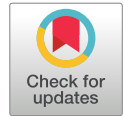


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A Methodological Approach to Historic Building Conservation: A DSS for Restoration Project Process Optimisation



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Abstract

This study investigates ongoing project submission and evaluation processes in institutions responsible for restoration projects in Turkey to accelerate processes by digitising and transferring restoration project submission and evaluation processes to a digital environment for sustainable conservation and to ensure resilient archives. The proposed method is based on domain knowledge acquisition and content analysis of multiple interviews. The study hypothesised that a decision support system (DSS) would be suitable for digitalising the process because both systems perform on flowcharts. The interviews were conducted based on content analyses of multiple structured stakeholder interviews. The process flowchart was evaluated based on stakeholder interviews. Their responses revealed strengths and weaknesses that can be used in future studies. By mapping out the existing legislation-based workflow, this study aims to lay the groundwork for a more efficient, digitised system to manage restoration projects in Turkey. One of the most important findings was that the restoration project submission and evaluation process evolved over the years, and the councils compensated for the insufficient definitions of the related legislation. Under these terms, a common medium is necessary to support our analyses of the need for DSSs. This study is an example of a process surveying explicit processes defined in legislation and tacit, experience-based processes.

Keywords


Decision Support Systems • Restoration Project Processes • Sustainable Conservation • Domain Knowledge Acquisition



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Introduction

Conservation and restoration of cultural heritage are important, not only because they safeguard the traces of former sociocultural, socioeconomic, and sociopolitic trends and movements of civil history, but also because restoration provides a solution for sustainable development in terms of carbon emission, energy efficiency, and usage of new resources; like Cunningham (2002) suggests as revitalising the already occupied domain rather than expanding it. Similarly, in current ecological architecture approaches, large-scale transformations are replaced by small-scale approaches focused on transforming the system to a more ecological point while preserving the intrinsic value of the city (Boyacioglu et al., 2020). Power (2008) discussed the case, and questions whether demolishing or refurbishing existing building stock is more efficient in terms of energy use. A complementary study about life cycle analysis (LCA) is made by Caruso et al. (2020) to suggest a framework for identifying building renovation strategies that lead to an optimal balance, considering both economic and environmental impacts. On the other hand, Liao et al. (2023) found that although refurbishment is a must, economic and policy barriers as well as design obstacles exist. At this point, an effective approach for solving this multi-layered problem could be useful. By nature, a DSS can provide this option as it concentrates more on improving effectiveness and can employ evolutionary and “middle-out” design strategies (Klein and Hirschheim, 1985).

This study proposes a multilateral framework for Turkey's conservation and restoration procedures by mapping resolution no. 660 “*Grouping, Maintenance and Repairs of Immovable Cultural Properties*” (1999). Resolution no. 660, by its nature, gives the general outlines of the restoration project submission and evaluation process and is used as guidance support at the Regional Councils for the Conservation of Cultural Property. The Regional Councils are under the High Council for the Conservation of Cultural Property, which is under the Ministry of Culture and Tourism in an organisational hierarchy. This study examines the ongoing bureaucratic approval processes for restoration projects in relevant Turkish public institutions. This research aims to address the restoration project submission and evaluation processes and propose an adaptable and sustainable restoration framework based on (a) domain knowledge acquisition in architecture by local authorities in Turkey and (b) the United Nations Sustainable Development Goals (UN-SDGs) through digitisation. The outcome of this study; the adaptable multilateral framework for restoration project processes in Turkey (local impact), could facilitate the restoration project submission and evaluation processes in developing countries (global impact).

Although UN-SDGs are for global purposes, the contribution and participation of local authorities are also crucial. Khalaf (2015) underlined the importance of a participatory approach for defining heritage values. This aligns with the ICOMOS' *Declaration of Amsterdam* (1975); “*Local authorities, which whom most of the important planning decisions rest, have a special responsibility for the protection of the architectural heritage and should assist one another by the exchange of ideas and information.*” The main contribution of our research is to suggest a multilateral framework to bring different institutions at different scales from Turkey and stakeholders involved in architectural heritage preservation together with the help of a DSS and to create a sustainable method for working, communicating, and transferring documents among these different actors for agile governance.

However, conservation and restoration procedures in Turkey are often bureaucratic. The conservation and restoration processes involve diverse stakeholders from different departments and organisations resulting in lengthy and complicated executions. The lengthy and complicated way of executing conservation and restoration procedures decelerates the work and creates a comparably unpopular opinion about restoration.



To popularise conservation and restoration for sustainable urban development, procedures should also be adapted to daily life practices in this digital age, by answering user needs while being efficient, cost-reducing, and economical.

Numerous studies have illustrated the impact of DSSs. One of these benefits is that DSS provides a wide range of solutions for people, whether they work together in a specific office or individually away from each other (Dempster, 1980). DSS also provides many benefits as it allows a better understanding of the business, fast response to unexpected situations, control, and more effective teamwork. (Keen, 1981). On the one hand, it is also claimed that these benefits are not humanistic and do not consider human needs; on the other hand, it was also explained that using DSS can lead to decision making, which stimulates initiative, creativity, and flexibility throughout the organisation (Klein and Hirschheim, 1985). With the help of DSSs, the conservation and restoration of architecture processes can be streamlined, allowing for more efficient collaboration and open knowledge sharing among diverse stakeholders.

The main research question is;

- *How can a multilateral framework be proposed to optimise restoration project submission and evaluation processes in Turkey?*

Building on these investigations, this study aims to lay the foundation for more efficient restoration project management in architectural heritage conservation by mapping out existing workflows in Turkey, detecting problems that are not seen unless you are included in the procedures, suggesting solutions for the root causes of those problems, and digitising the restoration project submission and evaluation process. This research offers a methodology that can also be adapted and used for any kind of tacit knowledge-based process digitisation involving both written and un-written processes, which can also be useful for digitising intangible heritage examples with similar processes. By translating resolution no. 660 into a flowchart, as in this study, the nodes formed by repetitive actions during the restoration project process until an appropriate outcome is obtained. These nodes are also useful for understanding the nature of the process and making it possible to question whether the cause depends on the resolution, technology, or related stakeholder.

As an answer to the main research question: *How can a multilateral framework be proposed to optimise the restoration project submission and evaluation processes in Turkey?*, a more optimised and technology-enabled process could benefit all stakeholders and for the transfer of knowledge, the best-fitting medium for this case is a DSS because it increases the number of the examined alternatives, can provide a better understanding of the business, enables fast response to unexpected situations, control, cost and time savings, more efficient teamwork, and makes better use of the data resource (Keen, 1981).

This paper is structured into four sections following this introduction. In Section 2, The Literature Review provides the background for the proposed multilateral architectural conversation and restoration framework and explains current conversation technologies in the world and the situation in Turkey. Section 3, Methods explains the steps of the study and the techniques used to acquire domain knowledge acquisition. Section 4, Results lists the research findings and provides the necessary information for developing a new framework. Section 5, Discussion shows the potential of the new framework and finally Section 6, Conclusion defines ways for further studies.

Literature Review

The works on digitalisation in the conservation field are grouped around a few different trends in visualisation, documentation, construction technologies, fabrication, and administration. These trends are

mostly grouped as; reconstruction or three-dimensional modelling, Heritage Building Information Modelling (HBIM), risk analysis and imaging, documentation of tangible and intangible cultural heritage, technological studies on materials used during conservation, visualisation of the cultural heritage using virtual reality (VR), augmented reality (AR), or mixed reality (MR) techniques, 3D scanning, and digital museums (Yuan et al. 2023). These trends are primarily used for the education, teaching, and application purposes of cultural heritage. On the other hand, there are studies on the digitalisation of administrative processes (Kourakou et al. 2014, Nikolina et al. 2020, Pelse et al. 2021), but these studies are in different fields than restoration. However, the aforementioned studies are being conducted worldwide. Kourakou et al. (2014) took this topic from an e-government perspective and used case studies from three Swiss cantons. Nikolina et al. (2020) made their study about the digitalisation of public management at the territorial community level in Ukraine. Pelse et al. (2021) focused on the diversity of institutions. They conducted their research on four different public administration institutions in Latvia and compared their digitalisation levels.

In Turkey, studies are mainly carried out in fields such as public administration, information systems, and documentation management. Kudde et al. (2019) completed a project that the Directorate of Cultural Heritage Preservation of Istanbul Metropolitan Municipality initiated as an inventory project in 2015. This study aims to create a digital database accessible to multiple stakeholders. Tuna et al. (2015) also carried out a similar project in Edirne, Turkey and they resulted in their study with a web-based platform that is publicly accessible. Merdan (2022) questions the digitalisation of governmental services and compared traditional and e-government services by referring to early e-governance studies at the beginning of the 2000s. Göksan (2023) took this comparison and discussed the benefits and the problems of the digitalisation of public administration. When the PhD theses on conservation in the field of architecture in Turkey since 1983 were examined, 15 out of the 284 theses are on information and communication systems (<https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp>). Only 4 of these 15 studies were on decision support or information systems.

On a global scale, some studies have reported on the use of DSSs in the conservation field. An AI-based DSS has been proposed for the preventive conservation of museum collections in historic buildings. Another study was conducted by Di Matteo et al. (2021) to develop a DSS framework for cultural heritage management with similar concerns parallel to this study, but their case study applied the framework to a museum and its management. Acampa et al. (2023) conducted their study on a bigger scale and suggested an evaluation system for the management of interventions in the Historic Centre of Florence by using a DSS. As DSSs provide resilience for the archiving and management of processes, Ripp et al. (2024) conducted a study about the integrity of resilience in practical cases and used the European research projects SHELTER and ARCH to determine whether a practicable integration of resilience with planning and development practices surrounding urban heritage was possible.

Methods

The requirements for restoration projects in Turkey were categorised and visually presented as a list. This list was transformed into a mind map, relating items to Information and Communications Technology (ICT) terms (Figure 1). The mind map indicates that a DSS is suitable for digitising the process. The relevant legislation was converted into a flowchart to digitalise the process in a DSS (Figure 2). This identified the main steps and actors. The interviews were conducted based on content analyses of multiple structured stakeholder interviews prepared from the flowchart points. These interviews were conducted after stakeholders

clearly declared their consent to be a part of this study, and they were recorded on camera immediately before the interviews began. This was explained to the Ethics board and their approval for this study.

The flowchart was evaluated based on stakeholder interviews. Their responses revealed strengths and weaknesses that will inform future studies on the use of DSSs in architectural conservation and restoration field.

Figure 1

Mind map of the project requirements list and ICT tools.

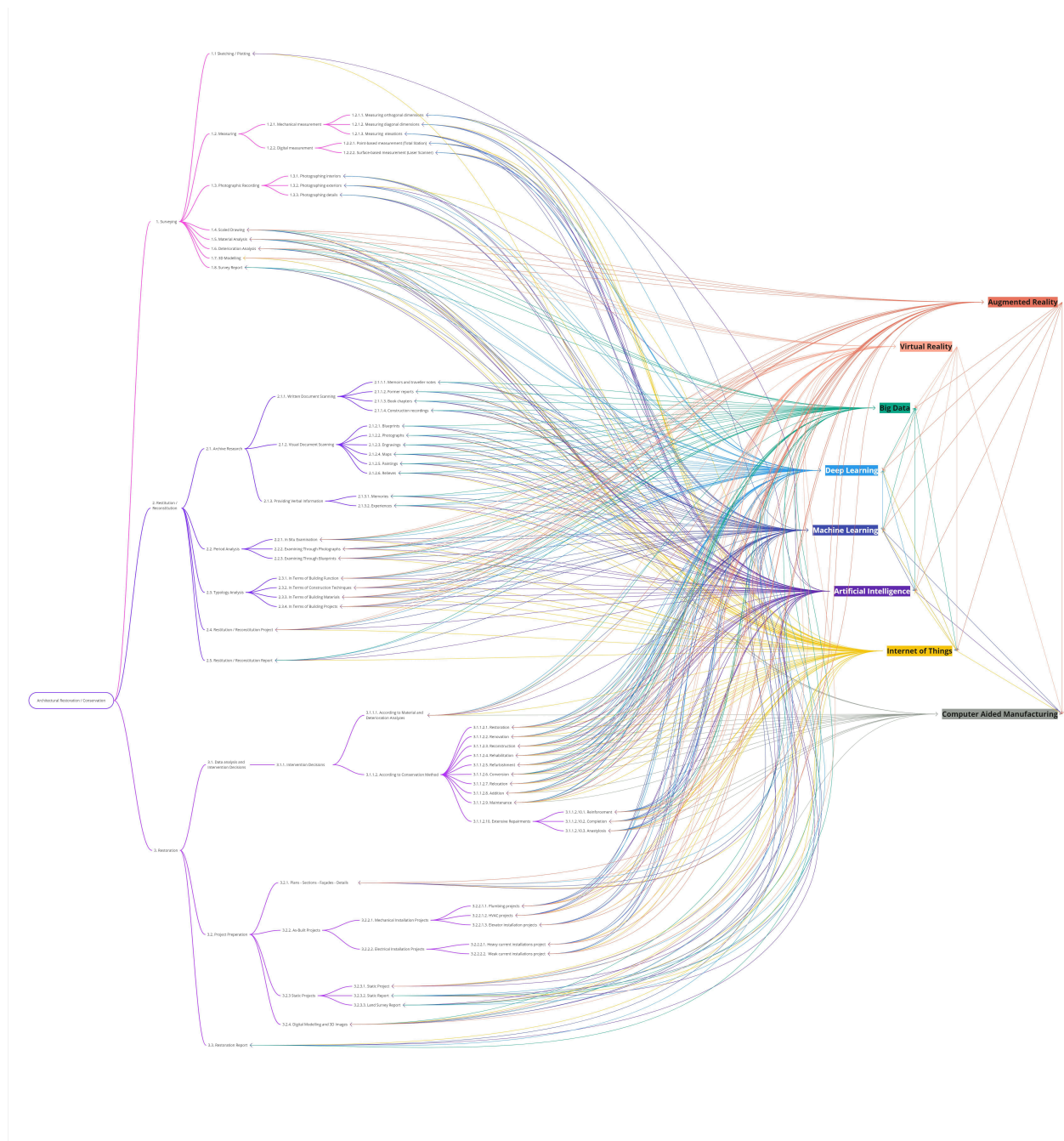
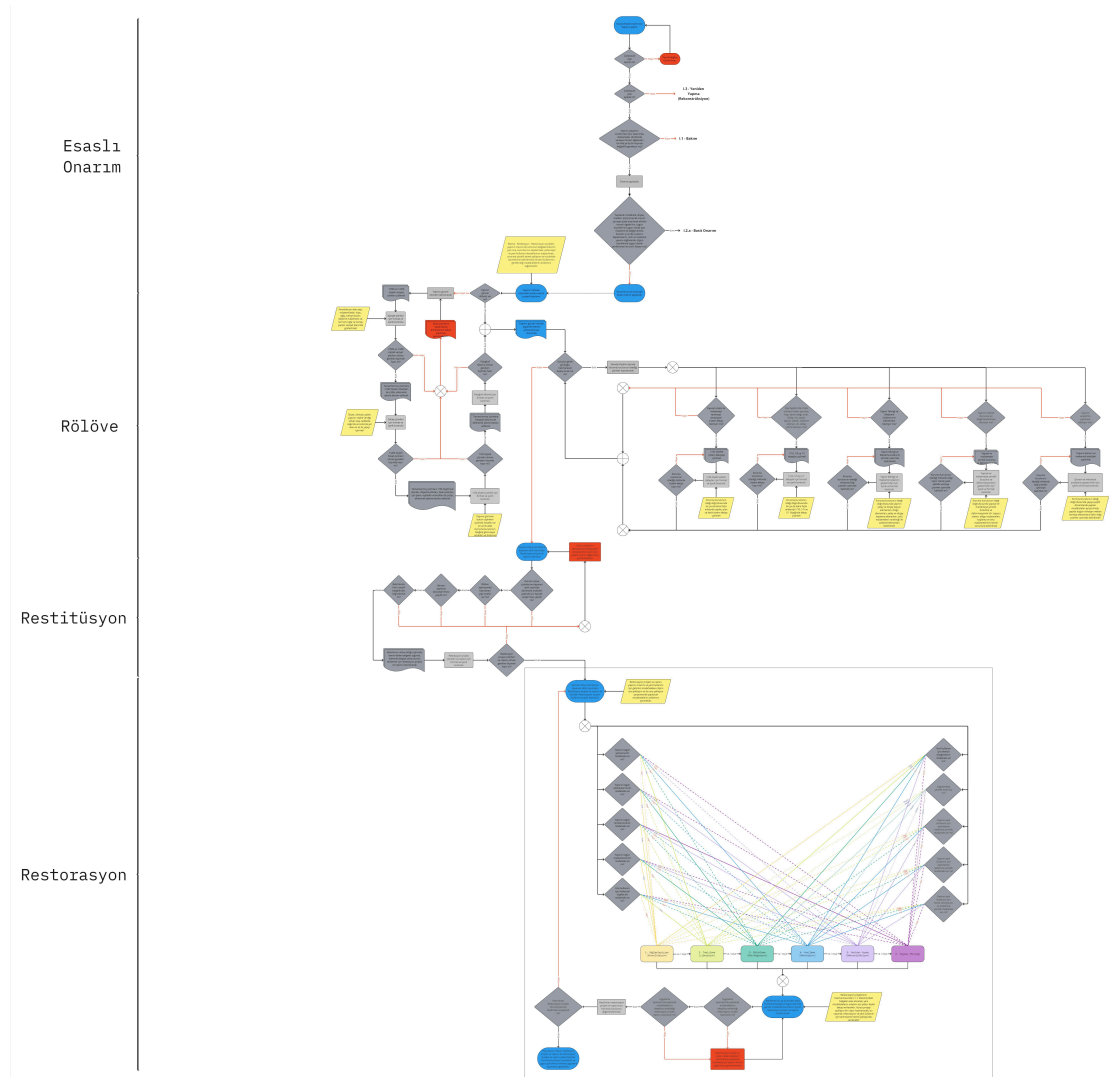


Figure 2*Flowchart of project process according to Resolution No. 660*

In these concerns and respects, this study's main question is whether the restoration project process can be transformable into a digital medium so that the data gathered through the process can be stored, analysed, and monitored by the related stakeholders and institutions within a multilateral framework. Several sub-research questions were formed while searching for the answer to the main question. The first sub-research question was whether resolution no. 660 is up-to-date and meets the restoration project process's needs. The second sub-research question was whether the needs have changed or new needs have appeared over time, and how do the councils adapt to this change. Finally, the third sub-research question is as follows: was whether a multilateral framework was needed to optimise the restoration project submission and evaluation processes in Turkey.

The methodology used in this study is based on domain knowledge acquisition in architectural conservation and restoration. As Alexander and Judy (1988) define; domain knowledge is a realm of knowledge that individuals have about a particular field of study, so domain knowledge encompasses declarative (knowing that), procedural (knowing how), and conditional (knowing when and where) knowledge, which can operate

at a tacit or explicit level (Alexander, 1992). Domain knowledge acquisition provides a way to understand the bureaucratic processes that are executed tacitly due to the nature of the expertise. To obtain domain knowledge the process followed these steps;

- 1) Write down the whole architectural conservation and restoration project submission and evaluation process explained in resolution no. 660 as a flowchart and visualise the process.
- 2) Preparing a questionnaire according to the process steps and nodes formed by repetitive actions in the flowchart.
- 3) Differentiating participants from different positions in the process depending on their contribution to the process.
- 4) Questioning the participants through structured interviews and analysing their answers to detect obvious and hidden problems with the first flowchart.
- 5) Suggesting a multilateral and adaptive architectural restoration and conservation framework for councils.

Results

To answer the main research question and understand the existing situation in Turkey's restoration project submission and evaluation process, first the resolution is transformed into a flowchart and visualised the process. After visualising the existing steps, a clear distinction appeared. The resolution defines the possible interventions under three main fields; the first one is basic repair, which covers the basic interventions like painting, fixing, or changing the woodwork and similar actions, that need no specific expertise; the second one is major repair, which covers the conservation-related interventions that need certain specific expertise; and the third one is reconstruction, which covers the whole project process of reconstruction that needs both; certain specific expertise and sufficient documents for reconstruction to verify the cause. As the purpose of this study is to scan and identify the problematic points of the restoration project process and the resolution related to it, the context of the study is limited to the restoration project processes of commercial and residential buildings under major repair. As they have a lesser amount of additional procedures than other conservation interventions such as reconstruction. Although their restoration project processes are also classified under extensive maintenance, monuments and monumental buildings were also excluded because of their need for different fields of expertise during the whole project process.

The next step after this segregation was to understand the situation. The first sub-research question was whether the existing resolution was still applicable, as it was dated back to 1999. We asked whether the project submission was still made, as defined in the resolution. This question was useful to form the first part of the questionnaire. In the first part, the submission content and format was questioned. The process was very clearly separated into three major drawing sets; surveying, restitution, and restoration (This term may have different meanings in other countries but in Turkey, it is related to the overall action, rather than narrowing the intervention options under a single alternative). In the following parts of the questionnaire; the process's surveying, restitution, and restoration sets were questioned. For each of the three drawing sets, the same set of questions were asked;

- 1) How should a submission be made? Can the three different drawing sets be submitted together or separately? What are the pros and cons of submitting the drawing sets together and separately? Does it affect the pace of the project evaluation process at the councils?



- 2) Is the bare minimum for the restoration project submission as described above? Is there any request for another set of drawings that is not mentioned in resolution no.660 but demanded by the councils? (This question was useful in searching for the answer to the second sub-research question; if the needs have changed or new needs have appeared over time, how do the councils adapt to this change?)
- 3) How should a submission be named “an ideal submission”? What should it contain? Can you anonymously provide examples from real cases without violating the confidentiality of the cases?
- 4) How should a submission be made that can be defined as “the perfect storm”? What must it not contain? Can you provide examples from your professional experience or anonymously from real cases without violating the confidentiality of the cases?
- 5) Is the format and medium for submission and presentation of the projects are sufficient? Are there any limitations related to the format and/or medium of the submissions?

A qualitative and exploratory research approach was used that included structured interviews with eleven experts from three different positions of the restoration project process; the professional architect as the project author, the council corresponsder as the project controller for the Regional Councils for the Conservation of Cultural Heritage, and the expert board member, as the decision maker for the Regional Councils for the Conservation of Cultural Heritage. These three expert groups were chosen according to the process structure. The project author's expertise was needed to prepare and submit the drawings so that the process could begin. The project controller's expertise was needed to control submissions to determine their proficiency and lead the process until submissions were ready to be presented to the board. Finally, decision-makers' expertise was needed to evaluate the submission and conclude the process. According to this setup, the selection criteria for these eleven experts were their working and project preparing, controlling and evaluating locations in Turkey. The selection was attempted to be made as the expertise covers as many as different locations possible.

Since the answers were obtained through domain knowledge acquisition, the expert conducting the interview had to interpret the answers given within the framework of his/her expertise. In light of all the information obtained from the interviewed experts, a very clear answer emerged for the first sub-research question; *“whether the resolution no. 660 is up-to-date and meets the restoration project process's needs”*. There is a marked difference between the definition of the process as written in the resolution and practice. The infrastructure and facilities required to prepare a substantial restoration project have changed significantly in the last 20 years. The new available mediums have created new alternatives in terms of the content and presentation techniques of the projects. Another change is that the techniques applied in the field of analysis and conservation can be customised to finer details by the use of advanced technology. This allows for case-specific and problem-specific solutions to be developed, rather than generalisations of intervention decisions and techniques, which is more compatible with the definition in ICOMOS' *Washington Charter* (1975); *“4. Conservation in a historical town or urban area requires prudence, a systematic approach, and discipline. Rigidity should be avoided since individual cases may present specific problems.”*

The answer to the second sub-research question; *“whether the needs have changed or new needs have appeared over time, how do the councils adapt to this change.”* was also given during the interviews. The bare minimum requirements for the project submission are not enough anymore. Extra requirements mentioned in the resolution became a part of the standard submission. In addition to this change, some regional councils have begun to demand a “credibility sheet” from the project authors to add to their submissions. Resolution no. 660 set the format and described the requirements for project submissions to councils in



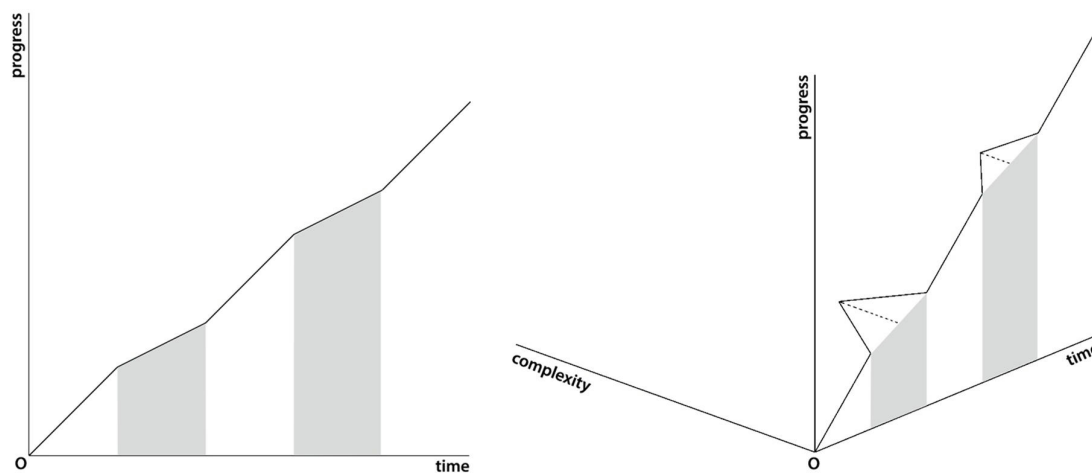
1999. Today, as the cases become more detailed and multilayered, the regional councils try to fill the void palliatively, as resolution no. 660 lacks the answers to newly emerged needs. To standardise all the process formats among regional councils, a multilateral medium is needed to bring all stakeholders together within a DSS.

The need answers the third sub-research question; “*whether a multilateral framework is needed to optimise the restoration project submission and evaluation processes in Turkey*”. There are several reasons for this need. First of all, as mentioned earlier, there is an optimisation problem among the council standards. Second, during the COVID-19 pandemic, it was experienced that existing workflows were mostly for offline practices, and the voids in the workflows were completed by the experts’ experience. Work definitions or workflows do not have clear steps to follow. This causes problems when usual processes should be completed online or remotely, and this situation affects the pace of progress.

Furthermore, some other results were obtained although they were not expected. The pace of the project’s progress also changed under urgent conditions. Abandoning the idea of protecting cultural heritage for rent and profit or the risk for the loss of cultural heritage due to disasters, such as earthquakes and fires, is the reason for urgent actions. Another obtained point was that in cases such as the cultural heritage has vital importance, such as hospitals, that also requires restoration; fast progress is only possible if board members, as the decision-makers, are experienced. This situation affects the pace of progress. The regional councils with such experienced board members can evaluate cases rapidly, whereas councils lacking this expertise need more time to evaluate such cases. The graph on the right shows the reason for the change in the pace of progress of undefined areas in the process by adding the complexity axis for undefined and/or emergent cases. This also shows that the process timeline is not linear but rather planar. Therefore, a flowchart with multiple dimensions would be more useful than a linear flowchart (Figure 3).

Figure 3

Workflow graph and undefined areas in the process on the left (marked with grey areas).



In some cases, this difference in expertise can affect the evaluation criteria and the requirements demanded by the councils during the project submission phase. Documentation was also mentioned during the interviews. The drawings that are submitted to the councils may have changed during the execution of the decided interventions. If the project author has missed updating the project, the document in the

archives and the completed intervention will be at two different points. Finally, the risk of data loss over the years due to the way documents are stored was also mentioned. This risk validates the need for digitalisation of the councils but neither the councils have sufficient tools for that transformation nor the infrastructure is adequate. On the other hand, to protect the confidentiality of the cases sampled for this study, the problems were not exposed with all the details in order not to implicate the institutions or the authors. This is also a problem that makes it difficult to control cases.

Discussion

The world is heading to a digital future, and there are some efforts to digitise the existing daily practices. Particular fields such as; communication, management, and archiving are getting digitised rapidly due to their adaptable nature. On the other hand, private and public institutions that function within these fields are not equally adaptive although their organisations and workflows are alike. Private companies and institutions are more adaptive to paradigm changes, depending on their agile nature. In contrast, public institutions are not very adaptive to paradigm changes because their bureaucratic procedures can be lengthy and complicated if more than one department, let alone an institution, is involved in the process.

According to the findings of this study, the need is to create a system so the process can be adaptable among different councils. Creating a digital archive that can be accessible by different stakeholders at different levels can be very useful (Figure 4). This database can be stored on the servers of the Ministry of Culture and Tourism and executive authorisation of the Regional Councils for the Conservation of Cultural Heritage would be provided by the High Council for the Conservation of Cultural Heritage within the organisational hierarchy. This flowchart for the DSS also allows the digitisation of the process at various scales and contents, with the possibility of describing the work of the stakeholders involved in the process in the flowchart. The digitisation of the system allows the process to be less bureaucratic and accessible to different stakeholders at a faster and wider scale. Another advantage of this system is that in cases where councils need to assign employees for certain files due to the insufficient number of staff they have, employees access through the system that allows the process to be examined through an inter council system.

Figure 4

The DSS and the database relation over the project authors, councils, researchers, citizens, and municipalities' roles.



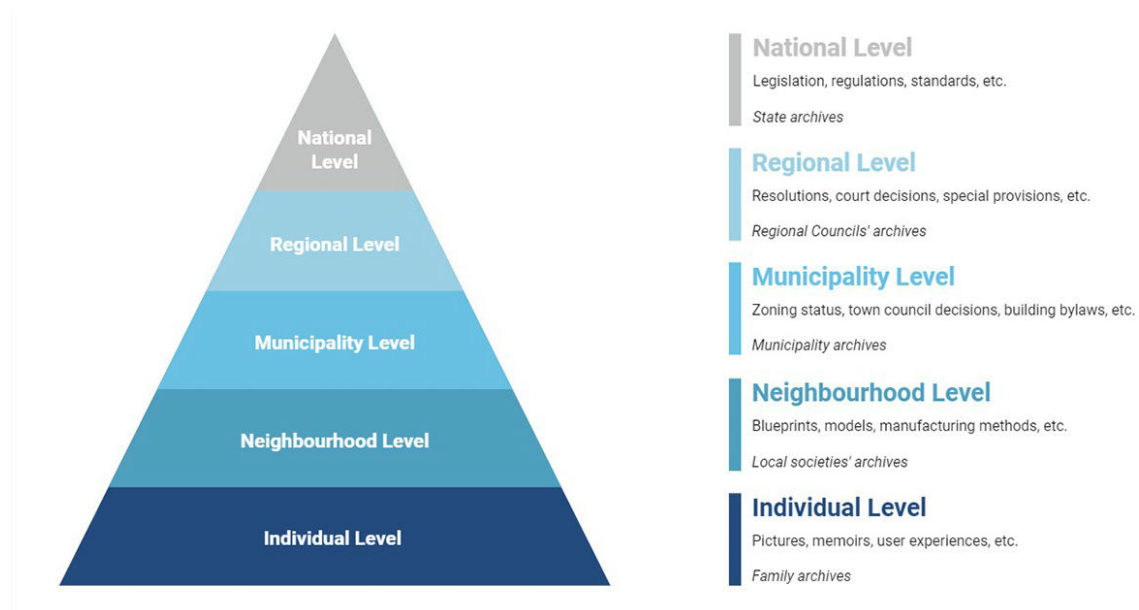
Although all this system formation, standardisation, and digitisation has the potential to enable the process to work with more agility, it does not mean that the entire system should completely be digitised. Especially when the technological development process of the last twenty years is considered, the problems of accessing the data within the media such as floppy disks, or lately with CD/DVDs where all the data in a large period was stored is also a problem. The probability of not having an access or having troubles accessing the data today should not be ignored. Cloud services can be useful in preventing this problem, but copyright and privacy can become an issue between institutions and service providers. This problem can be avoided if public institutions develop servers to store and share their data with authorised stakeholders. In addition, some neutral stakeholders like universities and NGOs should keep independent archives for backup and control of digitally stored data in case it is needed so that the whole process can be transparent and trackable at any point.

Another point is that in case of emergencies, the experience of covering the voids of the flowcharts or undefined areas in the process is vital for the continuity of the process. Digitisation can cause a bureaucratic burden in cases that should be acted swiftly first and then the bureaucracy to follow these actions. If this DSS or similar systems had been established before the catastrophes, such as the Notre Dame fire in 2019 and two devastating earthquakes in Turkey on February 6th, 2023. The recovery process might have been faster and more organised. This point also shows that the digitalisation of this process provides resilience to the protection of data and can be useful globally. It may be useful to underline that the purpose of all this DSS and standardisation is to improve the process, and that is a step towards enhancing the councils' current problems by bureaucratically solving the problematic points in the functioning of the councils. In other words, what should be done is not replacing employees with machines but enhancing them through ICT. As council archives have not yet been completed as digitised, the councils are limiting the database of the councils themselves. Spreading this experience can also be beneficial for on-the-job training among architects, council employees, and researchers. This also matches with the 16th Article of the Venice Charter (1964), which is about the publication of the study and the records; *"...(The reports) should be placed in the archives of a public Institution and made available to research workers. It is recommended that the report should be published."*

This transformation can lead to further changes in council structures. The first change can be related to project formats, and councils may start asking for BIM-based projects rather than only two-dimensional drawings (Arayıcı et al., 2017). As a result of this basic change, projects and intervention decisions can be saved in council archives both digitally and in printed-out formats. Once the projects are delivered in BIM format, digitisation of the existing archives and the entities in them will not increase in number but can rather be transformed in time. Another advantage might be that if these digital building copies are also stored in a cloud system, the new interventions can be updated on the models simultaneously, and it would be possible to see former interventions on the same element in the model. Further, this cloud service is integrated with blockchain technology, so councils can determine who can access which kind of document according to the kind of authorisation they have. This can also create unity among the councils and archives, but the existing infrastructure and the technological know-how are not adequate for this kind of transformation to be completed (Figure 5).

Figure 5

Graph showing different levels of data; the type of the data and the related archive type.

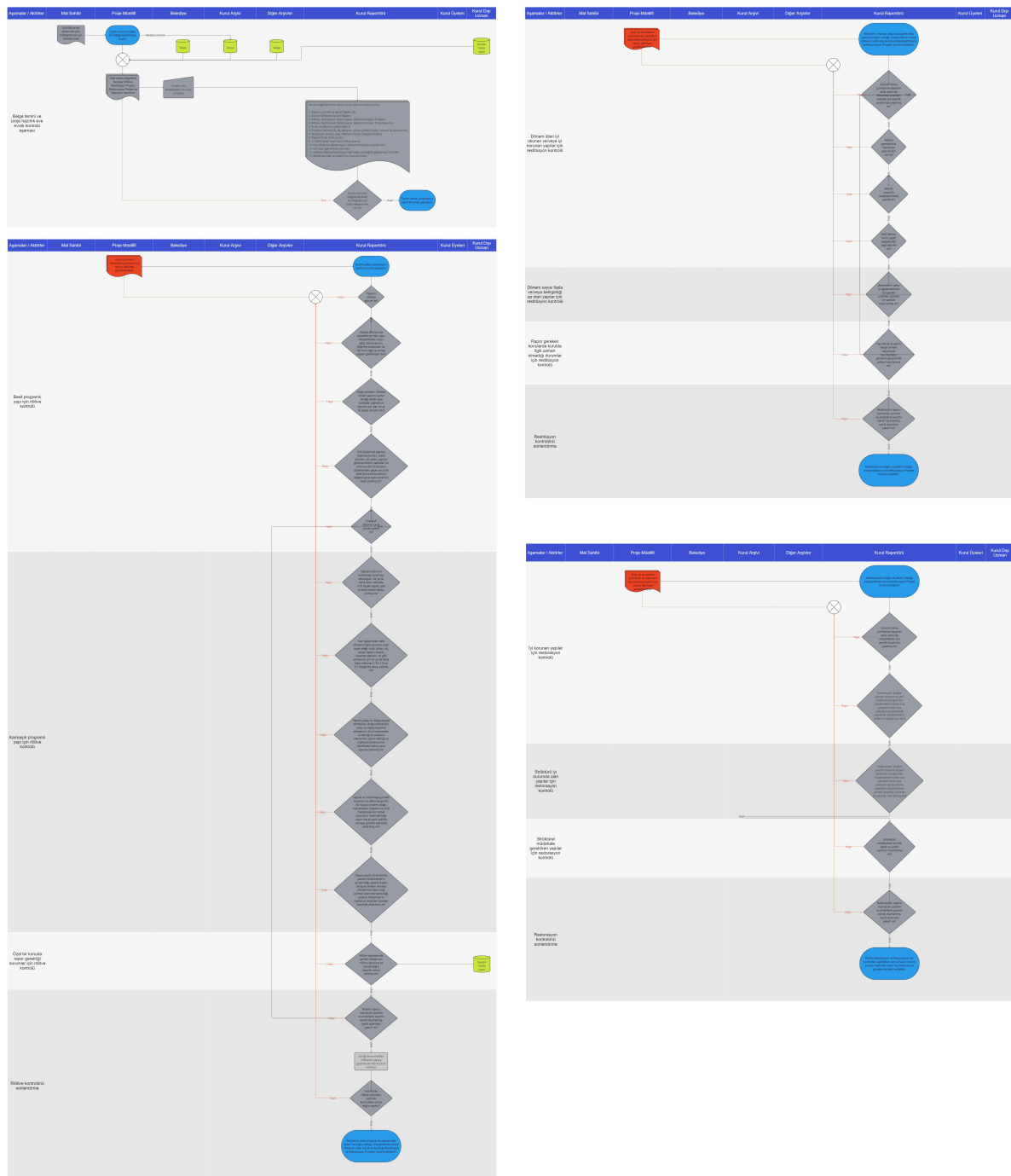


Conclusion

Considering all these factors, a more adaptable, elaborated flowchart is suggested, which is based on the analysis of the first flowchart. Rather than transforming the existing resolution into a flowchart, the ongoing project process is transformed into a flowchart and modified according to resolution no. 660. The second flowchart was prepared as a cross-functional flowchart and various stakeholders were involved in the process who were not mentioned in the resolution. By changing the format, the flowchart became legislation-independent (Figure 6). As the new flowchart is based on the process rather than the resolution itself, even if the law or resolution is updated or changed, the system is expected to be adaptable to these changes. This also allows the system to be used by different countries and councils around the world with similar problems, as discussed above in Turkey's case.

Figure 6

Enhanced flowchart for DSS that can adapt to different needs of different regional councils as well as provide a common basic flowchart for all the councils.



Knowing that as it was recognised in the *Delhi Declaration on Heritage and Democracy* (2017), “... the role that digital technologies and modern communications now play in heritage management” it is becoming more crucial to adopt and innovate similar technologies in the conservation field as much as technological advancements allow.

This study can be further elaborated in future studies in several different areas, such as computer science, software engineering, information and document management, information and communication technologies, architectural conservation, and digital heritage. The objective of this study was to create a methodological framework with an exploratory approach by using domain knowledge acquisition. Incorporating existing knowledge into a visual workflow by the validation of the domain knowledge and digitising an existing process is also aimed at transforming empirical experience into DSSs that can be adapted into similar organisations in need of any digitisation process. It can also be elaborated and used for intangible heritage-related topics and can help to form a framework for them in terms of transferring domain knowledge into a digital medium and being more accessible for interdisciplinary research. This digital medium provides another important point: When archiving becomes digital, it will be easier to store domain knowledge from various experts. The DSS creates the software and the network among these experts, making it possible to gather the big data from different interventions within this network using the DSS. After collecting an appropriate amount of data, it will be possible to train artificial intelligence (AI) agents and use them as assistants during similar evaluation processes. This possibility has the potential to be very useful by tracking down all the gathered data and suggesting AI-developed intervention alternatives from the patterns of existing data, even for cases without any useful data to evaluate for intervention.




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