SUSTAINABLE PROJECT MANAGEMENT PRACTICES IN MUSEUM RENOVATIONS: BALANCING HERITAGE PRESERVATION AND MODERN VISITOR EXPECTATIONS

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ABSTRACT: This research investigates sustainable project management practices in museum renovations, focusing on balancing heritage preservation with modern visitor expectations. The purpose of the study is to identify and analyse sustainable practices employed in museum renovations, explore how museums integrate historical preservation with contemporary design, and uncover the challenges and best practices in this context. Utilizing a qualitative approach, the study conducted 20 semi-structured interviews with museum professionals, project managers, and stakeholders, followed by a three-step thematic analysis supported by NVivo for coding. The findings reveal that successful museum renovations require a careful balance between environmental sustainability, social inclusivity, and economic viability. Key practices include the use of eco-friendly materials, integration of interactive technologies, and effective stakeholder management. The study highlights the importance of innovative approaches to sustainability, such as adopting green building certifications and modernizing facilities while preserving historical integrity. This research is significant for advancing understanding in sustainable museum renovation practices and provides practical recommendations for integrating sustainability with heritage conservation. It contributes original insights into the challenges and strategies for achieving a harmonious balance between preserving cultural heritage and meeting contemporary visitor expectations.

Keywords: Sustainable Project Management, Heritage Preservation, Museum Renovations, Modern Visitor Expectations.

1. Introduction

Companies are adopting sustainable project management because they realize economic, environmental, and social factors must be considered. Yu et al. (2018) define sustainable project management as using sustainability concepts to meet current and future demands. Museum renovations must reconcile current requirements with historical and cultural legacy. Museums must meet sustainability and visitor experience requirements to maintain their identity (Arandelovic & Musil, 2023). In recent decades, the building and restoration sectors have made significant progress in using sustainable methods. The first attempts used energy-efficient technology and eco-friendly materials. Foster et al. (2020) define sustainability as economic and social. When redesigning a museum, consider the community's long-term economic benefits and environmental impacts. Kamariotou, Kamariotou and Kitsios (2021) provide a holistic approach to refurbishment projects that follow sustainable development principles and meet current museum needs. Historical restoration is crucial to museums' cultural and educational value.

Modernizing facilities while preserving old structures and materials is difficult. Preservationists emphasize the need of preserving museum buildings' historical integrity and authenticity through strict conservation standards and professional repair (Gromysz & Orwat, 2020). To seamlessly integrate preservation efforts with modern architecture and tourism facilities, restoration project planning and implementation must be thoroughly examined. The large gap in national historical preservation regulations exacerbated the issue. Visitors' expectations are changing as technology and design progress. Modern museum visitors prefer interactive exhibits over static ones (Arandelovic & Musil, 2023). Museums are fast using virtual reality and interactive exhibitions to promote visitor interaction and education. Workplaces that welcome various groups are becoming more common. Museum restorations must respect and preserve the museum's history and architecture while modernizing facilities to suit current standards. Sustainable project management for museum restorations must balance environmental sustainability, cultural preservation, and visitor demands (Eyssette, 2022). Sustainable project management has been studied for museum restoration to incorporate cultural preservation.

The study emphasizes green construction materials and energy efficiency. These studies underpin long-term development programs like museum restoration. Raco (2023) found that renewable energy and green

building certifications lessen rehabilitation project environmental impacts. Empirical study shows that heritage conservation restoration must preserve museum buildings' historical and cultural identity and also examined preservation options (Dhingra et al., 2020). These include accurate repairs and stringent conservation standards. These studies show how difficult it is to balance historical accuracy with modern amenities. Research shows that successful conservation involves a comprehensive plan that considers both the object's physical and cultural qualities. The empirical research evaluates visitor expectations. Modern museum visitors desire immersive and engaging experiences, according to Cotter, Fekete and Silvia (2022). Their research found that interactive displays and digital technologies to instruct and engage visitors are growing. In 2020, Kupec et al. (2020) examined how museum renovations effect accessibility and diversity. Museums must now accommodate more people and be hospitable. Museum restoration sustainability and visitor expectations have been thoroughly explored. Pavlovskaya et al. (2020) highlighted that changes must satisfy tourists and sustainability.

Their research shows that successful restorations combine environmental sustainability with appealing tourism. This paper explains how museums should balance current aims with resource preservation. Additional study has investigated successful museum restoration case studies to find the best methods. These intriguing museum case studies balance sustainability, historical preservation, and tourist expectations. The Tate contemporary restoration in London showed that ancient and contemporary architecture may coexist, according to Tzima et al. (2020). This empirical investigation suggests innovative museum restoration methods may work. Different studies examined qualities. Developing a successful rehabilitation program requires studying how these factors interact (Fiore, Piras, & Santoro, 2024). Museum restoration plans must include economic viability, social effect, and environmental sustainability. Sustainable remodelling lacks long-term research. This study emphasizes energy conservation and tourism participation. Remodelling initiatives must be monitored for impacts on museum operations, visitor satisfaction, and the environment (Czarnecki & Rudner, 2023). Future remodelling initiatives may last longer and work better with further study. Due to empirical study on different museums or sites, restoration strategies in varied situations are poorly understood. Comparative examination across institutions and localities is needed to find the most effective museum restoration methods and challenges (ALmasoodi et al., 2023). This research may allow for extrapolation and protocol development for other institutions. This research on sustainable project management approaches in museum restorations addresses the difficult relationship between sustainability, historical preservation, and current visitor expectations. The primary objectives are:

1. To explore sustainable project management practices:
2. To investigate the balancing act between heritage preservation and modern expectations:
3. To identify challenges and best practices in museum renovations:
4. To provide recommendations for effective integration of sustainability and heritage preservation

The study offers practical advice and useful insights on museum restorations and sustainable project management. Museums must balance historical and cultural significance with environmental concerns to achieve balance. The project examines whether museums can embrace sustainable practices while preserving their historical relevance, offering an example for other institutions facing similar issues. This study examines sustainability and historic preservation to fill a gap in the literature. Rehabilitation projects' ability to consider economic, social, and environmental sustainability is examined in this study. This research improves theoretical knowledge and offers museum restoration advice, speeding up the process. The study's conclusions affect museum administrators, politicians, and project managers who develop and administer restoration initiatives. This study can help stakeholders adapt traditional preservation methods to modern needs. By promoting long-term restoration, evidence-based recommendations improve museum renovations.

2. Literature Review

2.1. Sustainable Project Management

Sustainability project management incorporates environmental, social, and economic factors into project design and implementation to ensure long-term sustainability. Traditional project management focuses on time, money, and quality, but this comprehensive approach includes environmental conservation, social accountability, and resource efficiency (Yan & Haroon, 2023). Sustainable project management takes several steps to reduce environmental consequences, boost economic sustainability, and improve social equality. Fair labour and community participation, biodiversity, waste and emission reduction, and resource optimization are the goals (Polkinghorne et al., 2024). Following these concepts, project managers may integrate sustainability goals into their projects, benefiting present and future generations. Sustainable building and renovation technologies have emerged as stakeholders recognize the need to promote social and economic advantages while reducing environmental impact. Energy efficiency, water conservation, home environmental quality, and sustainable materials are highlighted. Recycling or utilizing local resources decreases mining and exporting's environmental effect (Jain, 2021). Energy-efficient lighting, renewable energy systems, and high-performance insulation minimize building energy usage and CO2 emissions. Increasing building and repair project social and economic value is sustainable. To promote tenant health, improve indoor air quality, provide green spaces, and optimize natural lighting (Tushar et al., 2023). Engaging local communities and stakeholders throughout the project may guarantee that activities fit local needs and goals, fostering social unity and support. Green employment boosts property prices, lowers operating expenses, and improves energy and resource efficiency (Sandra Marcelline et al., 2022). Balanced economic success, social equity, and environmental stewardship in building and remodelling projects may help the industry achieve sustainable growth.

2.2. Heritage Preservation

Museum assets preserve cultural and historical narratives that determine civilizations and identities. Museums retain past generations' scientific, artistic, and historical achievements (Lamptey, 2022). Preserving these cultural treasures helps future generations understand and respect their heritage, creating identity and belonging. Through preserving the unique traditions and abilities of different civilizations, museums encourage cultural diversity and mutual respect (Giuffrida et al., 2022). This initiative benefits the local environment, global culture, and education. Culture, our shared human legacy, may enrich and contribute to these aspirations. Museums must verify things and structures using various methods and criteria to preserve cultural and historical heritage. Preventative conservation manages temperature, humidity, light, and contaminants to slow artifact decay (Fiore et al., 2024). Prior studies define restoration as the process of restoring items or structures to their original or historical importance. Cultural preservation relies on digital technology like digital archiving and 3D scanning to record, examine, and restore objects and settings (Chernbumroong et al., 2024). These projects preserve history and make it more accessible and engaging through digital storytelling and virtual displays. However, museum culture conservation faces various challenges. Maintaining historical authenticity while adapting structures and products to present norms and demands is difficult (Arayaphan, Intawong, & Puritat, 2022). For instance, changing a museum to boost tourism or fulfil safety standards may compromise its authenticity and stability. Financial constraints make cultural conservation difficult since it requires ongoing commitment and is costly (Egbelakin, Ogunmakinde, & Carrasco, 2022). Funding such activities may be difficult, especially when they compete with other social demands. Because culture preservation demands specialized and often restricted abilities, the business needs continual training and growth. Despite these limits, conservation science, technology, and stakeholder engagement may overcome them and ensure the long-term safeguarding of cultural and historical legacy in museums.

2.3. Modern Visitor Expectations

Modern museumgoers have higher expectations due to social and technological advancements. Modern museum visitors choose active, immersive encounters over passive observation (Pavlovskaya et al., 2020). The complexity and accessibility of digital technology have revolutionized how people consume information and entertainment, fuelling this inclination. Visitors expect engaging, multimedia, interactive museum exhibits. The growing need for customized experiences, which cater to visitors' personal interests and preferences, also drives this trend (Orhan & Yilmazer, 2021). Museums are designing exhibitions around visitors' needs and interests to foster personal inquiry and learning. Interactive displays, virtual reality (VR), and augmented reality (AR) are being used in museums to increase visitor engagement and provide new ways to interact with historical and cultural information (Thwaites et al., 2019). VR can transport visitors to different times and places, assisting them in comprehending historical events and distant cultures, while AR can add context and engagement to actual displays by overlaying digital material. Contemporary museum design affects visitors' visual experience. Modern museums stress the need for cultural institutions to change. This emphasizes the necessity for flexible and accessible venues that can quickly adapt to a variety of exhibitions and events (Panavas et al., 2022). Energy efficiency, natural lighting, and sustainable materials increase museum environmental performance and visitor experience. Creative strategies like immersive displays and multimodal interactions increase museum visitors' involvement (Rizvic, Boskovic, & Mijatovic, 2024). To provide fascinating experiences, museums must adapt

to visitor expectations and follow the latest design and technical trends.

2.4. Balancing Act: Heritage and Modernity

Many museums have creatively balanced historical protection with tourist expectations. Renovations conserved the building's heritage while adding modern features to improve visitor experience (Hernando, 2024). The museum was rehabilitated using digital assistants and temperature control technologies while preserving its historic architecture. The states has implemented many measures to preserve its buildings' historical authenticity while improving energy efficiency and accessibility (Benslimane & Biara, 2019). These examples show how historic places may employ modern technologies and visitor-focused design. Conservation science and modern museology theories help balance tourist expectations with cultural artifact preservation. Adapting historic structures while keeping their cultural importance is adaptive reuse, according to (Eyssette, 2022). The According to the New Museology movement, museums should prioritize visitors. This strategy is interactive and participative to reach a large audience. By merging historical preservation and visitor demands, which often overlap, museums may make informed and equitable decisions (Carvalho, Martins, & Pinto, 2023). Conservators, architects, and exhibit designers may be needed for museum restorations that balance tradition with improvement. This collaborative strategy considers the tourism path and building construction. Digital innovations like interactive displays and virtual reality have made the museum more accessible and appealing. These case studies demonstrate how theoretical frameworks may rebuild museums while protecting cultural heritage and meeting visitor demands.

3. Methodology

3.1. Research Design

Studies of complicated, context-specific phenomena like museum restoration project management benefit from qualitative research. Qualitative methods may not reflect this field's attitudes, behaviours, and experiences (Hennink, Hutter, & Bailey, 2020). Semi-structured interviews allowed participants to freely share their thoughts and experiences. This strategy lets the interviewer gather a lot of information and dig deeper (Adeoye-Olatunde & Olenik, 2021). Thematic analysis helped identify, evaluate, and record data patterns. The data analysis method given is adaptable and rigorous, helping qualitative research uncover complex patterns and acquire significant insights (Braun & Clarke, 2006). NVivo software improves classification accuracy and efficiency, enabling a complete examination (see Figure 1, 2 and 3).

3.2. Participants

The research participants were carefully selected to represent a variety of perspectives on sustainable project management in museum restorations. About 20 museum experts and specialists with direct expertise in such projects participated (see Table 1). The group included architects, conservators, museum curators, and project supervisors. These positions were selected to represent a variety of perspectives on the practical issues and decisions involved in reconciling historical preservation with visitor expectations. Qualitative research often uses purposeful sampling to choose individuals with relevant and helpful knowledge. Thus, volunteers were picked. Participants were selected based on their professional expertise and participation in sustainable museum restoration initiatives. Each participant had to have completed at least one major museum refurbishment project in the past five years and have five years of expertise in their field. This shows that the participants knew a lot about the study and could provide informed comments. Using professional networks, industry groups, and field insider recommendations, a preliminary roster was created. Initial email and phone conversation assessed participants' interest in the research. Potential volunteers were informed of the study's goals, participation, and privacy and ethical safeguards. This initial communication also validated their selection criterion qualification. After first contact, selected individuals received official invitations with a detailed information paper and consent form. The information page detailed the research goal, projected interview time, subjects, and importance of their engagement. It also highlighted voluntary involvement and anonymity and confidentiality measures. To ensure ease and clarity, the chosen people were selected systematically. After the first contact and invitation, they were contacted by email or phone to confirm their interest and schedule interviews at a mutually convenient time and place. Visual conferencing allowed individuals to meet virtually regardless of location. The final batch of 20 museum professionals includes five project managers, five architects, five conservators, and five curators. Many viewpoints were needed to understand museum restorations, including project management, architectural design, conservation techniques, and curatorial judgments. Since each participant had unique viewpoints and experiences, the research topic was fully understood. To guarantee relevance and diversity, respondents were recruited from art, history, and science museums in various areas. This diversity enables the research to include many activities and topics from diverse contexts, boosting generalizability and depth.

Table 1: Demographic Profile of Participants.

Participant ID	Role	Years of Experience	Type of Museum
1	Project Manager	12	Art Museum
2	Architect	8	History Museum
3	Conservator	15	Science Museum
4	Museum Curator	10	Art Museum
5	Project Manager	7	History Museum
6	Architect	11	Science Museum
7	Conservator	9	Art Museum
8	Museum Curator	14	History Museum
9	Project Manager	6	Science Museum
10	Architect	13	Art Museum
11	Conservator	8	History Museum
12	Museum Curator	12	Science Museum
13	Project Manager	10	Art Museum
14	Architect	9	History Museum
15	Conservator	11	Science Museum
16	Museum Curator	7	Art Museum
17	Project Manager	14	History Museum
18	Architect	10	Science Museum
19	Conservator	13	Art Museum
20	Museum Curator	6	History Museum

3.3. Data Collection

This study collected data using semi-structured interviews in an orderly and flexible manner. The interviews were done to investigate museum staff processes, attitudes, and experiences throughout refurbishment as interview guidelines shows in Table 2. The renovation sought to balance historical preservation with tourist needs. 20 interviews were conducted in person or via video conference, depending on the participant's location and preference. Each interview lasted 45–90 minutes. Semi-structured interviews allowed participants to freely express their opinions and experiences while supporting organized discourse. Open-ended questions in the interview guide gathered substantial information regarding museum refurbishment sustainability management. The implications on cultural conservation, visitor satisfaction, and techniques and obstacles were covered. With participants' consent, interviews were filmed to assure data reliability. The tapes were transcribed verbatim to capture each session. Researchers examined the transcripts numerous times to better grasp the content and find patterns and themes. Detailed recordings and written instructions helped identify trends and analyse data from early observations and notes. This strategy allowed extensive data collection and analysis from participants' actual remarks and personal engagements.

Table 2: Interview Guidelines.

Variable	Interview Questions
Sustainable Project Management Practices	1. What sustainable practices have you implemented in recent museum renovation projects?
	2. How do you balance sustainability with other project constraints?
Heritage Preservation	1. What challenges do you face in preserving the historical integrity of museum buildings?
	2. How do you ensure that modern updates do not compromise the historical value of the museum?
Modern Visitor Expectations	1. How have visitor expectations changed in recent years regarding museum exhibits?
	2. What role does technology play in meeting these modern visitor expectations?
Integration of Modern Design	1. How do you incorporate contemporary design elements into traditional museum spaces?
	2. What strategies do you use to ensure that modern design enhances rather than detracts from the heritage aspects of the museum?
Impact of Technology	1. Can you provide examples of how digital tools have been used to improve visitor experience in museum renovations?
	2. How do you assess the effectiveness of technological innovations in your renovation projects?

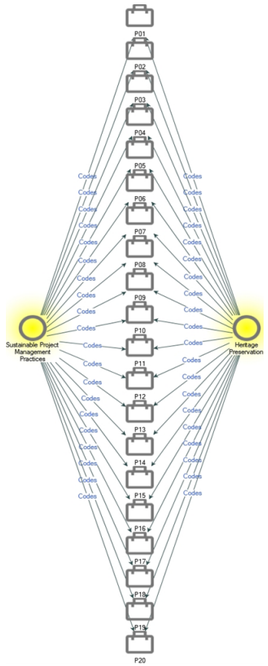

Figure 1: Interconnection of Sustainable Project Management Practices and Heritage Preservation.

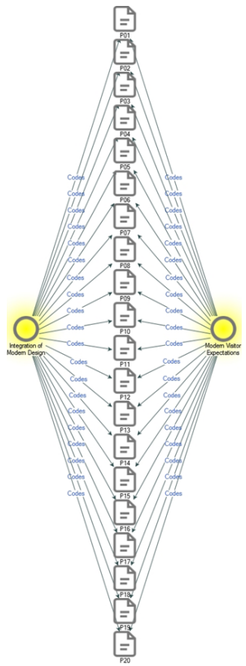

Figure 3: Interconnection of Modern Design and Modern Visitor Expectations.

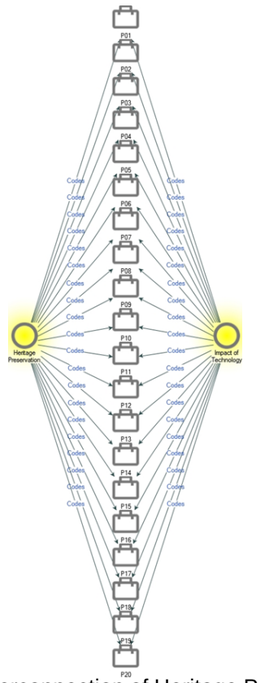

Figure 2: Interconnection of Heritage Preservation and Impact of Technology.

3.4. Data Analysis

This study evaluated and presented interview data patterns using a three-step theme analysis. Researchers transcribed audio-recorded interviews word-for-word to accurately record participant replies. To comprehend the data, read and reviewed the transcripts. In the second step, NVivo generated preliminary codes. This tool identified critical material on sustainable project management, historical preservation, and visitor expectations to simplify systematic data classification (Alam, 2021). In the third phase, the researcher sorted the codes into possible themes and checked them for data accuracy. A themed map that properly displayed key patterns and insights required ongoing adjustments. Categorizing the study's final themes revealed its primary findings. The researchers used a reflective method to ensure that the themes were supported by data and accurately reflected the participants' perspectives.

3.5. Ethical Considerations

This study's ethical foundation ensured participant respect and honesty throughout all research processes. To ensure informed consent, participants received a full information leaflet explaining the study's aims, methodology, risks, and benefits. The content was carefully given to ensure participants understood their duties and intentionally participated. Participants signed permission papers before the interviews acknowledging their right to withdraw without penalty and their desire to participate. To guarantee identity and confidentiality, interview data were kept hidden. Pseudonyms were used to protect study participants' privacy. The study team had exclusive access to the securely preserved audio recordings and transcriptions. Any findings were reported collectively to protect participant confidentiality. The project received ethical approval from the appropriate IRB before data collection. The study proposal was thoroughly reviewed to guarantee ethical compliance, including research methods and participant rights. Due to rigorous ethical oversight, the study was conducted ethically.

4. Results

Theme 1: Sustainable Project Management Practices

The findings of this study show that respondents understand sustainable project management in museum restorations. Modern restoration projects must prioritize environmental sustainability. Respondents stressed utilizing eco-friendly products. Respondent 1 said, "In our latest endeavours, we give priority to recyclable or environmentally friendly materials." We employ low-VOC coatings and salvaged timber to decrease carbon emissions. These techniques support sustainability goals and show an increasing preference for green building. Moreover, energy-efficient technology were consistently promoted. The third responder said they use LED lights and high-performance HVAC systems to save energy and money. This energy-saving and environmental sustainability focus strengthens the museum's financial stability.

Sustainable project management now includes social and environmental sustainability. Engagement with local communities was essential. Respondent 5 said community engagement matters. We often work with local organizations to ensure the restoration maintains community values and customs. This approach guarantees that community renovations respect the neighbourhood's culture and encourage social inclusion. Respondent 7 said ensuring all guests may use our facilities is our top priority. We accommodate disabled people with tactile assistance, escalators, and ramps. Accessibility in museum design demonstrates a trend toward inclusivity (Rivero Moreno, 2019). Respondent 9 stressed cultural and historical preservation. Says, "We meticulously preserve the historical aspects of the structure, ensuring that renovations improve rather than conceal its cultural heritage."

The respondents also addressed economic viability. Survey respondents studied effective project planning and budgeting. Respondent 11 said they do rigorous cost-benefit evaluations to distribute every repair expense properly. This measure reduces waste and optimizes budgeting. The effective management of project funds and their connection with long-term goals need this method. Also stressed were operational efficiency and system maintenance over time. Respondent thirteen chooses durable materials and technology for renovations to reduce maintenance. This method keeps the structure functional and attractive while conserving money. This emphasis on operational efficiency and durability matches the most effective sustainable project management methods (Wang et al., 2023). Financial help and financing were also acknowledged as important to economic sustainability. Respondent fifteen said that diverse finance sources like grants and contributions helps manage project costs and reduce financial risk. This method acknowledges the need of financial preparation for long-term recovery.

It confirms earlier sustainable project management research. Tamburini et al. (2020) emphasize the importance of energy-efficient technologies and eco-friendly materials in building project environmental impact. The study on community engagement and inclusive design aligns with museum architecture's growing focus on social sustainability and accessibility, according to (Kupec et al., 2020). Participants' economic sustainability tactics match sustainable building research, which stresses long-term operational efficiency and cost-effective design.

Theme 2: Balancing Heritage Preservation and Modern Visitor Expectations

The study found a complex relationship between new visitors' expectations and museum restorations' preservation of historical characteristics. Historical conservation requires preserving original materials and buildings (see Figure 4). Respondents offered many ways to maintain museum buildings' historical authenticity. Respondent 2 stressed the importance of preserving the structure's genuine brickwork and architecture using conventional methods. This methodology follows modern historical conservation methods, which carefully preserve original materials (Pavlovskaya et al., 2020). There were also thorough debates on repair methods. Respondent four said their

restoration effort involved considerable research and period-appropriate materials. This method verifies authenticity and addresses structural issues. Museum artifacts must be restored carefully to preserve their history. Heritage preservation measures were also significant to responders. Respondent 6 said “We ensure that all our renovation projects comply with local and international heritage protection standards, which helps us maintain the building’s historical significance while making necessary updates.” These standards guarantee that museum renovations maintain the museum’s history and culture (Eyssette, 2022).

Tourist expectations also hinder renovations. Interactive and digital displays are often used to satisfy modern tourists. The eighth responder said they use touchscreens and virtual reality to engage tourists and enhance physical displays. Interactive components are part of a bigger change in museum practices to improve visitor interaction with technology (Wiastuti et al., 2020). Upgrades to infrastructure and services were also prioritized. Respondent 10 suggested upgrading visitor amenities like toilets and sitting to improve comfort and ensure a good experience. Visitor comfort matches the growing requirement for accessible and inviting museum facilities (Gromysz & Orwat, 2020). Increasing educational and experiential offerings has met tourist expectations. Respondent twelve said their company focuses on hands-on instructional activities and interactive displays. Their mission is to make museum visits educational and enjoyable. This strategy responds to the growing demand for informed and entertaining museum visits, according to Biondo, Cellini and Cuccia (2020).

Integrative techniques were needed to align cultural preservation with present needs. Many respondents preferred historical features in modern design. The fourteenth responder committed to merging historical elements with modern design traits to create settings that honor the past and embrace the future. Museum rooms must combine traditional and modern aspects to be cohesive and appealing (Florescu et al., 2022). Stakeholders were also encouraged to collaborate. Respondent sixteen said that incorporating community members and historical experts ensures that all perspectives are included throughout rebuilding. Collaborating to achieve many goals is essential for a successful refurbishment (Azócar & Hauyon, 2021). Using contemporary technology to preserve and showcase cultural relics was another suggestion. Respondent 18 said they conserve historical items via 3D scanning and digital archiving. They can present these characteristics in creative and engaging ways. This technology improves and protects historical elements for current viewers.

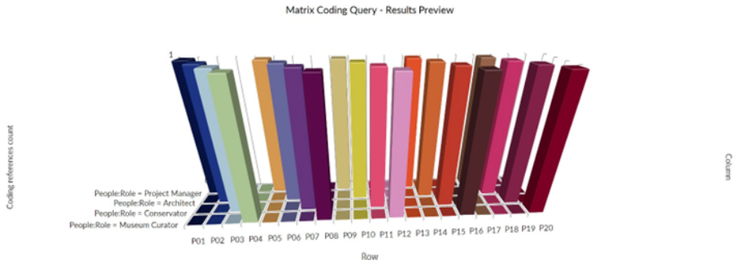

Figure 4: Percentage Results for Balancing Heritage Preservation and Modern Visitor Expectations.

Theme 3: Challenges in Museum Renovations

The examination shows many issues marred the museum’s restoration. Structure, technology, stakeholder management, and legal and regulatory issues were issues (see Figure 5). Weak infrastructure was a key obstacle. The second point was that restoring old buildings requires careful structural and electrical work. Pistofidis et al. (2021) stress the importance of planning and execution while updating obsolete infrastructure. Updating newer systems was complicated technologically. Respondent 4 said placing modern technology in old structures, such HVAC systems in unexpected spaces, might be challenging. This example illustrates the conflict between preserving facility records and updating them (Bakry et al., 2022). During renovation, structural integrity was another key factor. Respondent 6 stressed the need of structural integrity while constructing or updating a system. Rigorous testing and advanced engineering assure our stability. Structures must be restored according to certain steps to ensure safety and longevity. Furthermore, regulatory and compliance issues arose. Implementing historical conservation was tough. Respondent 8 says historical preservation criteria are complicated and geographically heterogeneous, making restoration compliance challenging. The complexity of this issue can hinder preservation and restoration. Following safety and accessibility regulations might be difficult. Respondent eleven stressed the need of matching our changes with safety and accessibility standards, even if it meant sacrificing antiquity. Harmonizing regulatory duties with preservation aims requires substantial research.

Managing several rules was challenging. Respondent 12 says “We often face conflicting requirements from different regulatory bodies, which can create delays and increase project costs.” Rehabilitation project regulatory compliance is challenging and requires a thorough plan to meet conflicting demands (Zhang, Sotiriadis, & Shen, 2022). The rebuilding technique made stakeholder management difficult. Stakeholder issues were difficult to address. Respondent 14 said the decision-making process is complicated by stakeholder conflicts. We must balance and harmonize interests for mutual gain. Refurbishing initiatives need stakeholder participation to balance several interests. Resolving environmentalist-modernist conflict was vital. Respondent sixteen says traditionalists and change-makers typically clash. Finding common ground is vital yet tough. This problem highlights industry challenges with balancing historical accuracy and modern demands. Participation and collaboration from stakeholders were also important. Respondent 18 stressed that stakeholder participation and collaboration considerably affect renovation. We frequently debate and convene to address various views.

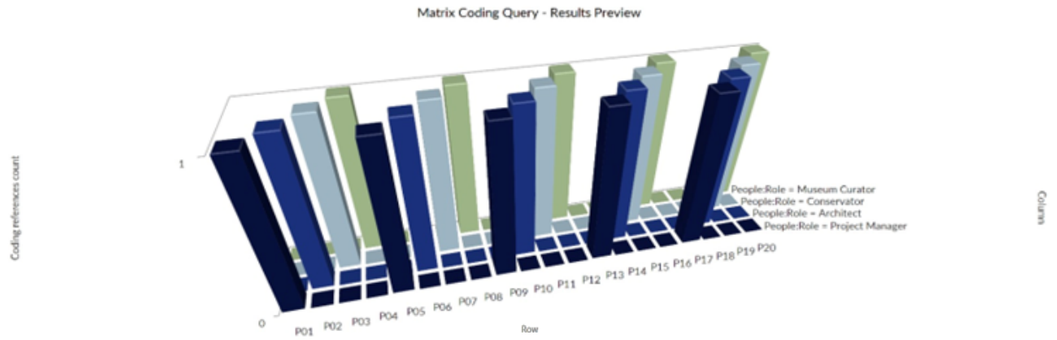

Figure 5: Percentage Results for Challenges in Museum Renovation.

Theme 4: Solutions and Best Practices

The research suggests using novel sustainability methods, good communication and teamwork, and case studies to solve museum restoration problems (see Figure 6). The importance of green building certifications and standards was acknowledged. Respondent 1 claimed they want LEED certification for their refurbishing projects to ensure sustainability. This method follows industry practice of certifying sustainability initiatives. Sustainable energy sources were also examined. The third responder said renewable energy technology, such solar panels, has reduced energy prices and environmental impact. Renewable energy is increasingly required for rehabilitation efforts to lessen their environmental impact (Apostolopoulos et al., 2023). Also stressed was the need of sustainable operational methods. The fifth responder supports their efforts with trash minimization and eco-friendly housekeeping. These steps will help restored museums practice environmental stewardship.

Rehabilitation programs require effective communication and teamwork. Effective stakeholder communication was essential. Respondent 7 stressed the need of effective communication to ensure everyone understands and resolves issues quickly. Research shows that complex rehabilitation programs require good communication (Fiore et al., 2024). Promoting regular communication and feedback was crucial. Respondent 9 claimed they often invite stakeholders to provide comments and address restoration issues. This technique incorporates stakeholder involvement into decision-making (Kierner, Kucharski, & Kierner, 2023). Decision-making emphasized transparency. The eleventh responder stated transparency in decision-making improves stakeholder conflict and

confidence. Openness and transparency improve project management and cooperation.

Successful museum restoration initiatives shared tips. A study of their efforts revealed pragmatic methods. Respondent thirteen researched institutions that blended historical preservation with modern upgrades for their projects. This strategy adapts current strategies to diverse situations (Tamburini et al., 2020). The case studies prioritized stakeholder feedback and innovative design. Participant fifteen said early stakeholder engagement helped identify difficulties and rewards. Active participation reduces problems. Another accomplishment was adaptability to various environments. Respondent seventeen said they use the most successful methods from previous projects and adapt them to each renovation's needs and constraints to deliver effective and satisfied solutions. Implementation flexibility ensures remodeling strategies are suitable for every project (Fiore et al., 2024).

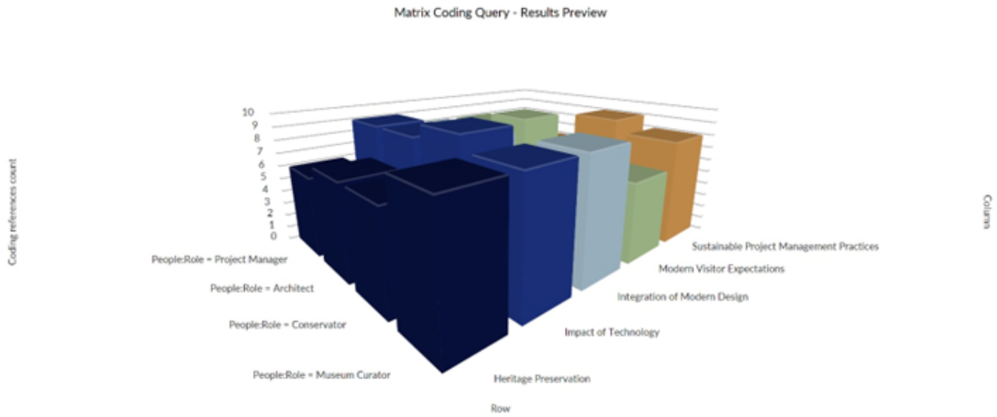

Figure 6: Percentage Results for Solutions and Best Practices.

5. Discussion

The study's findings shed light on sustainable project management and the best way to balance historical preservation and tourism needs during museum renovations. The study examines these attributes to address the challenges of historical authenticity, modern needs, and sustainability. Museum restorations prioritize environmental sustainability. This follows the building sustainability trend of using eco-friendly materials, energy-efficient systems, and waste minimization. Vareiro, Sousa and Silva (2021) discovered that sustainable building reduces rehabilitation projects' environmental impact and improves efficiency. Cultural relevance, community integration, and accessibility are essential to social sustainability. Wang et al. (2023) emphasize the importance of social concerns in project design and execution for sustainable development. Restorations should address environmental challenges, help locals, and ensure visitor access, according to the study. Economic sustainability demands long-term upkeep, careful budgeting, and cost-effective planning.

The findings provide an innovative way to balance current visitor needs with old building protection. This method blends historical preservation, current design, and interactive technology. Museums must maintain this balance to maintain historical authenticity and satisfy modern visitors. Freire-Lista, Becerra and de Abreu (2022) suggest restoring both ancient and modern characteristics to provide tourists a meaningful experience. Historic preservation laws and the protection of authentic structures and materials are the research's emphasis. Cultural preservation strategies emphasize preserving historical items while using modern advances (Eyssette, 2022). Tourist expectations are met via interactive and digital displays, facility enhancements, and educational enrichment. These traits match museums' use of modern design and technology to enhance visitor experiences (Florescu et al., 2022). The findings suggest that preserving historical aspects and adding modern facilities and interactive technologies will improve the tourist experience. These examples show a comprehensive museum renovation plan that preserves history while meeting current demands and ensuring long-term financial success. Liu and Du (2024) explore sustainable project management, focusing on economic, social, and environmental issues. The study shows the industry's transition toward sustainability and social responsibility.

Themes 3 and 4, Challenges of Museum Renovations, and Solutions and Best Practices, offer new perspectives on museum restoration. The paper thoroughly examines museum restoration issues and proposes solutions. Museum restoration is examined in terms of stakeholder management, legal and regulatory issues, structural and technical factors. Technology and construction issues in renovation projects include adopting contemporary technologies while preserving infrastructure. The study reveals that precise design and implementation of current technologies are essential for structural stability. Gravit, Tsepova and Kirik (2022) show that the literature has extensively discussed the difficulty of modifying ancient structures to fulfil modern needs without losing their historical significance. Retrofitting systems has technical constraints, thus new technologies and specialist assistance are needed to integrate them into existing buildings. Safety, accessibility, and historic preservation regulations might be challenging to resolve. This analysis confirms earlier research on cultural asset protection regulations that balancing many legal criteria is challenging (Eyssette, 2022). Thorough planning and regulatory body involvement are needed to meet these constraints and safety and accessibility criteria. To get great remodelling outcomes, you must understand and handle regulatory requirements. The research shows that environmentalists and modernists struggle to resolve disputes while considering the diverse interests of stakeholders. Thus, stakeholder management is crucial. Stakeholder management is essential for rehabilitation project completion and stakeholder resolution. Similar findings have been found in stakeholder communication and collaboration for conflict resolution and decision-making. Negotiating compromises and managing stakeholder demands are crucial to remodelling success

Conversely, the study's answers and best practices propose creative solutions to these issues. Restoration projects may be more sustainable with renewable energy and green building certifications. Luo and Ye (2020) promotes sustainability, energy-efficient building, and environmental laws. Project design and execution should embrace sustainable operating concepts including resource management and waste minimization, according to study. Stakeholder communication and collaboration are becoming more important to address the issues above. Effective communication, frequent meetings, and transparent decision-making are key to renovation success. These methods improve stakeholder engagement research, which emphasizes cooperation and communication to overcome challenges and achieve project goals (Elgammal et al., 2020). Case studies of museum restoration demonstrate the most effective methods. Examination of these events can yield adaptable methods and insights for other contexts. The study proposes using prior experiences to improve current efforts and results. Previous research has shown that case studies are useful for learning and executing effective refurbishment tactics in new projects. This research focuses on structure, technology, and legislation. This study gives new views on practical tactics like stakeholder management and creative sustainability approaches that may not have been widely studied before. Case studies and best practices enhance refurbishment techniques by analysing successful projects. This paper explains how case studies may enhance refurbishment methods and extend effective solutions to new situations. The findings improve project success by revealing best museum restoration practices.

6. Conclusion

Sustainable project management research examines the struggles of remodelling museums, particularly the delicate balance between historical preservation and tourist satisfaction. An extensive qualitative study examines sustainability, historical preservation, visitor expectations, and their obstacles and solutions. The results demonstrate that museum renovations must utilize sustainable project management. The research emphasizes environmental sustainability through waste-reduction, energy-efficiency, and eco-friendly materials. Recent study shows that the building industry is moving toward socially responsible and environmentally sustainable projects, which these methods support. Cultural relevance, accessibility, and community engagement are valued for social sustainability, coinciding with sustainable development. Financial caution in refurbishment projects is shown by cost-effective planning and long-term maintenance to maintain economic sustainability. Following heritage conservation criteria to preserve original structures and materials is stressed in the study's historical preservation analysis. To satisfy modern tourists, museums must combine historical preservation with interactive technology, modern architecture, and historical preservation. The findings suggest a balanced strategy that mixes historical and modern

elements to engage and satisfy visitors. The paper also identifies additional restoration concerns museums confront, such as stakeholder management, legal and regulatory issues, and structural and technological issues. The greater issues of decaying infrastructure and adapting to new systems require inventive technological solutions and careful planning, as shown in the literature. Due to the complexity of regulatory frameworks and several demands, adequate planning and regulatory body collaboration are essential. Stakeholder management—resolving disagreements and accommodating multiple interests is essential for rehabilitation projects to succeed. The report offers many solutions and best practices for these issues. Restoration sustainability may be improved via renewable energy, sustainable operations, and green building certifications. Build strong communication lines, encourage open discourse, and promote stakeholder openness to manage stakeholder expectations and assure project success. Case studies of successful museum restorations reveal important methods and approaches that may be applied elsewhere.

6.1. Theoretical and Practical Implications

This research affects the delicate balance between meeting visitor expectations during museum restorations and preserving history, as well as sustainable project management. It affects communities, politicians, project managers, and museum administrators. Museum restoration themes are important for future growth, and the study findings offer meaningful ideas. Museum administrators and project managers adopt sustainable restoration approaches, according to research. The findings imply that energy-efficient technologies, eco-friendly materials, and green building certifications may improve museum restorations' environmental sustainability. This supports the building industry's sustainability efforts and reduces museums' environmental impact. These methods can reduce museum electricity and waste costs and save the environment. Sustainability is becoming more crucial in project planning and execution, according to industry trends. The research stresses the necessity for a balanced strategy that includes historical preservation and visitor demands. Museum management must carefully plan renovations that mix interactive technology and current architecture while honouring the building's history. The research preserves old structures and materials while employing contemporary amenities to improve tourism. Meeting the shifting expectations of museum visitors who want both educational value and interesting experiences requires this equilibrium. These steps can help museums preserve and attract visitors. The study's conclusions affect lawmakers and regulators. The analysis shows the challenge of balancing complicated legal systems and current safety and accessibility standards with old asset rules. The research implies that governments should streamline rules and provide clearer directions to hasten restoration. Effective communication between project managers, regulatory agencies, and institutions may help resolve regulatory issues and ensure rehabilitation projects meet standards.

The study's conclusions affect museum restoration stakeholder management. Addressing conflicts and fixing problems requires stakeholder communication and collaboration, including environmentalists, modernists, and local inhabitants. The research emphasizes open decision-making, regular talks, and effective communication. By adopting these recommendations, museums may resolve all stakeholders' complaints and streamline restoration projects, improving results. The study's findings can improve museum experiences and increase public access to cultural and historical objects. Museums can improve visitors' experiences with interactive technology and modern design. For cultural preservation, community engagement, and environmental protection, museums stress heritage preservation and sustainability. This technique assists museum visitors and societal aims like culture preservation and sustainability. Additionally, the study suggests issues for additional research and development. Further study of sustainable methods, stakeholder management techniques, and museum restoration examples may provide new viewpoints and ideal methods. These methods may be studied to see how they affect museum operations, visitor satisfaction, and environmental performance. Academics and practitioners can improve museum restorations and develop more effective methods by improving this study's conclusions.

6.2. Limitations and Future Direction

This study may inform future museum renovation and sustainable project management research by concentrating on many key points. First, museum restorations' sustainable solutions must be thoroughly examined. This study provides a comprehensive overview, but further research is needed to determine the effects of green building certifications, eco-friendly materials, and renewable energy. Complex case studies that show the environmental, energy, and operational costs of different approaches might benefit museum management. Additionally, recognizing the pros and cons of advanced waste reduction and renewable energy technologies can improve museum restoration sustainability. More research is needed on stakeholder management. This research emphasizes stakeholder engagement. The dynamics of these interactions need additional study. Future research may focus on how to best engage environmentalists, local residents, and museum visitors. Collaborative decision-making and conflict resolution frameworks can help include various interests and increase project success. Analysing stakeholder participation in rehabilitation method development and project goal attainment would provide valuable insights for improving stakeholder engagement. More study is needed to determine how new technology affect visitor experience. Interactive and digital technologies are examined in this examination. However, future studies may examine how interactive exhibitions, virtual reality, and augmented reality affect visitor engagement, satisfaction, and learning. Studies may assess the efficiency of different technology solutions in improving the museum experience and determine the best ways to integrate them without harming museum displays' historical and educational value. Future research should focus on restoration's long-term effects. Although this research shows current practices, longitudinal studies can examine the long-term benefits of restored museums. The research may analyse tourist attendance, maintenance costs, and energy efficiency to determine refurbishment projects' long-term sustainability and efficacy. Understanding the long-term effects of these measures can help museums make informed decisions on future refurbishment initiatives and assure their success. Comparative study in different contexts may also yield important insights. Future research may examine museum restoration practices in different cultures, geographies, and museums. These studies may uncover regional disparities in legislative frameworks, stakeholder expectations, and sustainability and cultural preservation initiatives. Recognizing context-specific obstacles and opportunities will improve museum restoration management in diverse locations, creating a more holistic approach. We can better understand how to balance current visitor expectations with cultural preservation by using more theoretical frameworks. This study uses certain ideas, but future research may include environmental psychology, organizational management, and heritage studies. By examining restoration procedures from multiple angles, we may learn how theoretical ideas are used in practice. Finally, museum restorations' financial and economic effects must be assessed. Future research should focus on refurbishment program cost-effectiveness, ROI, and financing options. By researching budgeting, financial strategy, and financing sources, museums may better manage restoration expenses and get funding. Sustainable remodelling strategies may save money and enhance revenue by improving visitor experiences, which museum administrators may learn from.

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