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USER-CENTERED BUILT ENVIRONMENT FOR COMMUNITY PARTICIPATION OF CULTURAL CENTER IN RELATION TO ADAPTIVE ARCHITECTURE

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ABSTRACT

This study explores the integration of adaptive architecture as a strategic framework for designing user-centred built environments. By prioritizing an understanding of the dynamic relationship between users and their surroundings, architects can address the communities' evolving needs and demands. Adaptive architecture serves as an innovative approach to creating designs that respond to these dynamics, fostering more inclusive and functional spaces. The research highlights the critical importance of preserving intangible cultural heritage. Beyond strengthening local culture and identity, this preservation contributes to tourism development and economic growth, positioning cultural centres as pivotal spaces for community engagement and participation. This study focuses on adaptive architectural strategies within the context of cultural centres, investigating how such approaches can enhance user-centred design. Employing literature reviews, document analysis, and case studies, it examines the theoretical connections between human behaviour and the built environment. By bridging these insights with practical applications, the research aims to guide architects in creating culturally significant, responsive spaces that balance tradition with innovation and sustain community needs into the future.

Keywords: *User-centred built environment, Community participation, Cultural centre, Adaptive architecture*

INTRODUCTION

Distinctiveness and local identity are vital for enhancing competitiveness in the tourism sector. Research by the OECD highlights the mutually beneficial relationship between culture and tourism, showing that cultural promotion can significantly boost a destination's attractiveness. In Malaysia, a multi-racial and multi-cultural country, heritage tourism plays a crucial role in drawing tourists with interests in culture and arts. Malaysia's tourism encompasses five main categories: Cultural Heritage Tourism, Adventure Tourism, Medical Tourism, Beach Tourism, and Agricultural Tourism. Among these, heritage tourism serves as an essential marketing tool, effectively encapsulated by the slogan "Malaysia Truly Asia," which reflects the country's diverse cultural heritage. Cultural heritage includes both tangible and intangible forms, as defined by UNESCO, encompassing knowledge, beliefs, arts, and customs within a society.

Cultural centres are pivotal in promoting and sustaining this heritage through local activities such as education, events, workshops, and festivals. However, active community participation is essential for these centres to thrive. Despite its importance, challenges remain in ensuring effective engagement within cultural centres due to changing community dynamics. This necessitates a user-centred design approach in cultural centre architecture to accommodate evolving needs. The primary aim of this study is to propose design solutions for user-centred built environments that enhance community participation in cultural centres through adaptive architecture strategies. The specific objectives include understanding the relationship between user-centric built environments and community participation, identifying how adaptive architecture can facilitate user-centred designs that promote engagement, and reviewing the application of these strategies in the Malaysian cultural centre. By addressing these objectives, this research seeks to bridge existing gaps in the literature regarding effective strategies for integrating community needs into the design of cultural spaces. Ultimately, it aims to contribute to the

sustainability of Malaysia's rich cultural heritage while fostering economic growth through tourism.

User-Centred Built Environment and the People

User-centred design (UCD) is defined as a design philosophy that prioritizes the needs, wants, and limitations of end-users throughout the design process. Various scholars have contributed to this definition, affirming that UCD focuses on users as the primary consideration. Donald Norman's work in the 1980s popularized UCD, emphasizing usability based on user needs and experiences. The essence of UCD lies in accommodating user feedback, which enhances safety, effectiveness, and satisfaction.

Table 1. Definition and Discussion of User Centred Design from Scholars

No	Definition and Discussion	Source
1	User Centered Design is a system design method that focuses on potential users. To ensure that the product will create the best user experience, designers involve users throughout the design process.	(D. R. Anamisa, F.A. Mufarroha, F.R. Oktaviyani, N. P. Angganata, M. D. A. Mijahir, 2021)
2	User-Centered Design, also known as UCD, is a design process that focuses on the user and on solving their needs.	(Aela, 2022)
3	UCD is defined thus: “User-centred design is a broad term, used to describe a design philosophy and a variety of methods in which the needs, wants, and limitations of end users are placed at the centre of attention at each stage of the design process” (Uckelmann et al. 2011, p.68)	(Alzaed, A and Boussabaine, A.H, 2012)
4	User-centered design (UCD) is a design approach that places the needs and preferences of end-users at the center of the design process.	(Xavier, 2022)
5	‘User-centered design’ (UCD) is a broad term to describe design processes in which end-users influence how a design takes shape.	(Abras, C., Maloney-Krichmar, D., Preece, J. , 2004)

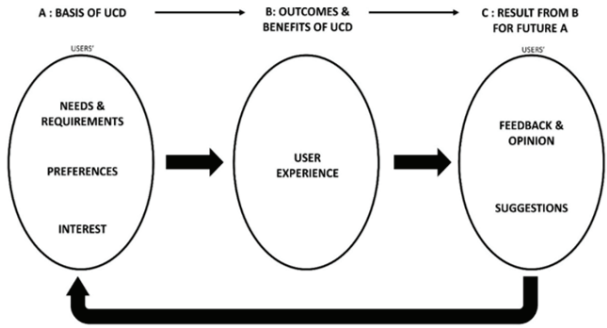

Figure 1. Conceptual Diagram for Relationship of User-Centred Design and Users

Source: Author (2024)

The concept of a user-centred built environment (UCBE) applies user-centred design (UCD) principles to physical spaces, focusing on creating environments that meet the needs and preferences of users. UCBE emphasizes designing buildings and infrastructure that enhance functionality, comfort, and user satisfaction. Studies show that incorporating UCD into architectural design improves usability, fostering better emotional and functional engagement with spaces. Key factors such as safety, comfort, and environmental suitability play significant roles in shaping user experiences, highlighting the importance of understanding how users interact with their surroundings.

A user-centred built environment considers user experience first and foremost where it evolves around psychological comfort, functional comfort and physical comfort. The considerations especially involve interalia functional requirements and preferences, socio-cultural context, and local environmental context to be applied to the built environment design to carry out the programme efficiently. A user-centred built environment for the community shall be generalised. Thus, design solutions that designers should take into account are that are universal in terms of affording functional comfort, physical comfort and psychological comfort. This is so that the usability of the built environment can be optimised, where it becomes suitable for as many people as possible and also usable in as many ways as possible. On top of that is the consideration that the needs and preferences of the people are dynamic, considering the change of time and the relevance of the needs according to time. This indicates flexibility and adaptability

may act as a strategy for both generalisation and dynamicity of needs and preferences of the community.

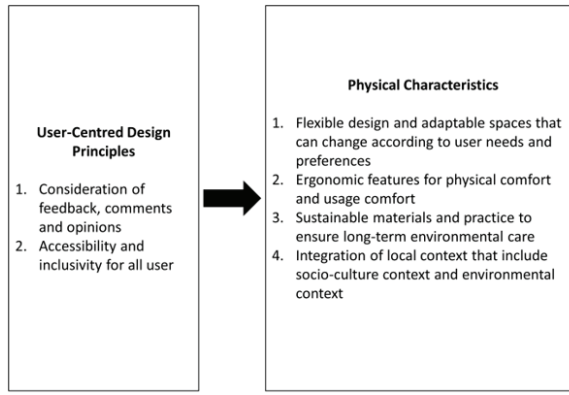

Figure 2. Relationship Between User-Centred Design Principles and Physical Characteristics

Source: Author (2024)

User-Centred Built Environment (UCBE) for Community Participation (CP)

Table 2. Definition and Discussion of Community Participation

Source	Definition and Discussion
Nestor Asiamah, Kyriakos Kouveliotis, Richard Eduafo and Richard Borkey (2020)	Community participation refers to the active involvement and engagement of individuals within a community to address common issues, make decisions, and implement solutions that affect their lives and surroundings.
Zhu, Y. (2015)	Community participation involves the collaboration of community members in planning, decision-making, and implementation processes of projects or initiatives that impact their community, ensuring their voices and perspectives are considered.
Botini, L. (2018)	Community participation is the process by which individuals in a community engage in collective actions, share responsibilities, and contribute to the development and improvement of their environment and social conditions.
Butterworth, I. (2000)	Community participation entails the inclusion and active involvement of community members in various stages of project development, from needs assessment to planning, implementation, and evaluation, ensuring that their needs and preferences are addressed.

Heng Zhang, Rodney H. Matsuoka and Yu-Jan Huang (2018)	Community participation encompasses the engagement of local residents in identifying problems, proposing solutions, and taking part in the execution and monitoring of community-based projects, fostering a sense of ownership and responsibility.

A user-centred built environment (UCBE) in cultural centres can play a key role in encouraging community participation by addressing the diverse needs and preferences of urban communities. Inclusive design helps create spaces that invite organic and spontaneous engagement, resonating with cultural identities and fostering social connections. These spaces go beyond functionality, strengthening community bonds and creating meaningful places for interaction. Community participation is driven by socio-economic, psychological, and cultural benefits, supported by accessible, user-friendly environments. Spaces should be designed to adapt to the changing needs of communities, offering flexibility and inclusivity while encouraging a sense of belonging and interaction. Facilities and amenities that address psychological, physical, and cultural needs can inspire greater participation and foster deeper community connections. Carr (1982) highlights the importance of urban forms that align with environmental preferences and support diverse activities. Designing spaces that reduce barriers to participation and accommodate different uses can increase engagement and well-being.

The local context is the biggest factor in community participation. The built environment should provide psychological, physical, socio-economic, and socio-cultural benefits through user-friendly, flexible, and diverse communal facilities. These spaces must encourage engagement by being accessible, inclusive, comfortable, and adaptable to various activities. Good circulation planning and spatial design help maximize usage and social interaction. Facilities should be responsive to local culture and the environment, ensuring they serve as many people as possible. When spaces are inviting and functional, community interest grows, leading to greater participation and a stronger, more connected community. By ensuring cultural centres are flexible, accessible, and responsive to local contexts, they can become dynamic hubs for community life. Thoughtful spatial planning and socio-cultural alignment allow these spaces to support evolving community needs, encouraging participation and creating environments where people can connect, interact, and thrive.

User-Centred Built Environment (UCBE) for Community Participation (CP) Using Adaptive Architecture

Adaptive architecture is a multidisciplinary field that designs buildings to adapt to their environments, users, and evolving needs. It emphasizes flexibility, adaptability, and sustainability, aiming to extend a structure's lifespan while accommodating diverse functions. Key concepts include spatial, functional, and structural adaptability, supported by technologies like modularity, mobility, and recyclable materials.

Spatial adaptability involves dynamic layouts, expandable spaces, and reconfigurable furnishings, enabling multifunctionality. Functional adaptability addresses changing uses, promoting open-plan designs and modular furnishings for ease of transformation. Structural adaptability focuses on durability, modular components, and compatibility for upgrades, repairs, or adaptive reuse. Adaptive architecture integrates flexibility and resilience, aligning with socio-economic, cultural, and environmental needs. Early design stages play a crucial role in embedding these strategies, ensuring sustainable, long-term usability. By balancing permanent and impermanent elements, adaptive architecture supports dynamic, user-centred built environments that foster community participation and address evolving societal demands efficiently.

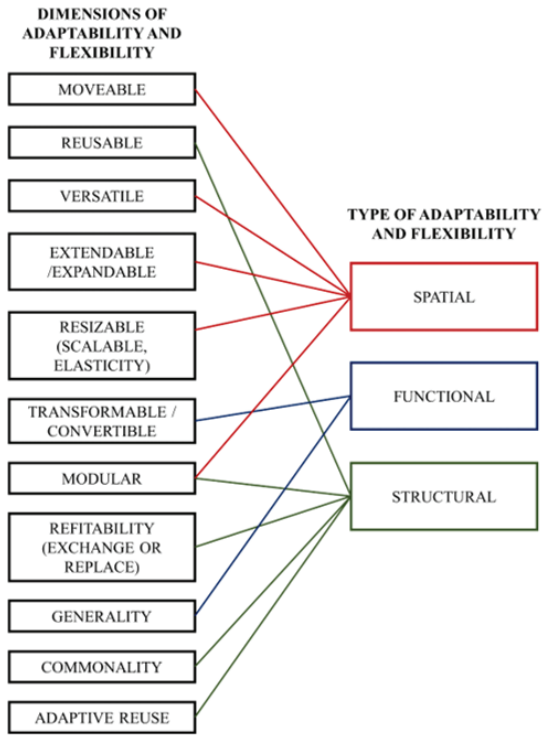

Figure 3. Relationship between Dimensions and Types of Adaptability and Flexibility

Source: Author, 2024

Table 3. Permanent Attributes to be Considered in Designing the Built Environment

Permanent attributes	Type of Adaptability and Flexibility		
	Functional	Spatial	Structural
Open Plan Layout	Generalisation (Multifunctional)		Clear Span
Big Volume	Accommodate change of use	Expanding/ Extending	Upgrading works
Flat floors	Generalisation (Multifunctional)		Upgrading works
Load Bearing External Wall	Accommodate change of use		Strong structural system
Minimal finishes	Accommodate change of use		
Material	Accommodate change of use		Durable, Reusable
Regular column spacing	Accommodate change of use		Commonality for structural components

Table 4. Impermanent (Changeable) Attributes for a Dynamic Built Environment Focus on Diverse Usage and Users

Impermanent (changeable) attributes	Type of Adaptability and Flexibility		
	Functional	Spatial	Structural
Interior non-load bearing partitions	Convertible: Accommodate change of use	Adjustable partitions (change of size)	Does not affect fundamental structural system
Moveable Furniture	Convertible: Accommodate change of use	Reconfigurable, change of layout	n/a
Modular Furniture	Convertible: Accommodate change of use	Adjustable according to need	n/a
Mechanical Fasteners (non-adhesive jointing)	Long term functional through change of use	n/a	Maintaining and Upgrading works for ease of deconstruction and reassembly

Source: Author, 2025

Achieving UCBE for CP relies on communal facilities that are accessible, inclusive, diverse, functional, and comfortable while responding to the local context. The goal is to engage as many people as possible by ensuring spaces support a wide range of users and activities. Limited use discourages engagement, making spaces feel unusable or unhelpful. Adaptive architecture allows for this by ensuring functional, spatial, and structural flexibility. A flexible design supports multi-programmes, ensuring spaces remain relevant, dynamic, and beneficial. By prioritizing adaptability and generalization, the built environment can continuously serve the community's evolving needs, fostering stronger participation and connection.

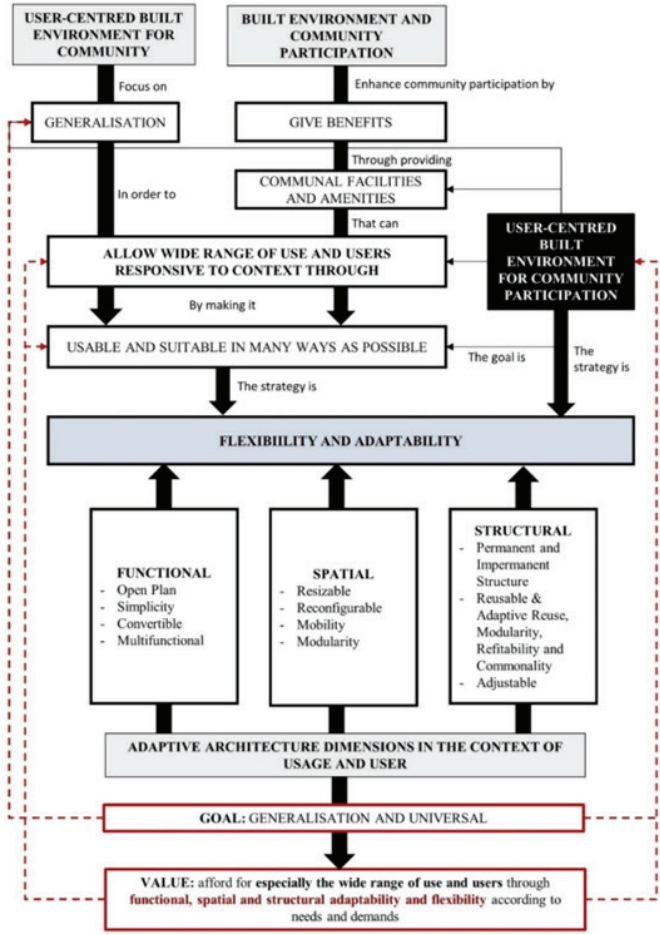

Figure 4. User-Centred Built Environment for Community Participation Through Adaptive Architecture

Source: Author (2024)

RESEARCH METHOD

This research followed a clear step-by-step process. It started with identifying the problem and understanding its significance. Then, a literature review explored the existing studies. Data was collected through observations and case studies, allowing for comparisons. Finally, the findings were analyzed, leading to design strategies and future research recommendations. This

research followed a clear step-by-step process. It started with identifying the problem and understanding its significance. Then, a literature review explores existing studies. Data is collected through observations and case studies, allowing for comparisons. Finally, the findings were analyzed, leading to design strategies and future research recommendations. The method used for this study was mainly through literature review, document analysis and case studies. This is due to the most crucial part of this research is the understanding theories and finding the linkage between the built environment and human behaviour where in the context of this research is generalised as the focus is the community.

Finding the linkage allowed us to focus more on the specific part related, thus discovering potentials in architecture by reviewing based on existing examples. Literature review and document analysis aim to understand the relationship between a user-centric built environment and community participation, and also to identify how adaptive architecture can help afford a user-centred built environment for community participation. Meanwhile, a case study is to review adaptive architecture strategies applied in the cultural centre in Malaysia as a user-centred built environment for community participation in relation to findings from the literature review and document analysis.

DATA COLLECTION

In this research, the primary data includes the data obtained from case study visits through visual observation and experience. The case studies selected for primary data collection refer to the scope of study such as in Table 5. In relation to the focus of this study and findings from the literature review, the criteria of buildings selected should fulfil such requirements shown below:

i)Building usage, typology: community, place of assembly
ii)Building programme: cultural
iii)Building age: at least two decades (considering how the building ensures and sustains community participation over a period of time)
iv)Building location: Urban context in Malaysia

The case studies selected were all allocated within Kuala Lumpur, Malaysia which include Kuala Lumpur Performing Arts Centre (KLPAC),

REX KL, The Godown and Slate at the Row. Meanwhile, Secondary data used for this research were resources that include articles, journals, books, videos, official websites and social media itself. Articles, journals and books were used to achieve RO1 and RO2 through literature review and document analysis. Meanwhile, videos, official websites and social media were to obtain data that was not able to be obtained related to the community use during the period of case study visits, such as (not limited to) past collective action.

RESEARCH DESIGN

This research is qualitative with unobtrusive collection of primary data through observation from the case study visit. The primary data collection will focus on functional, spatial and structural adaptability and flexibility as discussed in the literature review. Below shows the table of permanent and impermanent attributes that contribute to functional, spatial and structural adaptability and flexibility according to findings from the literature review and document analysis. These attributes will be used in analysing specifically communal facilities and amenities.

Table 5. Permanent Attributes Unobtrusive Collection

Permanent Attributes	KLPAC	REXKL	The Godown	Slate at the row
Open Plan Layout				
Big Volumes				
Flat Floor				
Load Bearing External Wall				
Minimal Finishes				
Durable and Reusable Material				
Regular column spacing				

Source: Author, 2025

Table 6. Impermanent (changeable) Attributes Unobtrusive Collection

Impermanent (changeable) attributes	KLPAC	REXKL	The godown	Slate at the row
Interior non-load bearing partitions				
Moveable furniture				

Modular furniture				
Mechanical fasteners				

Source: Author, 2025

FINDINGS AND DISCUSSION

Application Of Permanent Attributes In Selected Case Studies

In general, most permanent attributes of adaptability and flexibility are applied in all case studies. The case studies show that open layouts and flat floors enhance flexibility, accessibility, and community participation. KLPAC's Pentas 2 and Indicine allow diverse uses, unlike Pentas 1, which is restricted by fixed furniture and stepped flooring. REXKL's RXP-REXPERIENCE supports various events, but BookXcess lacks adaptability due to its stepped floor. The Godown is the most versatile, with fully adaptable spaces and good accessibility. The Slate at The Row also offers multipurpose spaces for workshops, exhibitions, and cultural events. Overall, open layouts and flat floors create dynamic, inclusive spaces that better serve evolving community needs. Big volumes enhance functional and spatial adaptability, allowing spaces to evolve for future needs. Pentas 1& 2 at KLPAC and BookXcess benefits from its large volume. At BookXcess, the big volume makes a former cinema more functional despite its stepped floor. The Godown's former warehouse adapts well for various uses, while The Slate's double volume supports changing spatial programs.

Load-bearing external walls and well-placed columns support functional and spatial adaptability in large activity spaces. All case studies ensured unobstructed movement by placing columns in supporting areas, not main halls. The Godown's AiR Building uses open concepts with round columns, proving that strategic placement enhances flexibility for long- and short-term use. Lastly, all case studies showed the use of minimal finishes, especially through exposed structure of walls and roofs. All case studies portray the use of durable and reusable materials as proven through the adaptive reuse of the case studies and also the use of concrete, steel and bricks.

Table 7. Permanent Attributes Applied in Selected Case Studies

Permanent Attributes	KLPAC	REXKL	The godown	Slate at the row
Open Plan Layout	√	√	√	√
Flat Floor	√	√	√	√
Big Volumes	√	√	√	√
Load-Bearing External Wall	√	√	√	√
Minimal Finishes	√	√	√	√
Durable and Reusable Material	√	√	√	√
Regular column spacing	√	√	√	√

Source: Author, 2025

Application Of Impermanent Attributes In Selected Case Studies

Generally, most impermanent attributes for adaptability and flexibility are applied through moveable furniture in all case studies. Very few apply interior non-load bearing partitions that are adjustable, and only KLPAC applies the use of modular furniture. Impermanent attributes like movable partitions, modular furniture, and mechanical fasteners enhance adaptability and flexibility in all case studies. REXPERIENCE and BookXcess use removable partitions to adjust visual connection or create enclosed spaces for digital art experiences, blending seamlessly with the permanent structure. KLPAC's Pentas 2 uses a movable cyclorama for adjustable stage settings, allowing different spatial configurations. Movable and modular furniture gives users the freedom to reconfigure spaces based on needs. KLPAC's Pentas 2 is the only case study with modular furniture, maximizing functional adaptability. While most structures use cast-in-place concrete, steel, and brick, some mechanical fasteners are observed, allowing for future modifications.

Table 8. Impermanent (changeable) Attributes Applied in Selected Case Studies

Impermanent (changeable) attributes	KLPAC	REXKL	The godown	Slate at the row
Interior non-load bearing partitions	√	√		
Moveable furniture	√	√	√	√
Modular furniture	√			
Mechanical fasteners				

Source: Author, 2025

CONCLUSION

This research examines how adaptive architecture can create a user-centered built environment (UCBE) for community participation in cultural centers. It explores the relationship between the built environment and the community, emphasizing adaptability and flexibility as key factors in making spaces inclusive, accessible, and functionally diverse. Findings reveal that UCBE for CP thrives when spaces accommodate a wide range of uses, users, and ways of use. This is achieved through permanent and impermanent attributes. Permanent attributes include open-plan layouts, big volumes, flat floors, load-bearing external walls, minimal finishes, and durable materials. Impermanent attributes, such as movable partitions, modular furniture, and mechanical fasteners, allow for further adaptability. Case studies of Malaysian cultural centers show that permanent attributes, especially adaptive reuse, play a dominant role in adaptability and flexibility. Historic buildings with big volumes, open layouts, and flexible structures are often repurposed for new cultural uses. However, impermanent attributes are underutilized, suggesting an opportunity for improvement.

To enhance adaptability, cultural centers should explore impermanent attributes like modular elements and dynamic structures. KLPAC's modular design demonstrates how such features can enhance functional flexibility. Additionally, integrating dynamic structures can accommodate changing programs and community needs more effectively. The implementation of adaptive architecture in cultural centers has significant community and urban development implications. Flexible, multi-use spaces foster social inclusion, enhance participation, and promote sustainability by optimizing the functionality of existing structures. Expanding the application of impermanent attributes will further strengthen user-centered, community-driven environments in cultural centers.

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