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Parasitic Architecture: Developing a Thematic Design Framework for Adaptive Reuse as an Urban Regeneration Strategy in Kuala Lumpur, Malaysia

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ABSTRACT

Parasitic architecture embodies an innovative design approach that reconceptualises existing structures as the foundation for new construction endeavours. This approach presents a progressive and adaptive alternative for urban regeneration, adeptly addressing issues like urban decay and overdevelopment. Despite the increasing global recognition of parasitic architecture, Malaysia nevertheless remains heavily dependent on inefficient and unsustainable building demolition practices. The practices have led to the destruction of significant historical edifices and the abandonment of numerous dilapidated structures, resulting in a dissonance between old and new developments in urban regeneration efforts. Against this backdrop, this article aims to propose a design framework that appropriates parasitic architecture as an adaptive reuse strategy for the urban regeneration process. The proposition is posited within the context of assimilating parasitic architecture into the urban fabric of Malaysia, particularly focusing on the metropolis of Kuala Lumpur. To attain this, the article first explores the theoretical underpinnings and design constraints of parasitic architecture, followed by expert interviews with six experienced practitioners to gather first-hand opinions and comprehensive insights. The findings lay the groundwork for a thematic-based design framework, which posits a sustainable approach for repurposing existing structures while safeguarding their environmental and historical cultural significance. This investigation into parasitic architecture, as an exploratory thematic study, would pave the way for more design research possibilities. It could benefit relevant stakeholders, including local authorities, architects, designers, planners, and researchers alike, in expanding the urban regeneration paradigm.

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1. Introduction

"The architect must become, more than ever before, a creature of the present, fusing all that is remembered and all that is dreamt within it, as though existence itself were hanging in the balance," by Lebbeus Woods [25].

1.1 Research Background

In Malaysia, urban regeneration programs have often relied on demolishing historical buildings and replacing them with new developments, resulting in inefficient and unsustainable design practices. This approach has led to issues such as land scarcity, poor resource management, and environmental sustainability concerns. Consequently, many old buildings have been left abandoned while new towering structures surround them. According to Bunyan [7], recent report by Malaysia's Ministry of Housing and Local Government (KPKT), there are 534 problematic developments nationwide, with 417 classified as "sick projects" and 117 as abandoned projects, highlighting the urgent need to address the abandonment of existing structures and spaces in Malaysian urban development.

To combat these issues, innovative approaches such as parasitic architecture have been proposed. Parasitic architecture is an adaptive reuse method that involves using existing structures as a foundation for new construction, providing a sustainable alternative to demolishing historical buildings. The United Kingdom and Canada have already explored this concept for several decades, yielding encouraging results.

In recent years, urban regeneration through adaptive reuse of old buildings has gained recognition for its potential benefits. However, in Malaysia, there are significant barriers to implementation, such as strict zoning regulations that limit mixed-use development and impose heavy conversion requirements. Without more flexible guidelines and design frameworks that integrate tectonics and sustainability, effective and efficient urban regeneration remains challenging. Furthermore, while modern approaches to conservation and urban regeneration are gaining traction, there is a lack of innovation in utilizing parasitic architecture as an adaptive reuse approach in citywide planning.

To address these challenges, this article explores the possible attempt to appropriate parasitic architecture within the context of the Malaysian urban landscape. The article begins with the contextualization of theoretical frameworks regarding parasitic architecture and its design constraints before narrowing down to the thematic analysis based on several expert interviews. The analysis includes the challenges of implementing parasitic architecture in Malaysia, such as zoning regulations and the need for innovative design frameworks. Finally, the article discusses the potential benefits of utilizing parasitic architecture in sustainable and efficient urban regeneration in Malaysia.

1.2 Conceptual Framework 1: Encoding Parasitic Architecture

The practice of design guidelines in adaptive reuse and urban regeneration can serve as a foundation for creating a framework for parasitic architecture, which Karacali and Erdil [18] describe as a 'bio-political' approach that mimics nature in architectural design.

Despite the potential significance of integrating parasitic architecture with adaptive reuse strategies and urban regeneration processes, the academic literature has paid limited attention to these synergies. To address this research gap, our study aims to explore the discursive relationships between architecture and biological concepts, as well as the innovations of parasitic architecture within the context of adaptive reuse in urban regeneration projects.

Baroš and Katunský [6] emphasize the importance of capturing and cultivating the dynamic reciprocity between organic systems of architecture and biological systems to create sustainable and innovative solutions. Their earlier work [5] suggests that parasitic architecture can be a new way to interpret existing relationships in space and architecture. It can be likened to a parasitic relationship in

nature where a host and parasite coexist. In this case, parasitic architecture involves the integration of a new extension, adaptive reuse, superstructure, or installation with an existing building, where the new addition is dependent on the existing structure for survival, much like a parasite relies on a host. Therefore, we use their ideas as the basis for our theoretical framework and refer to our approach as 'Deductive Code 1' (DC1), based on three main keywords: Parasitic Architecture (PA), Adaptive Reuse (AR), and Urban Regeneration (UR) (see Table 1).

Table 1
Deductive Code 1 (DC1): Innovation of parasitic architecture as an adaptive reuse method among urban regeneration projects

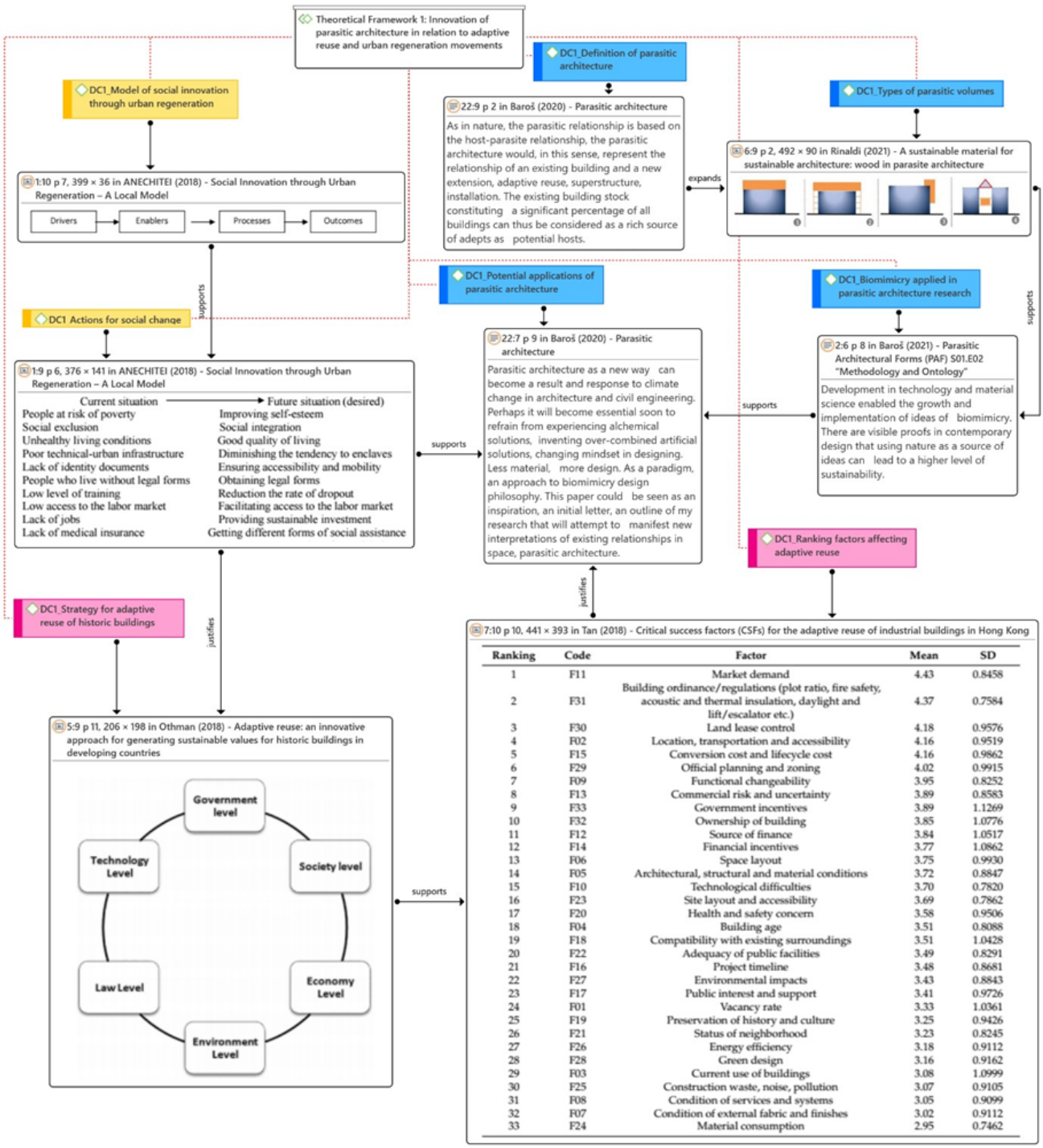
Theme	Document	Problem Statement	Conclusion	Remarks
PA	Baroš [6] (2021) - Parasitic Architectural Forms (PAF) S01.E02 "Methodology and Ontology"	Architecture and biology should adopt models that acknowledge and nurture the dynamic reciprocity between organic architecture systems and the complexities of biological systems.	Biomimicry definitions indicate that a radical approach to design is inevitable.	The paper discusses the design process for parasitic architecture, focusing on biomimicry and biological aspects.
PA	Baroš [5] (2020) - Parasitic architecture	The impact of global warming is transforming our environment. In the last two decades, we experienced eighteen of the hottest years, increases in intensity and frequency of extreme weather events.	A well-coordinated strategic research, innovation and investment agenda will make zero-carbon solutions economically workable while bringing about new ones.	The paper identifies the issues of current solutions for global crisis, and how parasitic architecture can substitute as an alternate to properly address them.
PA	Rinaldi [21] (2021) - A sustainable material for sustainable architecture: wood in parasite architecture	Unfortunately, cities often face saturation and public buildings fail to meet new needs, requiring expansion and multidisciplinary commitment to intervene on existing patrimony.	"Parasitic architecture" allows volumetric addition without soil consumption, using off-site technologies like laminated wood components with innovative technologies like Presslam and CLT.	The article primarily delved into the advancement of wood as a sustainable material for parasitic architecture.
AR	Della Spina [9] (2020) - Adaptive sustainable reuse for cultural heritage: A multiple criteria decision aiding approach supporting urban development processes	The disparity between the quantity of material and cultural heritage and the limited public resources for conservation has resulted in the abandonment or partial abandonment of cultural heritage.	This document proposes a methodology that integrates multiple evaluation methods to aid in the decision-making process for sustainable alternative functions for adaptive reuse of historical-cultural heritage.	The paper focuses on the unique characteristics of abandoned cultural heritage, rather than identifying general strategies for such buildings.
AR	Othman [19] (2018) - Adaptive reuse: an innovative approach for generating sustainable values for historic buildings in developing countries	The vision should consider historic buildings, which are often obsolete and not fully utilized, despite their stable state.	Adaptive reuse of historic buildings in developing countries is a novel approach for revitalizing and maximizing their sustainable values, despite facing challenges in their utilization.	The paper focuses on historic buildings and achieving sustainable values without discussing about modern abandoned buildings.

AR	Tan [23] (2018) - Critical success factors (CSFs) for the adaptive reuse of industrial buildings in Hong Kong	At the same time, owing to limited land supply, a shortage of affordable housing has been a problem in Hong Kong for many years.	The useful building lifespan further extends through adaptive reuse to meet the increasing market demand from other sectors, such as service-based industries.	The paper examines urban regeneration movements in a subtropical country and compares it to our tropical climate.
UR	Anechitei [2] (2018) - Social Innovation through Urban Regeneration – A Local Model	Innovation is a crucial aspect of public administration that is regularly pursued to enhance efficiency, effectiveness, and authenticity.	Social innovation is characterized not only by the problems it seeks to solve and the results it achieves, but also by its process and methods.	The paper only focuses on the specific neighbourhood of Ferentari, Romania.
UR	Cheshmehzangi [8] (2020) - Innovation through Urban Diversity and Achieving Comprehensive Sustainable Urbanism from a Community-Oriented Approach	As a result, a bigger emphasis has been given to other dimensions of "cultural" or "governance" (also known as institutional).	Sustainable urbanism should emphasize diversity in planning and design, incorporating spatial, social, and informational aspects to create richness and diversity in everyday life.	The study focuses on diversity in the U.S. However, it can still be referred as a general framework to achieve diversity in Malaysian context as well.

Adaptive reuse is a vital process that modifies and repurposes existing structures to extend their life cycle while performing a new function, as highlighted by Othman & Elsaay [19]. It is an essential component of urban regeneration projects as it can generate sustainable values for historical buildings and meet increasing market demands, as examined by Tan *et al.* [23]. Additionally, adaptive reuse can be applied to modern buildings abandoned in any urban context. This approach can lead to social innovation in the urban regeneration process, as Anechitei [2] suggests that social innovation is not only characterized by the problems it seeks to solve and the results it achieves but also by its process and methods. Furthermore, parasitic architecture has been recognized as a potential strategy for sustainable urban regeneration. Rinaldi *et al.* [21] note that these interventions can lead to positive outcomes such as energy efficiency, the creation of new living spaces, social services, and common areas, without requiring additional land consumption.

However, our literature review also reveals a research gap in the limited focus on heritage and historical buildings, which has resulted in a lack of research and implementation of results on other abandoned and underutilized buildings. As Della Spina [9] points out, local authorities today are confronted with the challenge of regenerating abandoned heritage buildings. This process requires engaging stakeholders and the local community to develop governance models that balance economic sustainability with the preservation of historical and cultural values. In this context, reinforcing diversity in sustainable urbanism at all scales is crucial. The interplay between spatial, social, and informational aspects of the built environment enhances everyday life and supports the resilience of urban areas, as emphasized by Cheshmehzangi and Aurelia Li [8].

Therefore, our study aims to develop a design framework that incorporates parasitic architecture as an adaptive reuse method for various types of buildings in urban regeneration processes, with the objective of providing a more comprehensive approach to urban regeneration. This approach seeks to leverage the potential synergies between parasitic architecture, adaptive reuse strategies, and urban regeneration processes. Figure 1 visually represents the conceptual integration of three primary themes identified through the DC1 review: the interplay between parasitic architecture and biomimicry design strategies, the social context of urban regeneration, and the adaptive reuse strategies relevant to historical and industrial buildings.



Ranking	Code	Factor	Mean	SD
1	F11	Market demand	4.43	0.8458
2	F31	Building ordinance/regulations (plot ratio, fire safety, acoustic and thermal insulation, daylight and lift/escalator etc.)	4.37	0.7584
3	F30	Land lease control	4.18	0.9576
4	F02	Location, transportation and accessibility	4.16	0.9519
5	F15	Conversion cost and lifecycle cost	4.16	0.9862
6	F29	Official planning and zoning	4.02	0.9915
7	F09	Functional changeability	3.95	0.8252
8	F13	Commercial risk and uncertainty	3.89	0.8583
9	F33	Government incentives	3.89	1.1269
10	F32	Ownership of building	3.85	1.0776
11	F12	Source of finance	3.84	1.0517
12	F14	Financial incentives	3.77	1.0862
13	F06	Space layout	3.75	0.9930
14	F05	Architectural, structural and material conditions	3.72	0.8847
15	F10	Technological difficulties	3.70	0.7820
16	F23	Site layout and accessibility	3.69	0.7862
17	F20	Health and safety concern	3.58	0.9506
18	F04	Building age	3.51	0.8088
19	F18	Compatibility with existing surroundings	3.51	1.0428
20	F22	Adequacy of public facilities	3.49	0.8291
21	F16	Project timeline	3.48	0.8681
22	F27	Environmental impacts	3.43	0.8843
23	F17	Public interest and support	3.41	0.9726
24	F01	Vacancy rate	3.33	1.0361
25	F19	Preservation of history and culture	3.25	0.9426
26	F21	Status of neighborhood	3.23	0.8245
27	F26	Energy efficiency	3.18	0.9112
28	F28	Green design	3.16	0.9162
29	F03	Current use of buildings	3.08	1.0999
30	F25	Construction waste, noise, pollution	3.07	0.9105
31	F08	Condition of services and systems	3.05	0.9099
32	F07	Condition of external fabric and finishes	3.02	0.9112
33	F24	Material consumption	2.95	0.7462

Fig. 1. The Conceptual Framework of DC1.

1.3 Conceptual Framework 2: Decoding the Design Constraints of Parasitic Architecture

Parasitic architecture involves the construction of structures that utilize the existing spaces of their host structures, including their construction, media, and communication areas. While some may view this trend negatively, the increasing popularity of exclusive structures built in locations offering memorable views and experiences confirms their attractiveness. As space in cities and megacities

becomes scarcer, the use of parasitic architecture can allow for an increase in urban growth significance while still adhering to pre-existing planning legislation.

However, the negative connotations around this type of architecture fail to capture its intended purpose. A better term to use would be 'mutualistic architecture', which is a form of symbiotic architecture. In some cases, the addition of a parasitic structure could even act as a catalyst for the rehabilitation of an area. By leveraging the visual dissonance between the old and new entities, the historic building can be better understood, and the addition can be evaluated on a spectrum ranging from a prosthesis to a parasite from a design perspective. The addition should assist the historic building, physically attached but not threatening its existence. Refunctioning of monumental structures can also play an important role in protecting and respecting the history by establishing a cultural connection with the past. By actively using these structures today, we can provide social and economic benefits to future generations.

After conducting a thorough analysis of the theoretical framework and identifying research gaps, the next step is to explore the design constraints associated with using parasitic architecture as an adaptive reuse method in urban regeneration projects. To achieve this, the Deductive Code 2 (DC2) approach will be utilized to identify and analyze the design issues, limitations, and challenges associated with parasitic architecture (see Table 2).

Table 2
Deductive Code 2 (DC2)

Theme	Document	Problem Statement	Conclusion	Remarks
PA	Bardzinska-bonenberg [4] (2019) - Parasitic Architecture: Theory and Practice of the Postmodern Era	The trend's focus has been shifted from artistic expression to social actions due to the increasing homelessness and immigration issues in cities.	Parasitic volumes utilize construction, media, and communication spaces from their mother-structures, attracting acceptance and attractiveness through ephemeral and exclusive structures built in locations offering unforgettable views and experiences.	The article focuses on the current trend, theory, and situation of parasitic architecture, highlighting its influences rather than its future potentials.
PA	Given [13] (2021) - Developing parasitic architecture as a tool for propagation within cities	The lack of distinction in the 'parasite' is causing underutilization of this tool for visually unusual extensions and exclusively benefiting the singular 'host' structure.	Space in cities is becoming a commodity, allowing for manipulation of urban growth while remaining flexible to fit existing planning legislation globally.	The paper conducted a case study in Japan, a country with a distinct architecture culture compared to Malaysia.
PA	Gurcan [14] (2018) - Mutualistic Understanding of Fill-in Architecture	A neglected building can infect a community, leading to continuous disrepair and unproductive conditions, causing the community to become "ill."	Mutualistic architecture, a form of symbiotic architecture, can sometimes act as a catalyst for area rehabilitation, despite its negative connotations.	The research focuses on smaller structural additions, neglecting structural integrity and support options, most buildings studied have not considered these aspects during design and construction.
PA	Letzter [16] (2022) - Additions to historic buildings: between parasite	Additions can be seen as a balance between expanding historic buildings and enhancing their significant values.	Visual dissonance between old and new structures aids understanding historic buildings, comparing additions to prosthetics and parasites,	Lack of methods to evaluate and justify additions to historic buildings, instead of usual conservations for

	and prosthetic architecture		ensuring they assist without threatening their existence.	restoration and preservation.
AR	Faiz Büyükçam [10] (2022) - An evaluation on the adaptive reuse of monuments with a focus on sustainability	Environmental factors, location, relationships with other buildings, and external factors like fire negatively impact the sustainability of a building.	Restoring monumental structures is crucial for protecting history, establishing cultural connections, and providing social and economic benefits to future generations through their active use.	The study focuses on monumental structures with specific criteria and strategies for sustainable adaptive reuse.
AR	Sanchez [22] (2019) - "Deconstruction programming for adaptive reuse of buildings"	Adaptive reuse makes it possible to retrieve components from an obsolete building through deconstruction programming.	The methodology generates high-quality, practical, and realistic deconstruction plans that are user-friendly and customizable for adaptive reuse building project objectives.	The paper discusses the demolition of the original building for adaptive reuse, ignoring conservation and preservation in its original state.
UR	Joanna Williams [15] (2019) - Circular cities: Challenges to Implementing Looping Actions	Cities, as a system of production and consumption, pose a significant threat to global environmental sustainability.	The research highlights the importance of addressing challenges in implementing looping actions across resource types in cities, highlighting the impact of context on these solutions.	The paper states that the impact of context on Looping Actions has not been thoroughly examined.

Bardzinska-bonenberg [4] and Given [13] point out the lack of a consistent and unified approach to the development of parasitic architecture. The absence of a unified approach leads to a lack of unity, rigidity, and grid in architectonic composition. Moreover, Letzter [16] emphasizes the importance of distinguishing between old and new entities in conservation discourse, with additions being an act of compromise between incentives and the need to preserve historic assets. Sanchez *et al.* [22] have further developed a multi-objective optimization model for efficiently sequencing the selective deconstruction of building components, with the goal of maximizing material reuse while minimizing costs and environmental impact.

When it comes to scale, parasitic architecture tends to be of larger scale when built on top of existing buildings and smaller scale in-between or attached projects due to restrictions in structural loads, as studied by Gurcan [14]. Additionally, environmental factors, location, relationship with other buildings, and external factors such as fire can have various effects on the sustainability of a building, as highlighted by Faiz Büyükçam & Eyüboğlu [10]. Moreover, Joanna Williams [15] stated implementing parasitic architecture in circular cities poses various socio-cultural, economic, and financial, information, regulatory, political, institutional, technical and design, and environmental challenges.

From the literature review, it is evident that there is a lack of a consistent and unified approach to the development and implementation of parasitic architecture. Therefore, integrating a design framework into the urban regeneration process can lead to a unified approach in parasitic architecture. Figure 2 illustrates the relationship of design constraint issues in parasitic architecture, focusing on four main themes: challenges within the circular cities paradigm, the exploitation of the original host buildings, tectonic structural conversion issues, and deconstructivist project planning.

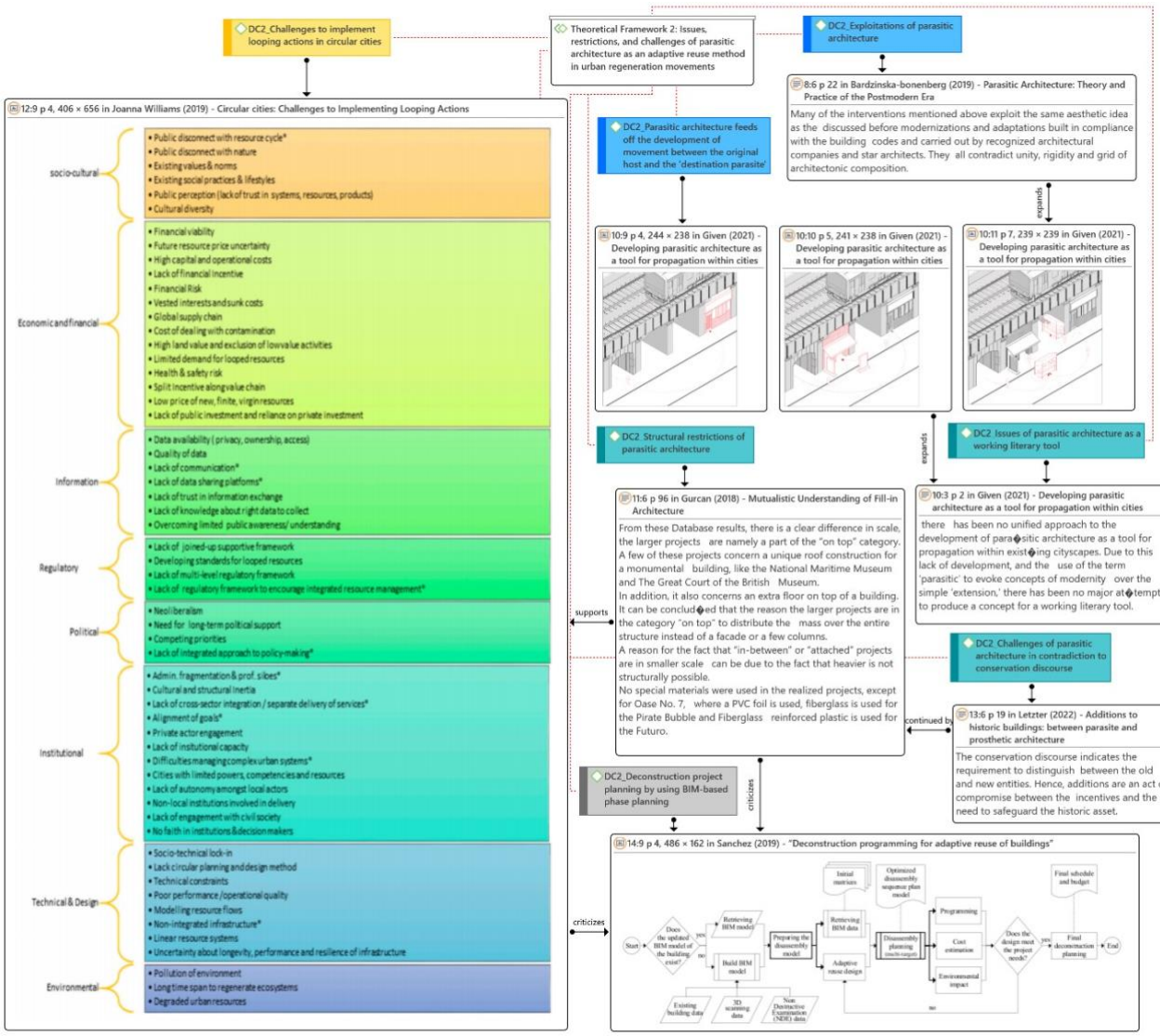


Fig. 2. The Conceptual Framework of DC2.

The first deductive code (DC1) examines the innovative application of parasitic architecture in urban regeneration initiatives, underscoring a prevailing focus in research on heritage and historical structures. Numerous abandoned and underutilized buildings are left aside in this analysis. In contrast, the second deductive code (DC2) draws attention to the design challenges and limitations inherent in parasitic architecture, emphasizing the absence of a standardized approach to developing and deploying this modular design concept in urban revitalization projects. Building upon these key observations, we enhance our methodological conduct through expert interviews with practitioners situated within the specific urban landscape of Kuala Lumpur, Malaysia.

2. Methodology

2.1 Participants

The theoretical frameworks mentioned earlier provide a strong epistemological foundation for conducting expert interviews with professionals in order to gather comprehensive and first-hand insights on the concept of parasitic architecture within the urban development scene. In this case, the sample group for the interview comprises six officers who are also architects and urban designers from

the Kuala Lumpur City Hall (DBKL) Urban Design Unit, with extensive experience and knowledge in urban regeneration projects initiated by the local authority of Kuala Lumpur.

It is important to note that the selection of these individuals as respondents is critical to the validity and reliability of the data gathered through the expert interviews. By choosing professionals who have been involved in projects related to urban regeneration, the interview results are more likely to provide relevant and valuable insights into the use of parasitic architecture within the urban development scene.

The six respondents adhered to a predetermined interview protocol carefully constructed to maintain consistency in their responses and standardize the analysis stage. To uphold privacy, the experts are designated as Expert 1, Expert 2, Expert 3, Expert 4, Expert 5, and Expert 6. The interview was designed to address the two Sub Research Questions, RQ1 and RQ2 derived from the main Research Question (RQ) of the current study, corresponding to the aforementioned DC1 and DC2 (see Table 3).

2.2 Thematic Analysis: Deciphering Expert Interviews

After conducting the expert interviews, the obtained data was analyzed using thematic analysis. The process involved utilizing a thematic analysis matrix, a commonly employed tool to organize and analyze qualitative data in research studies. The matrix usually takes the form of a table or spreadsheet, with rows representing the participants or cases in the study, and columns representing the key themes or categories that emerge from the data (see Table 3).

The thematic analysis matrix enables systematic coding and categorization of the qualitative data into the identified themes or categories and facilitates the identification of patterns and relationships between the themes and the participants or cases. By visualizing the data in this way, the analysis process is made more efficient and effective, and the matrix also serves as a means of checking the consistency and accuracy of the coding and categorization.

Conducting expert interviews with knowledgeable professionals and analyzing the data obtained using thematic analysis matrix is an effective approach to gathering valuable insights into the use of parasitic architecture within the urban development scene. The use of predetermined interview protocols and a thematic analysis matrix ensures consistency, reliability, and validity of the data, and enables the identification of patterns and relationships between themes.

3. Results

3.1 The Thematic Patterns of Parasitic Architecture

The study employs a thematic analysis approach to identify the categories and themes related to parasitic architecture and its potential application in the urban regeneration process, particularly in Kuala Lumpur. The transcriptions of the interviews are meticulously transcribed and subsequently analyzed as supportive data. To facilitate the process, a thematic analysis matrix is utilized, effectively organizing the identified codes and facilitating the development of themes derived from them. As a result, the study identifies two distinct inductive codes, namely ‘Development’ and ‘Innovation,’ as the main themes that emerged from the data.

In terms of Development, the study finds that the current market situation in Kuala Lumpur is primarily driven by economic and political factors. However, adaptive reuse and urban regeneration processes have gradually been implemented in government projects and public and private sectors. Expert 4’s comment on the progressive nature of these developments indicates that adaptive reuse is gaining momentum and could potentially provide a model for the incorporation of parasitic architecture in the future. To quote her statement, “It is a progressive thing [. . .] it has been done gradually in government projects and also public and private sectors where you can see lots of buildings that have been regenerated”.

Regarding innovation, the respondents viewed parasitic architecture as a niche concept that is not yet practical but holds potential as an experimental alternative for adaptive reuse in the urban regeneration process. Expert 3's positive comment on the creativity of parasitic architecture suggests that the concept is worthy of exploration and experimentation by architects. This optimistic view of the potential of parasitic architecture is a significant departure from past research, which suggested that the concept was controversial and faced significant opposition. "It is creative", the Expert 3 says, "if you do something like this actually it is something different in architecture field [. . .] It will be challenging for the architect, but it's very interesting, it is worth to explore".

The study also identifies two inducing codes, 'Issues' and 'Methods,' that further elucidate the potential challenges and opportunities related to parasitic architecture. One of the main issues related to parasitic architecture is the condition of the host building, in terms of its structural integrity and public image. Respondents expressed concerns about the safety of the occupants of the building and the impact on the surrounding structures, as pointed out by Expert 2, "They need to have some concern on how their development will affect the adjacent buildings [. . .] We need to check whether the integrity of the structure is still good, because that structure might impact the safety of the people who are using that building later."

Additionally, the issue of ownership, particularly in the case of old buildings, was raised as a challenge that could impede the implementation of parasitic architecture. To recall Expert 5's opinion, "The challenge is ownership because most are old buildings, the owner has difficulties to be traced up [. . .] Most of the buildings are owned by individual or private property [. . .] Some will give full cooperation, some will not be interested."

In terms of methods, the study finds that adaptive reuse is a viable model that could provide a framework for the incorporation of parasitic architecture. Expert 6's comments suggest that the repurposing of old heritage buildings could serve as a blueprint for enhancing the environment and promoting sustainable urban development. The study also emphasizes the importance of understanding why buildings are abandoned before adapting or reusing them. He states, "What happens in Melaka is slowly happening in Kuala Lumpur, whereby we are doing adaptive reuse of old heritage buildings [. . .] The repurposing or the re-gazettement of houses. We need to know why they were abandoned first, then only we can find a way of how we're going to enhance it or to adapt, to reuse it, to enhance the environment."

The study's thematic analysis approach successfully identifies the potential opportunities and challenges related to the incorporation of parasitic architecture in the urban regeneration process. The positive views expressed by the respondents towards parasitic architecture suggest that the concept is not as controversial as initially thought, and further research is necessary to explore its potential fully. The study also underscores the importance of adaptive reuse and understanding the context of abandoned buildings before embarking on any new development or repurposing initiatives in Kuala Lumpur city.

Table 3
Thematic Analysis Matrix

Main RQ: What are the key criteria of integrating parasitic architecture as an adaptive reuse method for urban regeneration process?
Aim of research: This research will formulate a parasitic architecture design framework for underutilized or abandoned buildings as an adaptive reuse method in urban regeneration process that utilizes new design guidelines and tectonics to cultivate architectural knowledge.
Informants: 6 DBKL officers / architects from different departments within Urban Design Unit involved and experienced in Kuala Lumpur urban regeneration projects.

Research Questions	Deductive Codes	Strategy of Inquiry	Inductive Codes		
			Coding	Category	Themes
Sub RQ1: What are the current innovations in parasitic architecture as an adaptive reuse method among urban regeneration projects?	**DC1.1: Development** of adaptive reuse AND urban regeneration	• Desk review • Expert interview	**Development:** • Progressive • Market driven • Revitalization efforts • Urban planning initiatives • Sustainable development • Public space enhancement • Brownfield redevelopment • Economy, social, and culture • Accessibility and connectivity	**Category 1:** Social and Community Impact **Category 2:** Economic and Market Factors	The strategy for successfully incorporating parasitic architecture as an adaptive reuse method in urban regeneration should incorporate established themes: **Theme 1: Adaptive Reuse and Urban Regeneration**
	DC1.2: Innovation of parasitic architecture		**Innovation:** • Creative spatial solution • Sustainable construction • Cultural and artistic elements • Transformation of obsolete structures • Reimagining public spaces • Flexible and modular • User-centric design • Balancing preservation and modernization • Supporting component • Financing model	**Category 3:** Design and Spatial Solutions **Category 4:** Sustainability and Cultural Elements	**Theme 2: Innovation in Parasitic Architecture**
Sub RQ2: What are the design issues, limitations, and challenges of parasitic architecture as an adaptive reuse method among urban regeneration projects?	**DC2.1: Issues**, limitations, AND challenges of parasitic architecture	• Desk review • Expert interview	**Issues:** • Ownership and property rights conflicts • Niche and experimental • Structural compatibility and technical feasibility • Legal and regulatory constraints • Socio-cultural acceptance and community resistance • Balancing commercial viability and public benefit	**Category 5:** Socio-cultural and Collaborative Factors **Category 6:** Technical and Structural Considerations **Category 7:** Regulatory and Legal Challenges	**Theme 3: Design Issues, Limitations, and Challenges of Parasitic Architecture**
	DC2.2: Methods of adaptive reuse		**Methods:** • Retrofitting and renovation • Repurposing underutilized spaces • Place identity • Collaborative approach • Urban acupuncture • Vertical expansion		

3.2 Formulating the Design Framework

The decision-making process for adaptive reuse is inherently complex, often complicated by varying stakeholder perspectives. Aigwi *et al.* [1], referencing Wang and Zeng [24], emphasize that a range of factors influenced by these differing viewpoints must be carefully considered. Furthermore, Li *et al.* [17] point out the limited research on evaluating built heritage assets for adaptive reuse, highlighting the necessity for more scientific methodologies in this field.

Early analysis of expert interviews and the subsequent identification of thematic patterns not only provide empirical data but also offer context-specific insights relevant to this study. By examining themes from the analysis matrix, the research findings are better grounded in real-world experiences and viewpoints.

These extracted themes are further supported by existing literature. Pınar Tabak and Ayşe Sirel's study [20] reveals that sustainability-oriented interventions in adaptive reuse tend to achieve higher success rates, supporting Arfa *et al.*'s [3] conceptual 10-step model for heritage buildings. While this model requires real-world validation, it shows promise for heritage preservation and urban enhancement. Girard [12] highlights the cultural dimension of the circular economy, aligning with Foster's [11] perspective on sustainable economic transformation. Li *et al.* [17] and Aigwi *et al.* [1] advocate for adaptive reuse as a strategy for sustainability, consistent with the 10-step model and suggesting potential for parasitic architecture. This research aims to evaluate existing adaptive reuse frameworks to formulate a new approach to parasitic architecture for urban regeneration.

Building on this thematic foundation, a design framework is proposed. This framework outlines key elements and parameters for integrating parasitic architecture into adaptive reuse strategies and urban regeneration. The development of this design framework employs a deductive approach, combining insights from the literature review with findings from thematic analysis (see Figure 3).

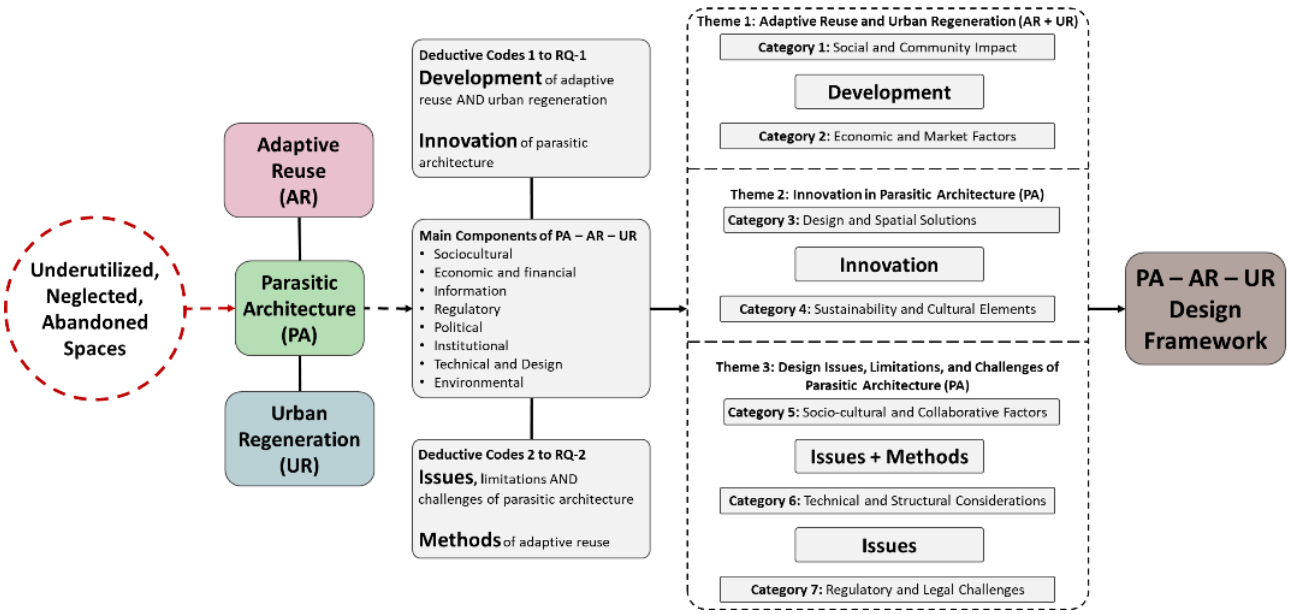


Fig. 3. Design Framework.

The design framework paves the way for the visual representations of proposed design interventions, incorporating them within the specific physical, social, cultural, and environmental context of the site for future exploration. The integration takes into account factors such as scale, materials, functionality, feasibility, and adaptability. Within this framework, the parasitic module emerges as modular components or elements that attach themselves to existing structures or urban environments, utilizing them as hosts. This approach addresses concerns like connectivity,

accessibility, visual harmony, and the impact on existing structures. The three deconstructivist approaches—superposition, in-between, and addition—illuminate the diverse tectonic interactions of the module with the existing context (see Figure 4 and 5).

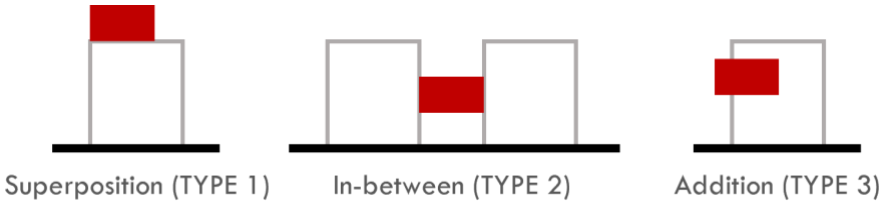


Fig. 4. Derived basic forms of parasitic modules

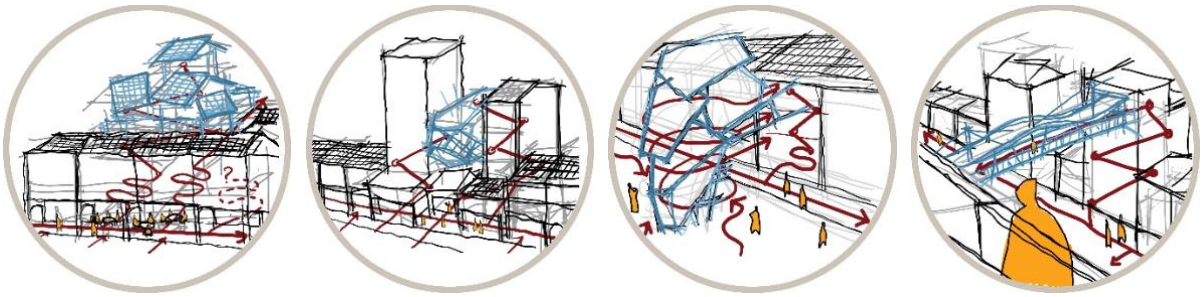


Fig. 5. Schematic designs of modules visualizing the interactions (in red) between the new structures (in blue) with the existing urban context (a) Type 1 (b) Type 2 (c) Type 3 - vertical (d) Type 3 – horizontal.

4. Conclusions

This article highlights the potential of parasitic architecture in revitalizing underutilized urban spaces for adaptive reuse and urban regeneration. It begins by discussing two theoretical frameworks that focus on the relationship between three keywords: parasitic architecture, adaptive reuse, and urban regeneration. The frameworks, referred to as DC1 and DC2, are followed by a thematic analysis that references the outcomes of expert interviews with six selected professionals.

The scope of the current article is limited to the epistemological basis issue in proposing parasitic architecture as an adaptive reuse method for the urban regeneration process. Departing from this, we look forward to further exploring the effectiveness of this parasitic architecture framework within the context of design practice research. It can adopt both quantitative and qualitative approaches by conducting a case study on similar adaptive reuse projects with parasitic architectural features in Malaysia and comparing them with overseas developments. The research outcomes will benefit multiple stakeholders in various ways. For instance, local authorities in urban city planning can use the research findings to prepare a design guideline on parasitic architecture for future urban regeneration and developments. Similarly, the Department of National Heritage can adopt new models of modern conservation and adaptive reuse methods, while heritage property owners and the Ministry of Tourism, Arts, and Culture (MOTAC) can explore new options for expanding spaces in their old buildings and repurposing them to meet modern needs and increase user capacity.

Furthermore, the use of this research in urban regeneration can help balance work and life, improve sustainability, and efficiency in daily urban living. We argue that parasitic architecture can inject a sense of community into non-livable city centers and improve the sustainability and efficiency of urban developments. As quoted in the opening of this article, the deconstructivist architect Lebbeus Woods [25] once said, “The architect must become, more than ever before, a creature of the present, fusing all that is remembered and all that is dreamt within it, as though existence itself were hanging in the balance” (1997: 28).

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