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Heritage Building Conservation Projects Decision-Making Processes

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Abstract

Restoration projects of historical buildings involve decision-making processes that require researchers from different fields of expertise to work together. One of the most challenging stages of conservation projects is making decisions. Scientific committees need information about the entire life of the buildings to decide on conservation strategies. In addition, communication and information exchange between stakeholders are critical issues in restoration projects. This research examines restoration projects from a project management perspective with a systematic literature review. In this study, firstly, a literature review was conducted to see the decision-making processes in historical heritage research. Then, by using the content analysis method, the main themes of the current research were determined. The problems experienced in the field are mostly project management based. Some of the important research themes are determined as, special laws for conservation projects, collaborative planning, risk management, resource management, and interdisciplinary work environments.

Keywords: Heritage conservation projects; Decision-making processes; Project-management; Collaborative work environments.

1. Introduction

Heritage building restoration projects are temporary organizations with limited time frames. Restoration project teams consist of professionals from different sectors and different educational backgrounds coming together for a common purpose (Söderlund & Sydow, 2019). Communication and collaboration between project participants are vital for decision-making. All aspects of intervention decisions taken in conservation projects of historical buildings should be discussed by experts. For this, it is necessary to provide suitable discussion environments. First, it is necessary to understand the history of the building and the change it has undergone with the environment in which it is located. Information such as the use of the building in the previous periods, the renovations it underwent, the changes in the materials and construction techniques of the periods, and the natural disasters that the building has undergone are important for the scientific committees that make the conservation decisions. In addition to these, current research, methods, and techniques in restoration and conservation area are also affect the decisions. Restoration projects consist of step-by-step work packages related to conservation. These work packages come together according to their subject or a certain part of the building and form the stages of conservation projects. Thus, a conservation project consists of stages formed by different work packages. Each conservation stage includes decision processes in itself. The primary priority in conservation projects is the safety and quality of the building. Therefore, the duration and costs of conservation projects are not predictable.

The field of construction project management basically carries out its studies under the performance areas of customer relation, safety, schedule, cost, quality, productivity, finance, communication and collaboration, environment and stakeholder satisfaction (Ingle & Mahesh, 2022). The project management research field examines the projects as a whole, evaluates the problems in terms of management and tries to offer solutions. There are problems that can be proposed from the perspective of project management in the conservation projects of historical buildings. In this research, research on conservation projects of historical buildings were examined from the perspective of project management. In this way, it is aimed to determine the studies carried out in the field and the research needed in the field.

2. Methodology and Data

A Systematic literature review need tightly specified aim and objectives with a specific review questions and transparent review process with including excluding criteria (Jesson et al., 2011, p.105). Therefore, this paper searched literature to visualize the trends in how restoration heritage studies are evolving in the construction project management domain. To acquire up-to-date and high-quality articles related to heritage building restoration projects and project management relationship through decision-making processes, a systematic review was conducted. Literature searches are an appropriate methodological approach to explore existing studies, identify knowledge gaps, and suggest research areas (Lima et al., 2021; Tezel et al., 2020; Xu et al., 2020). With a structured, transparent and reproducible protocol, a systematic review can organize, synthesize and evaluate existing studies to provide evidence for further research (Badi and Murtagh, 2019; Abid et al., 2018). Inspired by Jesson et al., (2011),

this study utilizes a framework of the systematic review protocol (Figure 1) consisting of initial search, filtering, examination, data extraction and synthesis.

Step 1: Initial search.	<ul style="list-style-type: none"> • Select the Google Classroom search engine and search by key words. • Ensure the time span: 24/11/2022 • 210 articles initially retrieved.
Step 2: Filtering I	<ul style="list-style-type: none"> • Inclusion: English language / Elsevier, Emerald, Springer, Taylor&Francis databases • Exclusion: Grey literature, such as reports and non-academic research. • 33 articles remains.
Step 3: Filtering II	<ul style="list-style-type: none"> • Screen each paper by reading the abstract, keywords, title. • Identify related papers by reading the full articles. • 19 article remains.
Step 4: Examination	<ul style="list-style-type: none"> • Identify related papers using a snowballing process. • 21 article
Step 5: Data Extraction	<ul style="list-style-type: none"> • Write down relevant data.
Step 6: Synthesis	<ul style="list-style-type: none"> • Synthesise the data from each individual article into one.

Figure 1. Systematic review protocol (Developed by Author)

This research conducted an article search in Google Scholar at 24 November 2022. Search string consisted "restoration projects" and "historical buildings" and "decision making" and "scientific committee" and multidisciplinary and interdisciplinary". Literature search sought out information about all fields, which resulted in a set of 210 publications. Researchers filtered publications according to their publishers. Only publications from Elsevier, Emerald, Springer, Taylor&Francis databases selected to provide comprehensive and high- quality papers to visualize the trends in how restoration heritage studies are evolving in the construction project management domain. In the first filtering step 33 articles remained. In the second filtering step researchers filtered papers by reading full papers. After this process 19 research papers were selected. According to selected 19 paper researchers identified two more research papers and total number increased 21. In Table 1 and Table 2, the articles reached as a result of the literature review are listed by grouping according to the research topics.

3. Findings

It is seen that the articles reached on the subject have been published in the last 10 years. Especially as of 2021, the number of articles published on the subject has increased. Studies on subjects such as project management, decision making, and management of multi-participant groups in the protection of cultural heritage seem to be new in the field. This shows that the need for management sciences in the field of cultural heritage conservation has just been discovered. It is seen that the researches in the field are carried out under the titles of, special laws in conservation, collaborative planning, heritage impact assesment (HIA), interdisciplinary work of architecture and structural engineering, diagnosis of heritage buildings, management-oriented heritage BIM, decision making process, cultural heritage management, management of complex properties, cultural heritage project management problems, heritage's contractor selection, the importance of participants from different fields of expertise, and risk management, resource management.

In conservation projects, documents belonging to historical buildings should be made available to diverse stakeholders. While this collaborative system allows the sharing of information among diverse stakeholders, it also improves the workflow between stakeholders (Palomar et al., 2020). It is necessary to determine the current situation in order to predict the negative (or positive) effects of the decisions taken in the projects developed on cultural heritage and to make suggestions for positive practices. To enable informed decision making and to guide collaborative project design, key decisions about how the process will proceed during the initial planning stages are necessary before final design and final approval. In particular, in reconstruction and adaptive use projects, the project planning and decision-making process should allow sufficient time to review the project proposal among stakeholders and interested parties (Wosiński, 2022).

In conservation projects of buildings, protection values and structural values are highly integrated. If there is a conflict between protection and structural values, building safety should be given priority. Structural safety needs must be implemented in a way that does not harm the heritage values, authenticity and integrity of historical buildings (Hurol et al., 2015).

Before starting the application on a historical building, preliminary work is required to detect unforeseen jobs as much as possible. The more unknown problems there are, the more likely the costs will be. Decisions regarding the repair or modification of use of an old structure should be based on an understanding of its original form, construction, and subsequent evolutionary stages. Drawings of the building, geological maps, archive files and, if any, records of all work done on the building should be examined. The more knowledgeable consultant engineers are about the current state and process of the basic structural systems in the existing building, the sooner decisions about such issues can be addressed in the design process (Hegazy, 2015).

Table 1 Selected articles according to review

Journal	Title	Researcher and Date
Post-Trauma and the Recovery Governance of Cultural Heritage	The Significance of Special Laws in Post-disaster Restoration and Recovery of Cultural Heritage: The Case of the Special Law for the Conservation and Restoration of Notre-Dame de Paris.	(Okahashi, 2023)
Land	Complex Social Value-Based Approach for Decision-Making and Valorization Process in Chinese World Cultural Heritage Site: The Case of Kulangsu (China)	(Liang et al., 2022)
Energy and Buildings	Non-destructive techniques (NDT) for the diagnosis of heritage buildings: Traditional procedures and futures perspectives.	(Tejedor et al., 2022)
Built Heritage	New perspectives on World Heritage management in the GCC legislation.	(Wosiński, 2022)
Sustainability (Switzerland)	A conceptual framework for heritage impact assessment: A review and perspective.	(Ashrafi et al., 2022)
International Journal of Architectural Heritage	Consolidation of a bath ruin in an archaeological site.	(Durmuşlar et al., 2022)
Megaron	Cultural Heritage Impact Assessment (HIA), International Approaches and Practices: Examining the Applicability of HIA in Turkey.	(Can Çetin & Zeren Gülersoy, 2021)
International Journal of Architectural Heritage	Development and Demonstration of an HBIM Framework for the Preventive Conservation of Cultural Heritage.	(Barontini et al., 2021)
Journal of Engineering, Design and Technology	A novel heritage BIM (HBIM) framework development for heritage buildings refurbishment based on an investigative study of microorganisms.	(Cooney et al., 2021)
Journal of Cultural Heritage	Information transfer between two heritage BIMs for reconstruction support and facility management: the case study of the Chalet of the Countess of Edla, Sintra, Portugal.	(Machete et al., 2021)
Automation in Construction	An online platform to unify and synchronise heritage architecture information.	(Palomar et al., 2020)
Journal of Building Engineering	A comprehensive literature review of Multi-Criteria Decision Making methods in heritage buildings.	(Nadkarni & Puthuvayi, 2020)
Journal of Cultural Heritage Management and Sustainable Development	The Gadamerian hermeneutics for a mesoeconomic analysis of Cultural Heritage.	(Settembre Blundo et al., 2019)
Journal of Cultural Heritage Management and Sustainable Development	Complex properties management: Preventive and planned conservation applied to the Royal Villa and Park in Monza.	(Moioli et al., 2018)
Journal of Cultural Heritage Management and Sustainable Development	Critical challenges in management of heritage conservation projects in India.	(Roy & Kalidindi, 2017)
Procedia Engineering	Selection Criteria For Evaluating Contractors Of Cultural Heritage Objects.	(Morkunaite et al., 2017)
HBRC Journal	Conservation of historical buildings–The Omani–French museum as a case study.	(Hegazy, 2015)
Science and Engineering Ethics	Ethical Guidelines for Structural Interventions to Small-Scale Historic Stone Masonry Buildings.	(Huroi et al., 2015)
Journal of Cultural Heritage Management and Sustainable Development	Risk management for sustainable restoration of immovable cultural heritage, part 1: PRM framework.	(Atakul et al., 2014)
Public Archaeology	Managing Oman’s Archaeological Resource: Historical Perspectives.	(Ali & Al-Belushi, 2013)
Journal of Cultural Heritage	Assessment of the decision-making process for re-use of a historical asset: The example of Diyarbakir Hasan Pasha Khan, Turkey.	(Yildirim, 2012)

In the planning and organization of the reconstruction of cultural heritage structures after the disaster, it is necessary to comprehensively evaluate and suggest what kind of intervention should be entrusted to whom. Special laws and regulations need to be regulated in order to regulate such post-disaster practices. In these laws and regulations, how the necessary budgets will be obtained, and which institutions can take part in these special projects should be defined (Okahashi, 2023).

Cultural heritage structures contain their own unique values. These values can be read differently by residents and experts in their fields. This situation allows the enrichment of cultural heritage values. In order for values to be

enriched, it is necessary to conduct community-based research. It is necessary to create participatory information sharing environments in order to access the thoughts, feelings and information of the cultural heritage structures of the community (Liang et al., 2022).

Policies regarding the protection and reuse of Cultural Heritage buildings should be adopted with a holistic approach. Non-destructive techniques and advanced modelling technologies should be used in a wider area than their current use in the protection of cultural heritage. In order to adapt the cultural heritage to the Sustainable Development Goals, non-destructive techniques and advanced modelling technologies should be included in the process in the strategies to be developed (Amen, 2021; Aziz Amen, 2022; Amen et al., 2023; Amen & Nia, 2020)

. It is thought that researchers, energy auditors and heritage authorities involved in the renovation and protection of Cultural Heritage buildings can make more effective decisions in the light of the data obtained from these tools in the decision-making processes (Tejedor et al., 2022).

It is seen that the practitioners and experts of the restoration industry neglect the concepts such as project management and project risk management in the restoration projects of cultural heritage buildings. In order for the public and private investments used in the protection of cultural heritage structures to be used more efficiently, it is necessary to plan the conservation approaches together with expert teams before the projects. Researchers have proposed a framework of PM and PRM processes to increase the efficiency of restoration projects, preserve historical icons and ensure sustainable development (Atakul et al., 2014).

Table 2 Research topics of the articles found as a result of the search.

Subject	Author
Special Laws in Conservation	(Hurol et al., 2015; Okahashi, 2023; Wosiński, 2022)
Collaborative Planning	(Wosiński, 2022)
Heritage Impact Assessment (HIA)	(Ashrafi et al., 2022; Can Çetin & Zeren Gülersoy, 2021; Wosiński, 2022)
Interdisciplinary work of architecture and structural engineering	(Durmuşlar et al., 2022)
Diagnosis of heritage buildings	(Tejedor et al., 2022)
Management-oriented Heritage BIM	(Barontini et al., 2021; Cooney et al., 2021; Machete et al., 2021; Palomar et al., 2020)
Decision Making Process	(Hurol et al., 2015; Liang et al., 2022; Nadkarni & Puthuvayi, 2020; Yıldırım, 2012)
Cultural Heritage Management	(Settembre Blundo et al., 2019)
Management of complex properties	(Moioli et al., 2018)
Cultural Heritage Project Management problems	(Roy & Kalidindi, 2017)
Heritage's contractor selection	(Morkunaite et al., 2017)
The importance of participants from different fields of expertise	(Hegazy, 2015; Hurol et al., 2015)
Risk Management	(Atakul et al., 2014)
Resource Management	(Ali & Al-Belushi, 2013)

It is necessary to manage the participation of different stakeholders in the decision-making processes in projects. At the beginning of this process, a project manager with high competence should manage the process. Transparent evaluation of alternative solution proposals in the process, effective communication between the project and its stakeholders, and determination of common goals and objectives for the project are necessary for the process to proceed efficiently (El-Sawalhi & Hammad, 2015).

Impact assessment is defined as “the process of determining the future consequences of an existing or proposed action”. Heritage Impact Assessment (HIA) emerged as a conflict resolution tool to improve the conservation of World Heritage (WH) in line with sustainable development policies. It is necessary to connect the policies, plans, and projects that manage the transformation of the cities where the cultural heritage is located, with the management plans prepared specifically for the location that determine the conservation and use of cultural assets (Can Çetin & Zeren Gülersoy, 2021). The creation of the Heritage Impact Assessment within the framework of environmental impact assessment is seen as an important step towards the preservation and preservation of cultural World Heritage values, together with sustainable development goals. In addition, the HIA method is expected to be supportive in preventing conflicts between multi-disciplinary teams and solving problems in decision-making processes (Ashrafi et al., 2022).

In order to take the retrofitting decisions to be applied to the heritage buildings, the current structural condition of the building should be determined first. Parameters are needed to make decisions about the structural status of

historical buildings. Safety factors, which express the structural stability of the walls, are one of the parameters necessary for making decisions regarding the intervention method. Architects and civil engineers should work together in determining these parameters and determining structural applications (Durmuşlar et al., 2022)

Although the Building Information Modelling (BIM) methodology is promising within the historical BIM (HBIM) research field, its application to the care of built heritage remains challenging. Standardization of procedures, interoperability of software components, and simplification of methodologies are required for these methods to become widespread. When the problems related to the use of BIM in historical buildings are examined, the low BIM knowledge of the teams working in the preservation projects of historical buildings, the absence of existing three-dimensional models of the buildings, the lack of standardization of the data to be collected in the field and the information to be uploaded to the BIM model are listed (Barontini et al., 2021).

Building information models created for cultural heritage buildings should be designed according to needs. The researchers produced two building information modelling of the cultural heritage structure they studied. The first model was prepared considering the data required for the restoration of the structure. The second model was created to record the protection and maintenance data of the building. In this study, in which two models prepared for the cultural heritage structure are compared, it is seen that the building information modelling differs according to the needs and the fields of expertise of the users. This shows that building information modelling should be designed by experts who will use that modelling in line with the needs (Machete et al., 2021).

“Multi-Criteria Decision Making (MCDM) is a basic scientific method used by experts to effectively and efficiently select the best alternative, classify alternatives, or rank alternatives in an order of preference.”(Nadkarni & Puthuvayi, 2020). Nadkarni & Puthuvayi (2020) gathered the intensities of research topics related to the use of MCDM under the headings in their literature review. These topics are listed as follows: Alternate-use/adaptive-reuse selection, priority order for renovation/restoration/rehabilitation, building significance/value assessment, evaluation of alternative solution for renovation, assessment of functional service life, and contractor selection.

5. Conclusion

When the articles obtained as a result of the literature review are examined, it is seen that cultural heritage structures need special legal regulations, expert teams, information management of the buildings and process management with a holistic perspective. It is emphasized in the studies that experts from different disciplines and people who use historical buildings should take a role in the conservation processes. The methods of multi-participant design and decision-making processes need to be determined. Otherwise, these processes are in danger of turning into processes where decisions about conservation projects cannot be taken. For this reason, the roles of the participants in the projects related to the preservation of historical buildings should be clearly defined. It should be ensured that the participants, whose roles are determined, take part and contribute to the decision-making processes appropriate to their roles. Strong interaction and communication should be ensured among all professionals involved in the conservation process. Cultural heritage structures that require multidisciplinary pre-diagnosis and strong interaction should be evaluated with a "case-by-case" approach (Gulotta et al., 2013).

The studies emphasize the importance of accessing and contributing to common knowledge databases. The importance of working together by professionals specialized in different disciplines in the transfer of historical structures to the future is emphasized. It is necessary for the sustainability of cultural heritage that all stakeholders have an active role in the decisions to be taken regarding historical buildings. All these collaborative working environments need to be regulated by laws, regulations and directives, and how the stakeholders will contribute to the decision-making processes should be defined. In the studies conducted, the issue of trust was not encountered. Trust is an important issue in collaborative work environments. In the future studies, studies on the issue of trust in the protection of cultural heritage structures will be useful to determine the existing problems related to trust and the related effects.

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Conflict of Interests

The authors declare no conflict of interest.

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