

## **Overview of qualitative and quantitative research methods in the field of library-material preservation**

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**Abstract:** The aim of this paper is to give an overview of qualitative and quantitative methods used in the field of library-material preservation. Preservation of library materials is a diverse issue that can be researched from various standpoints. For instance, it is possible to explore development of theoretical approaches, preservation planning and management process, economic and legal aspects of preservation, necessary knowledge and competencies, different material properties and preservation methods, and impact of preservation on cultural and social issues. A variety of methods and techniques can be used for doing so, from experimental (instrumental) methods, statistical methods, and bibliometrics, on one hand, to content analyses, case studies, and unobtrusive measures, on the other. This work is based on the preservation-management model developed by the authors that comprises five key components: strategic and theoretical, economic and legal, educational, technical and operational, and cultural and social component. An overview of possible methods for exploring preservation issues—grouped according to these categories—will be given

**Keywords:** preservation, conservation, preservation management, libraries, qualitative and quantitative methods

### **1. Introduction**

The preservation of library materials is a complex field that can be researched from various viewpoints. For example, it is possible to explore development of theoretical approaches, preservation planning and management process, economic and legal aspects of preservation, necessary knowledge and competencies, different material properties and preservation methods, and impact of preservation on cultural and social issues. Although preservation is very often perceived fragmentary within library and information science, it is a field that includes many research issues and methods. The aim of this paper is not only to give an overview of possible research issues and methods in this field but also to emphasise the connections between them. Methods in this paper are characterised by their ability to answer research questions. Each method will

allow us to gather some kind of information; therefore, it is important to know what it is we wish to do with the gathered data and to be able to position the results within the wider context of the field we are researching—in this case, preservation.

## **2. A framework for scientific research in the field of library-material preservation**

The conceptual approach used in this paper is based on the preservation-management model developed by the authors that is comprised of five key components: strategic and theoretical, economic and legal, educational, technical and operational, cultural and social component. (Krtalic and Hasenay 2012). The model is based on frameworks within which preservation is conducted (national, institutional, social, and cultural) and on the resources necessary for implementing preservation activities (financial and human, including the necessary knowledge and competence). The guiding principle is that preservation is a complex process that must be strategically planned by following goals and mission set on a national and institutional level. Such plans should be grounded in theoretical knowledge and achievements in the field of preservation. Furthermore, the preservation process must comply with the economic and legal framework within which the institution functions, but with an emphasis on overcoming limitations that such frameworks often pose. Special attention should be paid to the educational element of managing preservation, given that education on different levels (from the formal education of information specialists and conservators to the training of staff and users) is believed to contribute to the efficacy of preservation. Since the material and content of heritage items are the focus of preservation activities, an important part of preservation management is handling and safeguarding collections and knowing their conditions and needs. Finally, it is assumed that preservation should result in preserving information (and access to it) that is significant and usable to different areas of cultural and social life. Bearing in mind these basic premises, this preservation-management model comprises five key components, as already mentioned: strategic and theoretical, economic and legal, educational, technical and operational, cultural and social component. Different issues regarding successful preservation management are brought together within these components, such as policies and strategies, financial issues, legal regulations, knowledge and competencies, preservation methods and techniques, user needs, and, lastly, the cultural and social impact of preservation. The analysis of each component provides relevant data for successful preservation management, and this analysis can be conducted on the national and institutional levels. This five-component division of the preservation-management model is used as a starting point in this paper to systematise and group possible research issues in the field of library-material preservation.

### **3. Overview of qualitative and quantitative research methods used in the field of library-material preservation**

The following text aims to give an overview of possible research methods in the field of library-material preservation, categorising them using the abovementioned components of the preservation-management model. Several points need to be emphasised here. First, the term 'method' used in this paper implies a research method, i.e. a method used to scientifically investigate a research issue or question. It does not refer to specific preservation methods and techniques used on library material in order to enhance or restore its properties, such as conservation and restoration methods or digital preservation methods. Second, the overview of issues and methods given in this paper is not meant to be exhaustive or prescriptive but illustrative. The research issues and methods listed in the table below indicate what issues could be scientifically researched and what methods might be appropriate for that purpose. Third, the preservation field as illustrated in this paper is too wide for us to be able to give detailed reviews of research that has already been done. That is why this paper aims to give a general overview of the field, while separate reviews of specific issues regarding each component are considered the subjects of other papers. Finally, the proposed research issues belong to different fields of science, from social science to natural science. The diversity of issues and methods grouped inside the preservation field reflects the variations in descriptions of research methodologies used in different fields of science. The following overview is based on relevant professional literature about preservation (Cloonan 2011, Chowdhury 2010, Walker 2009, Calvi et al. 2006, Gorman and Shep 2006, Feather 2004, Matthews and Thebridge 2001, Banks and Pilette 2000) and about qualitative, quantitative and mixed-method research, especially in information science (Gorman and Clayton 2005, Powel and Silipigni Connaway 2004, Creswell 2003, Berg 2001, Patton 1990, McClure and Herson 1991, Busha and Harter 1980, Skoog and West, 1971).

The strategic and theoretical component includes planning and developing preservation programs, plans, and policies on national and institutional levels based on contemporary theoretical knowledge about preservation and taking into account examples of good practice. Within the strategic and theoretical component, these issues could be researched:

- issues related to the building and transfer of theoretical knowledge about and for preservation
- issues related to planning, organising, and managing preservation activities.

For example, when researching the development of preservation as a professional issue within the library and information science fields, a basic research problem is finding out the key events that caused change and encouraged development in the field towards a certain direction. This is especially important in terms of connecting professional trends in certain periods of time with wider contexts, such as dominant social values, technology

development, changes in the education system, etc. Bibliometric research and content analyses of published literature are methods that are most useful here. On the other hand, taking preservation activities that are within a national or institutional context and organising them into national or institutional preservation-management models can also be a subject of research. Complex research such as this requires survey research and interviews with relevant individuals and institutions, an analysis of scientific production through literature reviews, content analyses of legal, financial, and strategic documents, case studies, system analysis, etc.

The economic and legal component includes managing the available financial resources, finding additional resources, following, changing, and implementing legal documents relevant for preservation, and acting in accordance with them. Within the economic and legal component, these issues could be researched:

- issues related to budget planning, financing models, and calculating costs of preservation
- issues related to legal-document content, copyright issues, and the applicability of legal documents in practice.

For example, estimating preservation costs as a research issue implies finding answers to questions such as ‘What is the role of cost analysis in preservation management?’ and ‘How do I identify and calculate costs?’ Methods used to answer these research questions are cost analysis, cost-benefit analysis, operations research, etc.

In addition, analysing the content of legal documents and their applicability to practice is another research issue that can be researched using methods such as content analysis and case studies.

The educational component includes defining the corpus of preservation knowledge, incorporating knowledge about preservation issues into the formal education of information experts, training staff to conduct regular preservation activities (and, if necessary, educating them about specific preservation activities), educating users, etc. Within the educational component, these issues could be researched:

- issues related to developing preservation competencies and skills through formal education and professional training
- issues related to constructing educational resources and materials.

For example, an interesting research issue is the pedagogic, didactic, and methodical approaches to teaching preservation. Within this research issue it can be explored how theory and teaching methods grounded in education science are applied when one is teaching preservation in formal- and informal-education programs. Although this research issue may not seem explicitly related to preservation, it is an important topic in the field of preservation. Methods used in education science such as correlational and causal research methods and constructivist paradigm methods can be useful.

The technical and operational component includes estimating storage conditions and deterioration rates, conducting collection-condition surveys, handling materials, applying preservation methods and techniques, disaster preparedness, etc. This component encompasses the widest range of issues and, therefore, the widest range of research methods. Within the technical and operational component, these issues could be researched:

- issues related to preservation methods and techniques
- issues related to the condition and properties of materials.

For example, collection-condition surveys conducted in libraries are important prerequisites for efficient preservation management. One basic research problem is how to efficiently collect and analyse the necessary data for research that focuses on sampling models and analysing simulations of results. Modelling and statistical methods are important here.

Another important research issue is that of investigating paper and other materials in library collections. One basic research problem with regard to investigating paper as a material is determining its physical–chemical properties. This can be determined by non-destructive material testing methods which include many instrumental methods that vary in sophistication, such as optical methods, spectroscopy, and electroanalytical methods.

The cultural and social component includes establishing and applying evaluation and selection criteria for preservation, offering new services that contribute to social development, and raising social awareness about the importance and value of heritage and heritage preservation. Within the cultural and social component, these issues could be researched:

- issues related to the value of collections
- issues related to the value of preservation.

For example, the condition of library materials and the preservation activities conducted on them can have a significant influence on the study of cultural and social issues. If a bookbinding technique or style is a subject of a study, it can be of great value to researchers if library collections can offer researchers the opportunity to study original material with authentic bindings that were minimally interfered with over time and that are still in good condition. Detailed conservation documentation can also be very useful because it records the changes done to library materials over time, and it can provide photographic documentation of inaccessible parts of a book—for example, those that are visible only during the conservation process. The findings of such studies contribute significantly to book history and book-trade history, as well as reveal cultural and social links between countries. The value of collections and the value of preservation therefore have a crucial role in such studies. A potential methodology used for studying book bindings is the mixed-method approach. Especially significant in this component is the method of historical research.

An overview of possible research issues and research methods in the field of preservation is given in Table 1.

Table 1. Overview of possible research issues and research methods in the field of preservation

Strategic and theoretical component	
<i>Research issues</i>	<i>Possible methods</i>
<b>Organisation of preservation activities</b> --efficiency of organising preservation activities --impact of organisation process on preservation activities --interaction of preservation-organisation process with other library activities --development of new organisational models	-operations research -systems analysis -case studies -modelling
<b>Preservation-management models</b> --existing national and institutional preservation-management models --ways of implementing preservation-management models --comparison of existing model types in terms of efficiency, applicability, etc. --comparison of preservation-management models between institutions/countries --development of new models --development and simulation of implementation of 'if-then' decision-tree models	-comparative studies -case studies -operations research -modelling
<b>Preservation programs, policies, and strategies</b> --content of preservation policies and strategies in relation to type of institution, mission, user needs, etc. --the role and impact of preservation policies and strategies on general library management --ways of implementing preservation policies and strategies --efficiency of preservation programmes	-content analysis -Delphi study -comparative studies
<b>Disaster preparedness and planning</b> --content of disaster-preparedness plans --role of disaster-preparedness plans in general library management and ways of implementing them --comparison of efficiency of existing disaster-preparedness plans against real disasters that have taken place	-action research -case studies
<b>Development of the field</b> --development of new theories in the field of preservation --development of theoretical background in the field --dominant theoretical concepts --connections between theory and practice --impact of preservation research on the development of the library and information science field	-bibliometrics (including citation analysis) -content analysis (literature reviews)
Economic and legal component	
<i>Research issues</i>	<i>Possible methods</i>
<b>Managing financial resources</b> --development of budget-planning process --identifying potential investors and new financial resources for preservation --selection criteria for allocating funds	-modelling -operations research -market research

<p><b>Estimating preservation costs</b>                  --investigating the role of cost analysis in preservation                  --development of methodologies for cost analysis                  --identifying and calculating costs                  --monitoring and evaluating impacts of costs analysis</p>	<p>-cost analysis                  -cost-benefit analysis</p>
<p><b>Financial models for preservation</b>                  --prerequisites for developing financial models for preservation (on national and institutional levels)                  --development of selection criteria for choosing the most appropriate financial model                  --simulating the efficiency and impact of different models in a certain context                  --development of new models for financing preservation</p>	<p>-operations research                  -modelling                  -systems analysis</p>
<p><b>Legal documents</b>                  --content of legal documents                  --applicability of legal documents in practice                  --comparison of legal document on international level                  --consequences of enforcing or not enforcing laws                  --role of professional bodies in the process of creating and enacting laws relevant to preservation                  --role of copyright issues in the preservation process</p>	<p>-content analysis                  -comparative studies                  -survey research                  -individual and focus group interviews</p>
Educational component	
<i>Research issues</i>	<i>Possible methods</i>
<p><b>Formal education</b>                  --presence of preservation issues in formal-education programs for librarians                  --quality of programs                  --comparison of different formal-education programs and their learning outcomes                  --pedagogic, didactic, and methodical approach to teaching preservation</p>	<p>-content analysis                  -correlational and causal research methods                  -constructivist paradigm methods</p>
<p><b>Professional training</b>                  --presence of preservation issues in informal-education programs for practicing librarians                  --participation and interest of practicing librarians in lifelong-learning programs regarding preservation                  --implementation of gained knowledge in everyday practice                  --user satisfaction with these programs</p>	<p>-content analysis                  -correlational and causal research methods                  -constructivist paradigm methods                  -survey research and interviews</p>
<p><b>Requisite competencies for preservation activities</b>                  --estimating level of knowledge, skills, and competencies for preservation                  --exploring scope of knowledge, skills, and competencies necessary for efficient preservation                  --developing methods for testing/estimating knowledge, skills, and competences                  --transferring knowledge about preservation to users</p>	<p>-Delphi study                  -action research</p>

<p><b>Developing educational materials</b></p> <ul style="list-style-type: none"> <li>--influence of teaching methods on creation and use of educational materials</li> <li>--influence of information and communication-technology development on creation and use of educational materials</li> <li>--relation between availability of materials and motivation for conducting preservation activities</li> </ul>	<ul style="list-style-type: none"> <li>-content analysis</li> <li>-survey research</li> <li>-focus group interviews</li> <li>-technology-based research methods</li> </ul>
<b>Technical and operational component</b>	
<i>Research issues</i>	<i>Possible methods</i>
<p><b>Collection condition</b></p> <ul style="list-style-type: none"> <li>--technical achievements in collection-condition surveys</li> <li>--sampling models and ways of collecting and analysing data</li> <li>--impact of outcomes of collection-condition survey on preservation planning process</li> <li>--collection-condition data in bibliographic records</li> <li>--collection-condition survey models</li> </ul>	<ul style="list-style-type: none"> <li>-statistical methods</li> <li>-technology-based research methods</li> </ul>
<p><b>Investigation of paper and other materials of library collections</b></p> <ul style="list-style-type: none"> <li>--properties of materials</li> <li>--condition (damage types) of materials</li> <li>--deterioration rates</li> <li>--long-term effect of conservation and restoration methods on paper</li> <li>--artificial ageing</li> <li>--new methods of (instrumental) analysis for paper investigation</li> </ul>	<ul style="list-style-type: none"> <li>-non-destructive material testing</li> <li>-experimental (instrumental) methods</li> <li>-optical methods</li> <li>-spectroscopy</li> <li>-electroanalytical methods</li> </ul>
<p><b>Handling</b></p> <ul style="list-style-type: none"> <li>--recognising damage causes</li> <li>--user and staff attitudes towards preservation</li> <li>--impact of staff and user behaviour on condition of collections</li> </ul>	<ul style="list-style-type: none"> <li>-observation</li> <li>-experimental research</li> </ul>
<p><b>Storage</b></p> <ul style="list-style-type: none"> <li>--evaluation of existing standards</li> <li>--influence of storage environmental conditions (humidity, light, temperature, air pollution, etc.) on library material</li> </ul>	<ul style="list-style-type: none"> <li>-statistical methods</li> <li>-technology-based research methods</li> </ul>
<p><b>Conservation and restoration methods and techniques</b></p> <ul style="list-style-type: none"> <li>--development of new procedures and techniques</li> <li>--economic efficiency of application of conservation and restoration methods</li> <li>--application of new scientific achievements to conservation practice</li> </ul>	<ul style="list-style-type: none"> <li>-non-destructive material testing</li> <li>-technology-based research methods</li> <li>-survey research</li> </ul>
<p><b>Reformatting</b></p> <ul style="list-style-type: none"> <li>--reformatting policies</li> <li>--selection criteria for reformatting</li> <li>--organisation of reformatting process and process efficiency</li> <li>--impact of reformatting on preservation planning, as well as financial impact</li> </ul>	<ul style="list-style-type: none"> <li>-content analysis</li> <li>-comparative studies</li> <li>-case studies</li> <li>-operations research</li> </ul>



<p><b>Digital preservation</b>                  --development of new hardware and software solutions for digital preservation                  --digital-preservation planning process                  --ways of implementing existing conceptual models into library practice                  --interaction between economic efficiency and application of digital-preservation methods                  --establishing and applying standards for digital preservation</p>	<p>-technology-based research methods                  -modelling                  -action research                  -case studies</p>
Cultural and social component	
<i>Research issues</i>	<i>Possible methods</i>
<p><b>Perception of preservation</b>                  --attitudes and opinions (of both professionals and users) about preservation                  --connections between perception of preservation on different levels (strategic, technical, and operational) and position of preservation issues in a wider institutional or national context</p>	<p>-survey research                  -interviews, focus groups interviews</p>
<p><b>Selection criteria for applying preservation measures</b>                  --foundations for developing selection criteria and priorities                  --connections between mission of the institution and selection criteria</p>	<p>-Delphi study                  -content analysis                  -case studies</p>
<p><b>Value of collections</b>                  --defining what constitutes the value of collections                  --connections between mission of the institution and value of collections</p>	<p>-content analysis                  -comparative studies</p>
<p><b>Value of preservation</b>                  --the impact of successful preservation activities on a library's services to its users                  --contribution of successfully preserved library materials to the cultural and social development of a certain area/nation</p>	<p>-historical research                  -interviews                  -ethnographic studies</p>
<p><b>User studies</b>                  --user profiles, their habits, and their usage patterns                  --demands for reformatted material vs. paper material</p>	<p>-survey research                  -interviews                  -observation                  -experimental research</p>
<p><b>Cultural context</b>                  --cultural characteristics reflected in/through the library collections on the content level and on the material/artefact level (e.g. study of bookbinding styles, illumination techniques, etc.)                  --connections between different cultures and geographic areas based on library materials                  --traces that users leave on books over time (e.g. notes, objects, etc.) and their interpretation within other professional disciplines (such as book history, reading history, the arts, etc.)</p>	<p>-historical research                  -ethnographic and comparative studies                  -unobtrusive measures (erosion and accretion measures)</p>

#### 4. Conclusions

There are number of research issues in the field of preservation and, consequently, a number of research methods that can be used in order to find answers to research questions. An overview of research issues presented in this

paper shows that the research process in the field of preservation mainly focuses on exploring prerequisites for the efficiency or preservation process, researching development and achievements in specific parts of the field, investigating the implementation possibilities of preservation models, evaluating the preservation process, and analysing the impact of the preservation process on other library activities. Therefore, research in the field of preservation is fundamental and applicative. Only a small amount of fundamental research stems directly from the preservation field, such as research that deals with the paradigmatic role of preservation as a cultural activity and the cultural context of preservation. The majority of other fundamental research is done in other fields and is afterward associated with preservation, such as research regarding paper properties, cellulose, pigments, etc. Apart from information science, preservation issues arise from other fields of science, arts and humanities, such as economy, law, education science, biology, chemistry, history, art history, etc. Therefore, the methodology specific to those fields is used for researching preservation issues. The theoretical approach given in this paper shows that a preservation-management model that encompasses diverse preservation aspects is a good starting point for defining research issues in preservation and the possible research methods that arise from them.

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