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Adaptive interior design for heritage buildings: Balancing conservation and modern functionality

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Abstract

Heritage buildings are cultural and historical landmarks, yet many face neglect due to changing societal needs. Adaptive interior design offers a sustainable approach to repurposing these buildings for modern use while respecting their historical essence. This paper explores adaptive reuse principles, methodologies, and challenges, presenting case studies to illustrate best practices. By integrating modern functionality with historical preservation, adaptive interior design safeguards heritage and promotes sustainability and contemporary relevance. This paper focuses on the transformation of the Samsung Opera House in Bengaluru, India, as a primary case study, examining how its adaptive interior design retains historical integrity while introducing cutting-edge technology and contemporary functionality.

Keywords: Adaptive, design, heritage, buildings, modern, functionality, methodologies

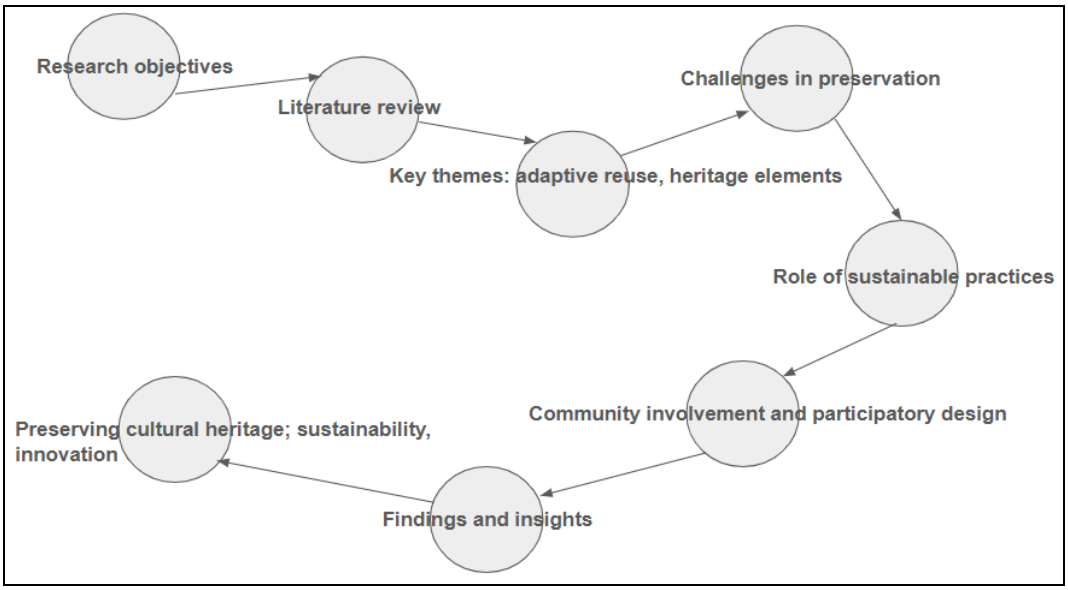
Introduction

Heritage buildings are vital links to our cultural and architectural history, reflecting the aesthetic, functional, and societal values of their time. These structures often face neglect or demolition due to urbanization, financial pressures, or changing functional requirements. Adaptive reuse is an innovative solution that involves reimagining these buildings for contemporary purposes without compromising their architectural integrity or cultural significance.

Adaptive interior design focuses specifically on the internal transformation of these spaces, ensuring they meet modern demands while preserving their historical identity. This approach provides numerous benefits, including environmental sustainability by reducing construction waste and retaining embodied energy, cultural continuity by preserving historical narratives, and economic viability through revitalized functionality.

The Samsung Opera House, a colonial-era structure in Bengaluru, India, serves as a notable example of adaptive reuse. Originally constructed as an opera house in the early 20th century, the building underwent a significant transformation to become Samsung's flagship store, blending state-of-the-art technology with heritage conservation. This paper explores the methodologies, challenges, and outcomes of the Samsung Opera House transformation, placing it within the broader context of adaptive reuse practices. This paper delves into the principles, challenges, and strategies of adaptive interior design for heritage buildings. It also examines successful global examples and offers recommendations for future practices.

Research objectives and Methodology



Objectives

This research aims

- Identify strategies for balancing historical preservation and modern functionality.
- Analyze challenges and solutions in adaptive interior design.
- Provide recommendations for sustainable and culturally sensitive reuse practices.

Methodology

The study employs a mixed-methods approach:

- Analysis of successful adaptive reuse projects globally and detailed examination of the Samsung Opera House transformation.
- Insights from architects, interior designers, and conservationists.
- Review academic papers, conservation guidelines, and project reports.

Design Strategies for Adaptive Reuse

Combining modern materials like glass and steel with traditional elements such as wood and stone can create a cohesive aesthetic. For example, glass partitions can maintain openness while highlighting historical walls. Reconfiguring interiors to suit new functions is critical. Open layouts, multifunctional spaces, and modular designs allow flexibility while respecting the original architecture.

Lighting plays a vital role in enhancing architectural features. Techniques like uplighting can emphasize arches and columns, while modern LED systems provide energy efficiency. Smart technologies, including automated climate control, can improve functionality without altering the building's structure.

Selecting furniture and décor that complement the heritage style is essential. Custom-made or vintage pieces can harmonize with the historical narrative, while contemporary elements provide contrast and functionality.

Challenges in Adaptive Interior Design

Heritage buildings often need help with issues like weakened foundations, outdated construction techniques, or unsuitable layouts for modern use. Solutions include reinforcing structures with modern materials while maintaining their historical appearance.

Heritage conservation laws vary globally and often impose strict guidelines on alterations. Designers must navigate these regulations to balance preservation and innovation.

Adaptive reuse projects can be cost-intensive, especially when specialized craftsmanship or materials are required. Financial incentives such as government grants or tax benefits can alleviate this burden.

Balancing the cultural significance of a heritage building with contemporary design demands careful consideration to avoid eroding its identity.

Literature Review

Case Study 1: The Department store Brixton- London

The Department Store Brixton, located in London, is a prime example of adaptive reuse, transforming a historic early 20th-century department store into a multifunctional space for retail, community, and cultural activities. Originally a key symbol of local commerce in Brixton, the building fell into disuse due to shifting retail trends before undergoing a thoughtful restoration and repurposing effort.

The project prioritized maintaining historical integrity while introducing modern functionality. Many original features were preserved, including exposed brickwork, high ceilings, large windows, mahogany and teak parquet flooring, cast iron radiators, and a central tiled staircase. Layers of paint were stripped to reveal authentic materials such as brick, stone, marble, and terracotta, emphasizing the building's industrial roots.

The design approach respected the past while adding modern touches. For instance, the original leaf motif from railings was highlighted with gold paint, creating a contrast with the aged appearance of the rest of the railing. This motif was subtly incorporated into the new carpet design, blending historical references with contemporary aesthetics. Voids were cut through the building to create dramatic volumes and improve vertical connectivity, offering striking vistas between levels.

Sustainability was a central focus, with existing materials reused where possible. Energy-efficient systems, including solar panels and advanced heating and cooling solutions,

were introduced to reduce the building's environmental footprint. Natural lighting was maximized to enhance energy efficiency and the ambiance of the interior.

As part of the restoration, community involvement was prioritized. Children were invited to create drawings converted into LED light installations displayed on the building's glass facade. The apex copper dome, which had deteriorated over time, was replaced with a bespoke glass and steel structure featuring emerald-tinted glass to harmonize with local copper cupolas, designed in collaboration with Swiss specialists.

Through careful preservation and thoughtful modernization, The Department Store Brixton retains its historical character while serving contemporary needs, making it a standout example of sustainable and community-focused adaptive reuse.

Case study 2: Alila Fort Bishangarh - Kings and Knights heritage hotels

Alila Fort Bishangarh, a 230-year-old Kachawa clan fortress, was transformed into a heritage hotel, reviving the historic structure that had remained vacant for years. The fort, perched atop a granite hillock, showcases the Jaipur Gharana architectural style, blending Rajput and Mughal influences, which inspired the restoration process.

The original structure, including stone-carved pillars, was preserved, while an upper wing and outer envelope were added to adapt the fort for modern use. The organic design of the fort, with no 90-degree angles, posed significant challenges for layouts and modern interventions. All materials for construction and furnishings were locally sourced within a 100km radius, and local artisans and craftsmen were involved in the restoration, leveraging the rich cultural heritage of Rajasthan.

The hotel features 59 uniquely shaped rooms with Jharokha-style windows, designed to enhance views of the Rajasthan landscape while maintaining architectural integrity. Unequal window sizes were intentionally used to improve views without affecting the fort's elevation, painted to match the fort's original colors.

Four vertical lifts, two staircases, and a kitchen lift were integrated to modernize the structure while using traditional methods like ropes for transporting goods during construction.

Restoration used natural materials like sandstone, marble, and granite, along with locally sourced plaster to blend with the original structure.

Design details include stone lattice work, vegetable dye frescoes, metal jaali screens, brass embossing, and traditional woodwork. Custom-made furniture and lighting were designed using traditional techniques such as block printing, tie-dye, and Gudri work, reflecting Rajasthan's cultural craftsmanship.

Natural lighting was prioritized with deliberate cutouts and the use of the central courtyard to illuminate common areas and corridors. Jaalis and screens in the corridors create dynamic reflections and patterns that evolve throughout the day, enhancing the fort's atmosphere.

Strategies for adaptive reuse of historic buildings in Western Rajasthan

Adaptive reuse in Western Rajasthan preserves historic buildings by giving them contemporary functions, ensuring cultural heritage is maintained while addressing modern demands. This sustainable strategy extends the lifecycle of structures, minimizes demolition, and retains embodied energy amidst urbanization pressures. The region's architecture, characterized by climate-adaptive designs, local sandstone, and intricate ornamentation, faces threats from urbanization, tourism, environmental stress, and neglect. Challenges include material deterioration, foundation issues, and insensitive modernization, often compromising historical integrity. Effective preservation demands thorough documentation using advanced technologies, minimal intervention strategies, and community engagement. Adaptive reuse not only addresses structural challenges but also revitalizes communities, transforming abandoned spaces into vibrant hubs. Enhancing non-invasive assessment technologies, improving energy efficiency, innovative funding models, and supportive policies can further advance these projects, while education and awareness are crucial for fostering public appreciation of architectural heritage.

A Comprehensive review of cultural heritage integration in interior design

This review (2019–2023) explores the intersection of interior design and cultural heritage, identifying themes like adaptive reuse, recycling materials, heritage elements in design, preservation challenges, and sustainable practices. Emphasizing the role of interior design in cultural preservation, it highlights adaptive reuse as a sustainable strategy to repurpose historic buildings while maintaining their cultural and architectural integrity. Recycling construction waste and integrating heritage elements enrich designs and foster sustainability, cultural identity, and national pride. Challenges in funding, environmental damage, and development pressures demand innovative preservation strategies, community involvement, and modern methods. A proposed framework guides future research in preserving heritage through sustainable practices, integrating traditional elements, and advancing cultural significance in contemporary design.

Understanding adaptive reuse

Adaptive reuse is defined as the process of repurposing old buildings for new uses while retaining their historical and architectural elements. The concept has gained traction as cities strive to balance heritage conservation with urban development. Notable frameworks for adaptive reuse, such as those outlined by the International Council on Monuments and Sites (ICOMOS), emphasize respecting the original structure while introducing subtle modern interventions.

Principles of adaptive interior design

Research emphasizes several core principles:

- Avoid unnecessary changes to preserve authenticity.
- Ensuring changes can be undone if needed for future restoration.
- Using materials and designs that complement the original structure.

Heritage buildings often feature high-quality, durable

materials. Reusing these materials reduces resource consumption and landfill waste, aligning with sustainability goals. Incorporating energy-efficient systems like LED lighting, solar panels, and modern HVAC systems can further enhance the environmental benefits.

Literature highlights challenges such as structural limitations, compliance with heritage preservation laws, and financial constraints. Maintaining cultural relevance while adapting to modern tastes also requires sensitive design approaches.

Samsung Opera House: Transformation through Adaptive Reuse

Historical Background

Constructed during the British colonial era, the Opera House in Bengaluru was initially envisioned as an entertainment hub, hosting musical performances and cultural events. Over the years, the building fell into disuse, symbolizing the challenges faced by many heritage structures in urban India.

The Adaptive Reuse Project

In 2018, Samsung India undertook a project to transform the opera house into its largest experience center. The goal was to blend cutting-edge technology with the building's colonial architecture, creating a space that serves both as a retail hub and a cultural landmark.

The building occupies a space of 33,000 sq. ft and is rectangular with an unobstructed central space with double height. The front facade faces the west.

It has verandas on both the longer sides of the building. The central space is surrounded by a series of columns supporting the semi-circular arches and the balcony above. The balcony overlooks into the central space which was once used as private dining balconies overlooking the dance floor. It had four entrances, two to the ground floor from the south façade and two directly to the first floor through an external staircase on the front facade(west).

In the ground floor, the columns were built in front of the entrances to optimize sound. The double height not only added grandeur but also added to the acoustics of the building. The monotony of the rectangular building was broken by the curved organic shaped balconies.

The stage was placed at the rear end of the building and was used for theatrical performances and boxing matches. The verandas were lined by series of smalls columns that added value to the facade of the building.

It had a semi-circular roof from the inside whereas from the outside it was sloped and was covered by Mangalore tiles. The western facade of the building looked like a pediment and had two staircases leading to the first floor.

Construction

Constructed using locally available materials, the building stands on a stone plinth approximately 2m high. The walls are made of stone, cemented with lime mortar and plastered with mud; they are approximately 13cm. The lintels and balustrades were made of stone. Timber was used for flooring and roofing. The roof was built from timber rafters and covered with Mangalore tiles.

Design Strategies

The building's original façade, with its intricate cornices and colonial arches, was meticulously restored using traditional materials and techniques. Interior spaces retained their original proportions, with careful attention to historical detailing such as ornamental moldings and exposed brickwork.

State-of-the-art features like virtual reality zones, a home theatre experience, and smart appliance displays were seamlessly integrated. Energy-efficient LED lighting highlighted architectural features while maintaining a modern ambiance.

The opera hall was repurposed into a multipurpose space that hosts product launches, workshops, and cultural events.

Flexible seating and modular layouts allow the space to adapt to various uses without altering its historical structure.

Sustainable materials, such as reclaimed wood and locally sourced tiles, were used in interiors to align with environmental goals.

Furniture and fixtures combined modern minimalist styles with vintage aesthetics, creating a harmonious blend of old and new.

Renovation

The veranda around the building was covered and is now used as office or display area. The stage was retained in the same space but was renovated with a huge display screen and some seating space near the screen. The space beside the stage was utilized for the washroom and services like lift and storage room. To install the HVAC system the verandas were covered with glass and air-con ducts were placed under the balconies to distribute air to both the ground and first floor and a false ceiling covered the ducts on the ground floor.

Three entrance doors were added on the south façade and a fire exit on the west façade and few other openings were converted into fixed windows to allow light into the building. The interior was partitioned using timber and glass. A café was also added on the west end of the building. The lighting in the interior of the Opera house is completely different from its dull and dark past.

The heavy curtains used to block sunlight out when the theatre was running, and now LED lights have been used to light up the space. The space outside the structure was renovated to include an amphitheater and a seating area where artists, stand-up comedians and musicians were invited to perform and entertain the public.

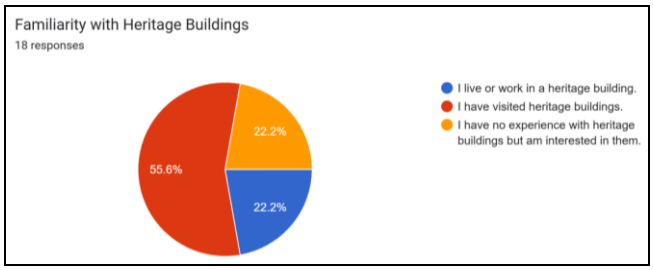
Challenges in the Transformation

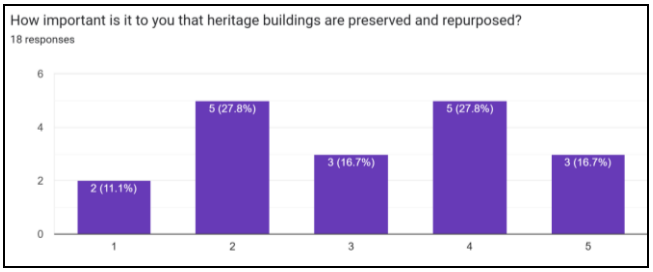
The aging building required significant reinforcements to meet modern safety and accessibility standards. This included strengthening foundations and introducing ramps and elevators for universal access.

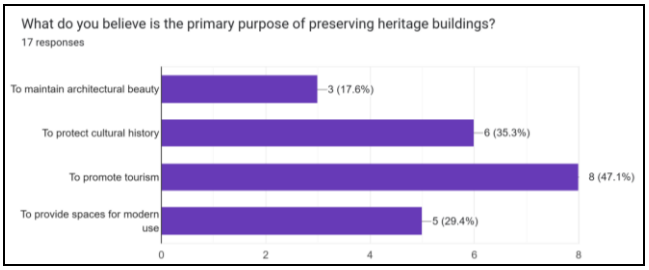
Heritage preservation laws in India imposed restrictions on alterations, requiring detailed consultations with conservation experts. Integrating advanced technological elements within a heritage setting posed design challenges, particularly in maintaining visual harmony. The restoration and adaptive reuse required substantial investment, with significant costs attributed to skilled craftsmanship and custom-built fixtures.

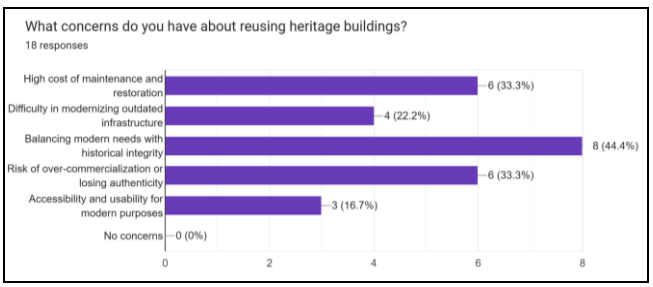
Results and Discussions

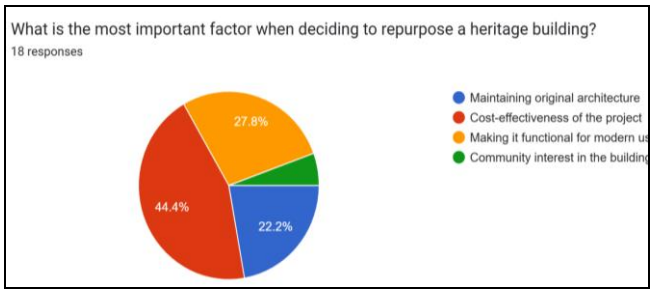
Questionnaire inferences: Graphical illustrations

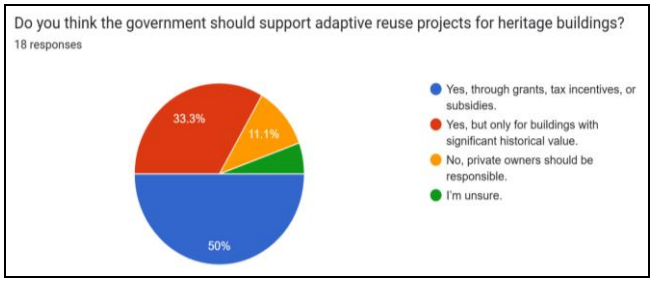


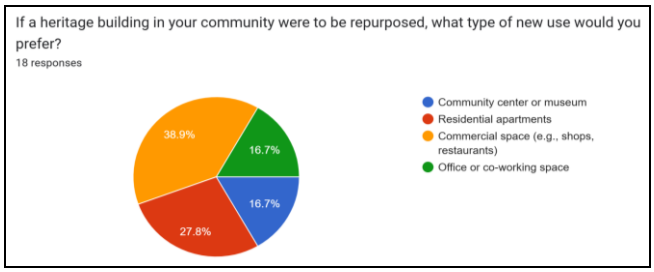


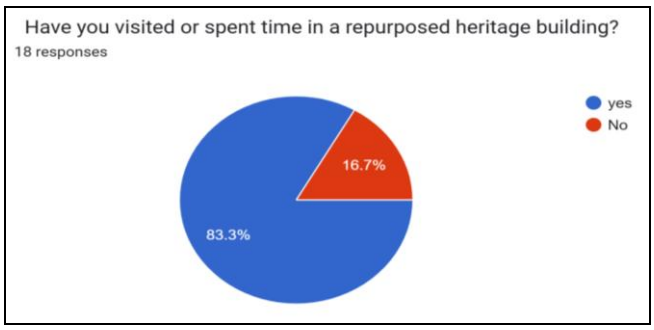












Recommendations and Future Directions

- Adopting advanced technologies like Building Information Modeling (BIM) can aid in planning adaptive reuse projects, ensuring precision and efficiency.
- Governments should introduce flexible conservation policies that encourage adaptive reuse without compromising heritage values.
- Engaging local communities ensures that adaptive reuse projects align with cultural values and serve societal needs.
- Incorporating renewable energy systems, water conservation measures, and eco-friendly materials enhances the sustainability of adaptive reuse projects.
- Adaptive reuse projects can benefit from tools like Building Information Modeling (BIM) for precise planning and execution.
- Engaging local communities in adaptive reuse projects ensures cultural relevance and public support.
- Simplifying regulatory processes can encourage more private and public collaborations in heritage conservation.
- The opera house could explore additional cultural programming, such as live performances, to further enhance its community impact.

Conclusion

Adaptive interior design provides a pathway to repurpose heritage buildings for contemporary use while preserving their historical essence. Integrating modern functionality with traditional aesthetics ensures the longevity and relevance of these cultural landmarks. Despite challenges like structural constraints and regulatory barriers, innovative strategies and collaborative efforts can overcome these hurdles. As the demand for sustainable and culturally sensitive spaces grows, adaptive reuse will play a crucial role in shaping the future of architectural conservation.

The Samsung Opera House serves as a shining example of adaptive interior design, demonstrating how heritage buildings can be transformed into functional, contemporary spaces without losing their historical charm. Through meticulous restoration, innovative design, and sustainable practices, the project has set a benchmark for similar initiatives globally. Adaptive reuse is not just a conservation strategy but a pathway to creating meaningful, multifunctional spaces that bridge the past and the future.

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