism for financial return. When appropriately managed, commercialisation provides a means of sustaining heritage conservation by generating the resources required for long term maintenance while preserving historical, architectural, cultural, and social significance. However, limited management frameworks are available to systematically integrate conservation values, commercial viability, adaptive reuse requirements, conservation permission, local authority approval, and heritage tourism considerations when evaluating heritage building revitalisation. Consequently, decision makers often lack a structured approach for balancing regulatory compliance, heritage

protection, and commercial sustainability throughout the revitalisation process. To achieve the aim, the research objective are as follows:

1. To identify the characteristics of heritage buildings that has potential for commercialization.
2. To investigate the value appreciation of heritage buildings through the process of revitalization (adaptation and retrofitting).
3. To establish a heritage buildings' management revitalization framework for the purpose of commercialization.

LITERATURE REVIEW

According to National Heritage Act 2005 Act 645, the definition of heritage building is if a building, a group of distinct or related buildings that is homogeneity is due to their architecture or their location in the landscape, have exceptional universal value in terms of history, art, or science (National Heritage Act, 2005). On 7 July 2008, Melaka and George Town, Historic Cities of the Straits of Malacca were declared and listed in UNESCO World Heritage List as World Heritage Sites. Both cities constitute a unique and unparalleled architectural and cultural townscape in East and Southeast Asia (Tan et al., 2018; Wahab et al., 2018). The dominant building type within the core zones of Melaka and Georgetown, Penang is the shophouse. There are a lot of shophouses, mostly two and three storey, in World Heritage Sites. The shop-houses in Malaysia were recognized by UNESCO in 2008, and their conservation has been intensified due to fast urbanization (Tan et al., 2018; Wahab et al., 2018). The Southeast Asian traditional shophouse is a long-standing architectural tradition of mixing dwelling and commerce that originated in Malaysia in the late 1800s and continued until the 1960s.

The usage of historic shophouses buildings commonly used to be a combination of commercial and residential use. According to Maghsoodi Tilaki et al. (2026); Zhao (2025), the ground level is utilized for retail, light industrial, or service enterprises such as laundries, repair shops, and so on. In a single shophouse, more than one business may share the ground floor space. The residential portion of some shophouses is located behind the shop. The upper levels are for residential use and may comprise housing units for multiple families or individuals who may share kitchens and baths (Maghsoodi Tilaki et al., 2026; Zhao, 2025). However, the current usage allowed in heritage buildings mainly under the buffer zone of UNESCO is strictly controlled to preserve the value of the building. Commercial activities such as coffee houses, handicraft shops, traditional gift shops, and more are preferred to preserve the value of the heritage buildings. In general, revitalization is an effort to restore the dynamics and to revive the assisted environment, which is affected by various factors such as

social, cultural, economic and political policies (Musyawaroh & Pramesti, 2024). Heritage revitalisation therefore extends beyond physical rehabilitation and economic utilisation. Its primary objective is to ensure that heritage buildings remain socially relevant, culturally meaningful, and financially sustainable through adaptive reuse that respects their heritage significance while supporting their continued conservation.

RESEARCH METHODOLOGY

Qualitative method is selected for this research as it able to offer an in-depth understanding, begins with the understanding on the theory or concept within literature review until the final step where to develop the framework (Creswell & Creswell, 2023; Sunandar et al., 2025a, 2025c, 2025d). Figure 1 show research framework developed for this study. In this research, three heritage shophouse case studies were undertaken across two study locations, namely Lebuḥ Kimberley, George Town, Pulau Pinang, and Jalan Laksamana, Banda Hilir, Melaka. Case Study 1 consisted of six shophouses located within the buffer zone of Lebuḥ Kimberley. Case Studies 2 and 3 consisted of twelve and fourteen shophouses, respectively, both located within the core zone of Jalan Laksamana. Although three separate case studies were undertaken, the findings are presented according to the two study locations because Case Studies 2 and 3 represent the same heritage precinct and were analysed collectively for comparison with the Pulau Pinang case.

The selection was based on ten criteria, namely project title, owner, type of heritage building, building age, heritage characteristics, form of contract, restoration commencement date, restoration completion date, total restoration cost, and total gross floor area. These criteria ensured that all selected cases represented completed heritage shophouse revitalisation projects with sufficient technical, contractual, physical, and financial information to support the analysis of value appreciation and the development of the proposed management framework. Focus Group Discussion (FGD) was employed as a structured Delphi process consisting of two iterative rounds to refine and validate the proposed management framework (Sunandar, Andriyanti, et al., 2026; Sunandar et al., 2025b). Experts were selected using purposive sampling based on their professional experience (Sunandar, Abd Karim, et al., 2026a, 2026b). The expert panel comprised consultant quantity surveyors, architects, contractors, valuers, clients, and heritage investors to ensure multidisciplinary perspectives.

The first Delphi round involved 15 experts in a one day face to face discussion. Participants reviewed the preliminary list of heritage building characteristics, value appreciation variables, and management components identified from the literature and case studies. They were asked to evaluate the relevance, completeness, practical applicability, and clarity of each component

and to recommend modifications where necessary. Consensus was achieved through group discussion until no substantial disagreement remained, and the agreed comments were used to refine the framework. The second Delphi round involved 13 experts, including five participants from the first round to ensure continuity. The validation process was conducted in two stages comprising a face to face session followed by online consultation with recognised heritage conservation practitioners.

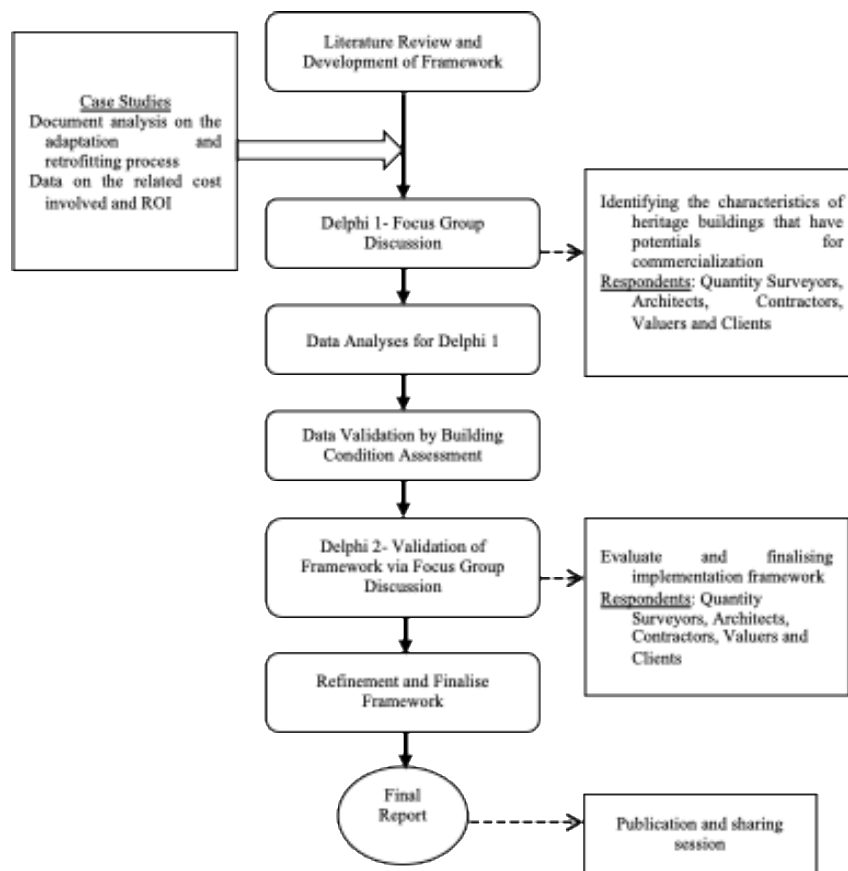


Figure 1: Research Framework
Source: Author's Own Creation (2026)

In addition, a standardized calculation template was developed from the case study data to ensure that construction cost, maintenance cost, operational cost, rental value, capital value, yield, life cycle cost, and return on investment were analysed using a consistent procedure across all cases, thereby improving the transparency and replicability of the proposed framework. Rental and capital

value data were primarily obtained from market surveys and official transaction records provided by the Valuation and Property Services Department (JPPH). Where recent transaction evidence was unavailable, particularly in Jalan Laksamana, Melaka, market values were estimated using established comparison and investment valuation methods based on comparable heritage shophouses within the same locality.

ANALYSIS AND DISCUSSION

Findings for Research Objective 1

The first objective of this research is to identify the characteristics of heritage buildings that have potential for commercialization. The preliminary literature review were collected prior to the FGD 1. In the preliminary literature review, the characteristics of heritage buildings that have potential for commercialization were collected. The characteristics are strategic location, historical significant, aesthetic value, tourism potential, tourism attraction, space for commercial activities, structures in good condition and suitable and practical design. These characteristics were presented and analysed by the respondents in the FGD 1.

Figure 2 present the characteristics that were extracted from the literature review and analysed by the participants in FGD 1. 14 respondents have agreed that strategic location, history significance and tourist attraction to be the important heritage buildings characteristics for commercialization potential. Tourism potential and suitable/ practical design of heritage buildings are secondary heritage buildings characteristics for commercialization potential that were agreed by 13 respondents. As for aesthetic values and space for commercial activities, only 11 respondents agreed that the two was important heritage buildings characteristics for commercialization potential. Three respondents (R8, R9 and R11) have included sustainability as a heritage buildings characteristic for commercialization potential. Following the FGD 1, further literature review were conducted and the findings in the preliminary literature review and the FGD 1 were refined. There were two extra characteristics on the heritage buildings characteristic for commercialization were discovered which are environmental and political factor. Through the refinement process, some of the findings in FGD 1 were categorised in new categories. The changes were conducted as shown in Table 1. Based on the further literature compiled, the nine characteristics collected in FGD 1 are now grouped into six characteristics. The two additional characteristics (environmental and political factor) will be included in the data collection in FGD 2.

Table 1: Refined Characteristic

Characteristic in FGD 1	Refined Characteristic
Strategic Location	Location
Historical Significance	Historical Significance
Aesthetic Value	Aesthetic value
Tourism Potential	Economic & Social Value
Tourist Attraction	Tourist Attraction
Space for Commercial Activities	Architectural value
Structures in Good Conditions	Architectural value
Suitable and Practical Design	Architectural value
Sustainability	Architectural value

Source: Author's Own Creation (2026)

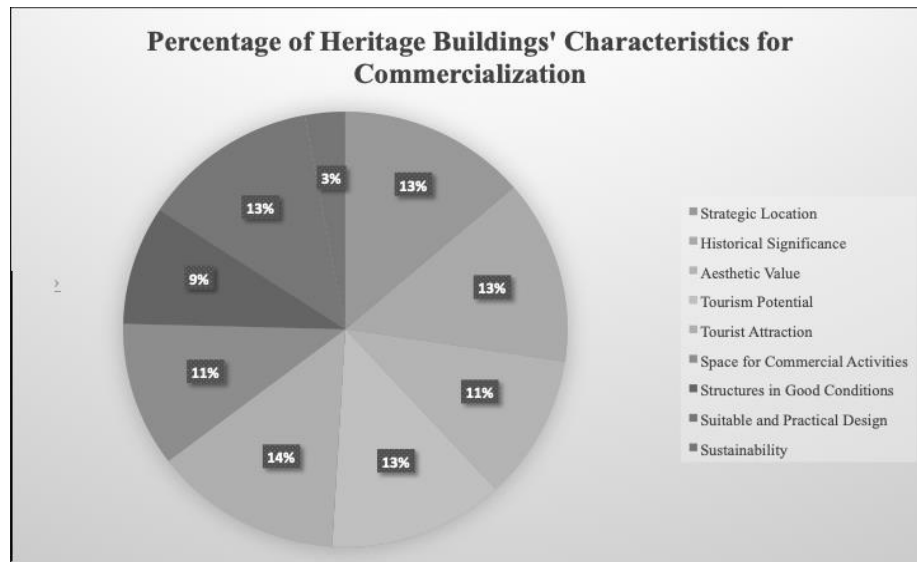


Figure 2: Pie Chart on Heritage Buildings' Characteristics that have Potential for Commercialization

Source: Author's Own Creation (2026)

Findings for Research Objective 2

The findings are organised according to the two study locations. Although the study comprised three case studies, Case Studies 2 and 3 are presented together because they are located within the same heritage precinct at Jalan Laksamana, Banda Hilir, Melaka. Through a comprehensive literature, there are 6 variables that have been identified as value appreciation after the shophouses has been revitalised namely: Social, Political, Aesthatic, Historical, Cultural and Economic Value. Further analysis using case study has been made to identify the economic value appreciation.

i. Analysis on Economic Value Appreciation

Economic value appreciation was evaluated using a consistent calculation procedure across all case studies. The assessment comprised rental value, capital value, yield, life cycle cost, and return on investment, allowing direct comparison between buildings before and after revitalisation. Rental and capital value appreciation were calculated by comparing pre and post revitalisation market values, whereas yield, life cycle cost, and return on investment were incorporated into the management framework as decision support indicators for commercial feasibility.

ii. Rental Value Appreciation

Study Area 1 – Lebuhr Kimberley, Pulau Pinang

There was a significant increase in rental of a two- storey shophouse located at Kimberley Road which had been revitalised compared to before revitalisation. Unit No. 96 which was rented out before revitalisation works done at a rental rate of RM600 per month was successfully rented out at a rental rate of RM2,500 per month after revitalisation work done. A comparison in terms of rental between units that are in their original condition and units that have been revitalised were also conducted to determine the differences. From the rental survey conducted, it is found that the rent for units with land areas in the range of 850 - 1,000 square feet which have been revitalized are rented out at rental ranging from RM2,500 to RM4,000 per month whilst units with the similar land size and in its original condition are rented in the range of RM600 - RM1,500 per month. For larger units where the land area are approximately 1,500 square feet, the rents for revitalised units are in the range of RM4,000 – RM7,000 per month. The increment of rental if the units are revitalised compared to units which are not revitalised ranging from 166% to 316%.

Table 2: Comparison of Rental Price at Lebuhr Kimberley, Pulau Pinang

No.	Land Area (sq. ft.)	Monthly Rental (units not revitalised)	Monthly Rental (units revitalised)
1	850–1,000	RM600–RM1,500/month	RM2,500–RM4,000/month
2	Approximately 1,500	Not available	RM4,000–RM7,000/month

Source: Author's Own Creation (2026)

Study Area 2 – Jalan Laksamana, Bandar Melaka

Significant differences between the revitalised units and the units in their original condition were also detected in Melaka Our rental survey revealed that units which is in poor condition (have not gone through revitalisation work) were rented out at monthly rental ranging from RM350 to RM2,000 whilst the shophouses that have been restored can fetch rental of RM5,000 to RM7,000 per

month. Two adjoining units of two-storey shophouses (Unit No 17 & 19, Jalan Laksamana) which are in poor state of repair (not restored/revitalised) are rented out at RM4,000 (RM2,000 per unit) per month whilst the two-storey shophouse that has gone through revitalisation process located opposite, across Jalan Laksamana is currently rented out at RM5,000 per month. The increment of rental if the units are revitalised compared to units which are not revitalised ranging from 150% to 215%.

Table 3: Comparison of Rental Price at Jalan Laksamana, Melaka

No.	Land Area (sq. ft.)	Monthly Rental (units not revitalised)	Monthly Rental (units revitalised)
1	850–1,000	RM350–RM2,000/ month	RM5,000–RM7,000/month
2	Approximately 1,500	RM2,000/month	RM5,000/month

Source: Author's Own Creation (2026)

iii. Capital Value Appreciation

Study Area 1 – Lebuhr Kimberley, Pulau Pinang

Comparison between the transacted prices of the two-storey shophouses that have gone through restoration works with the two-storey shophouses which are in its original condition (not restored, poor condition) has been done. It can be clearly seen that shophouses that have undergone restoration (although not full renovation) have been able to fetch higher prices in the market compared to the property that is in its original condition.

For 2- storey shophouses with land area of approximately 800 to 1,000 square feet which have undergone restoration works, its were transacted at prices of RM1.2 to RM1.25 million per unit whilst the one with same land area that has not undergone any restoration work was transacted at RM325,000 per unit. The incremental of price is about 269%.

Table 4: Transacted price of 2-storey shophouses at Jalan Kimberley

Address	Transacted Price (RM) / Date of Transaction	Land Area (sq ft)	Analysis (RM) per sq ft (over land area) / per unit
120, Lebuhr Kimberley	RM1,200,000 26 July 2021	839	1,430 per sq. ft. / RM1,200,000 per unit
64D, 64E, 64F, 64G, 66 & 68, Lebuhr Kimberley	RM7,500,000 5 July 2021	6,423 (1,070 sq. ft. per lot)	1,168 per sq. ft. / RM1,250,000 per unit
14, Lebuhr Kimberley	RM1,700,000 2 April 2021	1,546	1,100 per sq. ft. / RM1,700,000 per unit
208, 210, 212 & 214, Lebuhr Kimberley	RM650,000 (1/2 share) 29 Jan 2020	3,511 (878 sq. ft. per lot)	370 per sq. ft. / RM325,000 per unit

Source: JPPH Sales Data (2024)

Study Area 2 – Jalan Laksamana Melaka

There were no recent market transactions involving comparable two storey heritage shophouses along Jalan Laksamana during the study period for direct comparison between buildings in their original condition and those that had undergone revitalisation. Consequently, capital values were estimated using established comparison and investment valuation methods based on comparable heritage shophouses within the surrounding heritage area. This approach is consistent with professional valuation practice when direct transaction evidence is limited and provides a reasonable basis for comparative analysis. Based on this assessment, the capital value of two storey shophouses with land areas ranging from 1,100 to 1,300 sq. ft. that had not undergone restoration works (poor condition) was estimated at approximately RM400,000 to RM650,000 per unit, whereas comparable revitalised shophouses were estimated at RM1,200,000 to RM1,500,000 per unit. The estimated increase in capital value following revitalisation ranged from 130% to 200%.

Table 5: Transacted price of 2-storey shophouses at Jalan Laksamana

Address	Transacted Price (RM) / Date of Transaction	Land Area (sq ft)	Analysis (RM) per sq / per unit
2 storey shophouses along Jalan Laksamana	RM400,000.00 – RM650,000.00 per unit	1100–1300 sq. ft.	RM330.00 per sq. ft.
2 storey shophouses along Jalan Laksamana	RM1,200,000.00 – RM1,500,000.00 per unit	1100–1300 sq. ft.	RM1,125.00 per sq. ft.

Source: JPPH Sales Data (2024)

iv. Yields

The analysis of yield shows that yields for revitalised and not revitalised shophouses in Jalan Kimberley Pulau Pinang are about the same i.e in the region of 3% to 5%. For Jalan Laksamana, Melaka, the yields are in the region of 3% - 5% for the units not revitalised while the yields for the units that have been revitalised are also in the same region, i.e. 3% - 5%. Coincidentally the yields for shophouses in the both study areas are about the same. The range of yields of unrestored and restored units are in similar range (3%-5%) since the units restored not only increase in rental but also increase in capital value with similar range of percentage.

Table 6: Yields of 2-storey shophouses

No.	Location	Yield for units not revitalised	Yield for units revitalised
1.	Jalan Kimberley, Pulau Pinang	3%–5%	3%–5%
2.	Jalan Laksamana, Melaka	3%–5%	3%–5%

Source: Author's Own Creation (2026)

Findings for Research Objective 3

All the variables has been considered in the development of Heritage Building's Revitalization Management Framework as per Figure 3 for the Purpose of Commercialization. It is comprising of the following item:

- i. Revitalisation: Scope, Work Categories, and Standardised Construction Cost Calculation.
- ii. Maintenance: Annual maintenance cost categories comprising architectural, civil and structural, mechanical, electrical, housekeeping services, and pest control.
- iii. Operation: Operational cost estimation according to commercial use, including dress shop, café, and beauty product shop.
- iv. Financial Evaluation: Life cycle cost (LCC), rental income, capital value appreciation, yield, and return on investment calculated using a standardised assessment template for each commercial scenario.

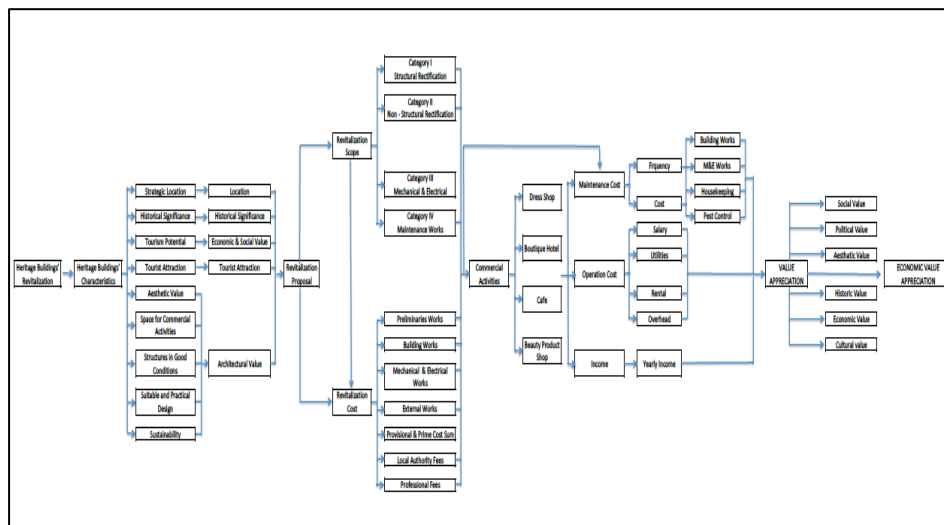


Figure 3: The Final Framework

Source: Author's Own Creation (2026)

The framework integrates a standardized sequence of calculations beginning with revitalisation cost estimation, followed by maintenance and operational cost assessment before evaluating rental income, capital value appreciation, yield, life cycle cost, and return on investment. It also functions as a planning and heritage management tool by supporting adaptive reuse decision making, facilitating conservation permission and local authority approval, and ensuring that commercial development remains consistent with conservation

principles by protecting the authenticity, architectural integrity, and cultural significance of heritage buildings while maintaining appropriate public and local community access and supporting heritage tourism objectives. This sequential structure enables consistent application and facilitates replication in future heritage revitalisation projects.

CONCLUSION

Heritage building conservation involves significant technical and economic challenges, while inadequate maintenance and management continue to threaten many heritage assets. Sustainable revitalisation requires balancing conservation with development through effective policies and collaboration among relevant stakeholders. Commercialisation should be viewed as a mechanism to support long-term conservation by generating resources for maintenance, adaptive reuse, and public appreciation rather than merely increasing financial returns. Revitalisation creates social, cultural, historical, architectural, and economic value, enhancing asset value, supporting heritage tourism, and contributing to local economic development.

The proposed heritage building revitalisation management framework provides a transparent and replicable decision support tool by integrating standardised procedures for construction cost estimation, maintenance and operational cost assessment, rental and capital value analysis, yield evaluation, life cycle cost assessment, and return on investment analysis. Consequently, the framework assists investors, practitioners, and local authorities in balancing commercial viability with long-term heritage conservation. The framework also emphasises that commercialisation should proceed only where proposed adaptive reuse is compatible with conservation principles, protects the authenticity and cultural significance of the heritage asset, maintains appropriate public and local community access, and does not compromise the historic character that underpins its heritage value.

Beyond financial assessment, the framework supports adaptive reuse planning, facilitates conservation permission and local authority approval processes, and promotes heritage tourism management by ensuring that commercial activities remain compatible with the cultural, historical, and architectural significance of heritage buildings. Since the framework was developed from heritage shophouse case studies in George Town and Melaka, its direct application to other heritage building types should be interpreted with caution and validated within their respective conservation contexts.

ACKNOWLEDGEMENTS

Special thanks to the Institut Penilaian Negara (INSPEN) by providing us the opportunity to conduct a research on digital learning resources. We would also

like to thank the University Malaya, Majlis Bandaraya Melaka Bersejarah, ARR QS Consultancy, SG Services Sdn. Bhd and all individuals who involved for assisting us in completing this research.

DISCLOSURE

The authors declare that there is no conflict of interest associated with this research.

REFERENCES

- Chami, M. F. (2026). Cultural heritage conservation and the colonial past in Tanzania: Collaborative approaches towards German colonial administrative buildings and military stations (Bomas). *International Journal of Heritage Studies*, 32(1), 1–21. <https://doi.org/https://doi.org/10.1080/13527258.2025.2579246>
- Chen, Y., Wang, Z., Zhao, J., Zhao, X., Zuo, S., & Liu, W. (2025). Paths to policy sustainability for protecting cultural heritage: A quantitative analysis of conservation policies for the Great Wall within the “Instrument–Objective–Stakeholder” framework. *Sustainability (Switzerland)*, 17(10), 4378. <https://doi.org/https://doi.org/10.3390/su17104378>
- Creswell, J. W., & Creswell, J. D. (2023). *Research design qualitative, quantitative and mixed methods approaches* (Sixth Edition ed.). SAGE.
- Dişli, G., & Ankaralıgil, B. (2023). Circular economy in the heritage conservation sector: An analysis of circularity degree in existing buildings. *Sustainable Energy Technologies and Assessments*, 56, 103126. <https://doi.org/https://doi.org/10.1016/j.seta.2023.103126>
- Ma, Y., Xie, H., Li, Y., Hokoi, S., Zhang, X., & Wang, X. (2024). Water-related deterioration risk assessment for sustainable conservation of heritage buildings in the Forbidden City, China. *Developments in the Built Environment*, 17, 100293. <https://doi.org/https://doi.org/10.1016/j.dibe.2023.100293>
- Maghsoodi Tilaki, M. J., Wan Ibrahim, W. M. M., & Abdullah, A. (2026). Exploring challenges of adaptive reusing of vacant shophouses in Penang’s heritage zone. *Cities*, 170, 106663. <https://doi.org/https://doi.org/10.1016/j.cities.2025.106663>
- Marmaya, E. A., Mahbub, R., Muhammad, F., & Tahir, M. A. M. (2025). Community perspective and challenges of heritage buildings conservation in urban Malaysia. *Built Environment Journal*, 22(Special Issue), 26–36. <https://doi.org/https://doi.org/10.24191/bej.v22iSI.6476>
- Musyawaroh, M., & Pramesti, L. (2024). Revitalization model for ancient buildings and environment in the cultural heritage village Kauman Surakarta. *IOP Conference Series: Earth and Environmental Science*, 1361(1), 012028. <https://doi.org/https://doi.org/10.1088/1755-1315/1361/1/012028>
- National Heritage Act. (2005). *National Heritage Act 2005 (Act 645)*. Government of Malaysia
- Penjor, T., Banihashemi, S., Hajirasouli, A., & Golzad, H. (2024). Heritage building information modeling (HBIM) for heritage conservation: Framework of challenges, gaps, and existing limitations of HBIM. *Digital Applications in*

- Archaeology and Cultural Heritage*, 35, e00366.
<https://doi.org/https://doi.org/10.1016/j.daach.2024.e00366>
- Sunandar, A., Abd Karim, S. B., & Zolkafli Zulkifly, U. K. (2026a). Integrating ESG and sharia compliance in PPP infrastructure: Toward a conceptual framework for Indonesia. *Journal of Islamic Accounting and Business Research*, 1–25.
<https://doi.org/https://doi.org/10.1108/JIABR-08-2025-0542>
- Sunandar, A., Abd Karim, S. B., & Zolkafli Zulkifly, U. K. (2026b). Sharia public-private partnerships infrastructure in Indonesia: A framework for the operational phase. *Built Environment Journal*, 23(2), 467–482.
<https://doi.org/https://doi.org/10.24191/bej.v23i2.8973>
- Sunandar, A., Andriyanti, F. A., Abd Karim, S. B., & Zolkafli @Zulkifly, U. K. (2026). Examining the application of the semi-structured interview method in public-private partnership (PPP) infrastructure studies. *Journal of Civil Engineering*, 41(1), 3–19. <https://doi.org/https://doi.org/10.12962/j25799029.v41i1.9498>
- Sunandar, A., Karim, S. B. A., & Zulkifly, U. K. Z. (2025a). Exploring a preliminary conceptual framework for integrating sharia compliance into public-private partnership (ppp) in Indonesia. *International Journal of Built Environment and Sustainability*, 12(3), 65–75.
<https://doi.org/https://doi.org/10.11113/ijbes.v12.n3.1471>
- Sunandar, A., Karim, S. B. A., & Zulkifly, U. K. Z. (2025b). Exploring delphi method utilization research trends on public-private partnership infrastructure studies. *Journal of Infrastructure Policy and Management (JIPM)*, 8(1), 21–40.
<https://doi.org/https://doi.org/10.35166/jipm.v8i1.92>
- Sunandar, A., Karim, S. B. A., & Zulkifly, U. K. Z. (2025c). Integrating maqasid sharia into the planning stage of public-private partnership (PPP) sharia for infrastructure development in Indonesia. *Planning Malaysia*, 23(4), 399–413.
<https://doi.org/https://doi.org/10.21837/pm.v23i38.1801>
- Sunandar, A., Karim, S. B. A., & Zulkifly, U. K. Z. (2025d). Value engineering planning concept for street lighting (MYSINAR+) through the public-private partnership (PPP) scheme. *Planning Malaysia*, 23(4), 748–762.
<https://doi.org/https://doi.org/10.21837/pm.v23i38.1824>
- Tan, S.-K., Tan, S.-H., Kok, Y.-S., & Choon, S.-W. (2018). Sense of place and sustainability of intangible cultural heritage – The case of George Town and Melaka. *Tourism Management*, 67, 376–387.
<https://doi.org/https://doi.org/10.1016/j.tourman.2018.02.012>
- Wahab, L. A., Zain, N. M., Abidin, Z. Z., Saberi, M. H., & Bakar, N. A. (2018). Adaptive reuse of heritage buildings as hotels in Melaka and George Town - UNESCO World Heritage Cities. *Journal of Social Sciences Research, Special Issue 6*, 22–27. <https://doi.org/https://doi.org/10.32861/jssr.spi6.22.27>
- Wang, G., Li, Q., Song, C., Chen, J., Yao, Y., & Yang, L. (2025). Preventive conservation engineering practice based on deformation resistance capacity evaluation of heritage buildings. *Scientific Reports*, 15, 40256.
<https://doi.org/https://doi.org/10.1038/s41598-025-23996-8>
- Wang, K., Wang, M., & Zhou, J. (2026). Integrating heritage conservation into urban building energy modelling for retrofit decision-making in historic districts. *npj*

- Heritage Science*, 14(1), 1. <https://doi.org/https://doi.org/10.1038/s40494-025-02186-9>
- Xu, Q., Zhang, S., & Riffat, S. (2025). Uncertainty-proofing historic buildings: A data-driven framework for the sustainable retrofit of Suzhou-style heritage buildings. *Journal of Building Engineering*, 115, 114478. <https://doi.org/https://doi.org/10.1016/j.jobe.2025.114478>
- Zaid, N. S. M., Ghazali, M. I., Azmi, N. F., Kamarulzaman, P. N., & Akashah, F. W. (2021). Environmental sustainability in Malaysian heritage building conservation: Review of heritage legislation and policy. *Malaysian Construction Research Journal, Special Issue 12(1)*, 203–218.
- Zhao, W. (2025). Object lesson: Shop + house: The Chinese shophouse as a transpacific vernacular form. *Buildings and Landscapes*, 32(2), 68–88. <https://doi.org/https://doi.org/10.1353/bdl.2025.a972453>

Received: 12th June 2026. Accepted: 14th June 2026