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EVOLUTION AND IMPLEMENTATION OF THE DELPHI METHOD IN ARCHIVAL THEORY AND PRACTICE²

Purpose: *The article examines whether, and in what ways, the Delphi method is methodologically appropriate for addressing contemporary challenges in archival theory and practice, particularly those arising from digital transformation, technological change, and the growing complexity of archival decision making.*

Method/Approach: *The study adopts a qualitative, exploratory research design based on a systematic review and analytical synthesis of methodological and empirical literature. Sources were identified through the Scopus, Emerald Insight, and Springer Nature Link databases and complemented by foundational literature to capture the theoretical origins, development, and variants of the Delphi method. A comparative analysis of major Delphi variants (classical, modified, policy, decision, real-time, argument, and disaggregative) was conducted to assess their methodological characteristics and applicability to specific archival research domains.*

Results: *The analysis demonstrates that the Delphi method is well suited to archival research problems characterized by uncertainty, limited empirical evidence, and normative judgment. Different Delphi variants address distinct research needs: classical and modified Delphi support consensus building, policy, and argument Delphi structure normative and legal debates, while real-time and disaggregative Delphi facilitate rapid iteration and scenario-based analysis. Evidence from published applications confirms the method's relevance for appraisal, preservation, access, governance, and technology-related archival research.*

Conclusions findings: *The article concludes that the Delphi method constitutes a flexible and robust methodological framework for archival science, offering practical guidance for selecting appropriate Delphi variants in future archival research and interdisciplinary studies.*

Keywords: *Delphi method, origin and variants of Delphi method, archival science, research methodology, digital archives.*

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1 INTRODUCTION

With the expansion of digital society, the volume of generated digital records is increasing exponentially. This growth presents complex challenges across all areas of records management and archival work from appraisal, acquisition, arrangement, description, and preservation to ensuring access (Shinde et al., 2024). Archival research problems increasingly arise from a set of demanding conditions driven by rapid technological progress and the continuous evolution of software and technological solutions. These developments accelerate hardware obsolescence, complicate the management of exponentially growing data volumes, and require constant adaptation of archival workflows to evolving technical components and infrastructural changes within archival systems. In responding to new technological environments ranging from the digitization of analogue materials and the processing of born-digital records to the long-term preservation of digital archival holdings and the initial integration of artificial intelligence into archival practice the question arises as to which research methods are most appropriate for investigating contemporary archival theory and practice. Many of these challenges are characterized by limited empirical evidence, normative decision-making, and a high degree of uncertainty, rendering traditional empirical research approaches insufficient. Consequently, exploring emerging areas within archival science necessitates an adapted methodological approach capable of systematically incorporating expert judgment.

This paper is guided by research questions of whether, and in what ways, the Delphi method is methodologically appropriate for investigating contemporary challenges in archival theory and practice. The purpose of the study is not the empirical implementation of a specific Delphi study, but rather an analytical and comparative examination of different variants of the Delphi method and an assessment of their applicability to particular research domains within archival science. In doing so, the paper demonstrates that the Delphi method does not constitute a single, uniform research procedure, but rather a flexible methodological framework whose variants enable tailored approaches to diverse research problems ranging from archival appraisal and long-term preservation to issues of access, governance, and the impact of the technological environment on archival work.

The research is structured as follows. It first outlines the methodological and conceptual foundations of the Delphi method and its historical development. It then presents and compares the most common variants of the Delphi method, followed by an analysis of selected examples of its application in archival research. The concluding sections synthesize the findings and discuss the methodological implications for future research in archival science.

2 METHODOLOGY

The study employs a qualitative, exploratory research design to examine the evolution, variants, and applicability of the Delphi method in archival theory and practice. The research is based on a systematic analysis and synthesis of existing methodological and empirical literature. The literature was selected to cover both the theoretical foundations of the Delphi method and its practical implementation in archival and records management contexts.

The literature review was conducted using the Scopus, Emerald Insight, and Springer Nature Link databases. The initial focus was placed on more recent publications. However, the analysis revealed that contemporary studies rely on and repeatedly cite older foundational literature when addressing the theoretical underpinnings and development of the Delphi method. A closer examination of the recent literature showed that its core theoretical assumptions are derived exclusively from earlier works, while newer studies primarily reference these original sources without substantial theoretical advancement.

Consequently, the review was deliberately extended to older literature, which provided comprehensive insights into the origins of the Delphi method, its theoretical foundations, and the development of its major variants. The search strategy employed the terms Delphi method and Delphi technique, as authors in the literature frequently use these terms interchangeably. There is no substantive methodological difference between them; the distinction is primarily terminological rather than conceptual and reflects disciplinary conventions rather than differences in research design. In this study, the term Delphi method is used consistently. Although the terms method and technique are often treated as synonyms in the literature, this research adopts the term Delphi method for reasons of methodological precision and conceptual consistency.

In addition, the term Delphi process was included in the search strategy. Following Jorm (2, 2025), this term is primarily understood as referring to the procedural sequence of steps involved in conducting a Delphi study rather than to the method itself. Nevertheless, the literature occasionally uses the term interchangeably with Delphi method, which justified its inclusion in the search process.

A comparative analysis of major Delphi variants (classical, modified, policy, decision, real-time, argument, and disaggregative) was conducted, focusing on their methodological characteristics and applicability to archival research domains. The outcome is a conceptual and methodological contribution, providing guidance for selecting and designing Delphi-based research in archival theory and practice.

3 ORIGINS OF THE DELPHI METHOD: THE INITIAL RESEARCH STUDY

The Delphi method was developed by the RAND Corporation in the 1950s and 1960s as a means to prepare for national security threats during the Cold War (Sablitzky, 2022, 1). The RAND Corporation conducted Project Delphi as a study designed to use expert opinion to determine from the viewpoint of a Soviet strategic planner an optimal U.S. industrial target system and the number of atomic bombs required to reduce munitions output by a prescribed amount (Dalkey & Helmer, 1963, 458). The experimental application of the method yielded several notable findings. The experimental procedure revealed multiple methodological weaknesses that limited the robustness of the results. First, the independence of expert judgments was not fully ensured, as the structure of the study allowed for indirect influence among respondents. Second, the dual role of the experimenters as coordinators and substantive consultants introduced an inherent risk of bias in both questionnaire construction and interpretive framing. Third, certain informational inputs unintentionally “led” respondents toward particular interpretations, thereby compromising the neutrality of the elicitation process.

The study was also terminated prematurely due to time constraints, even though additional rounds may have facilitated further convergence of estimates. Moreover, the restricted comparison of “neighboring” bombing strategies constrained analytical depth, while several questions triggered strong respondent criticism, indicating shortcomings in clarity or relevance. Finally, the post-hoc correction

of results altered the distribution of estimates in ways that complicate straightforward interpretation. Overall, the procedure illustrates the need for stricter methodological control, clearer question design, and sufficiently iterative cycles to achieve a reliable expert consensus (Dalkey & Helmer, 1963, 466–467).

4 APPLICATION OF THE DELPHI METHOD IN RESEARCH PRACTICE

The Delphi method is used to investigate complex problems through a panel of experts selected based on their specialized knowledge and experience in the relevant field (Strasser, 2017, 120). The Delphi method works especially well when the goal is to improve our understanding of problems, opportunities, solutions, or to develop forecasts (Skulmoski et al., 2007). The Delphi method has become a fundamental tool in the field of technological forecasting. Even within “classical” management science and operations research, there is growing recognition of the need to incorporate subjective information (such as risk assessment) directly into evaluation models addressing increasingly complex societal challenges, including environmental protection, public health, and transportation systems. As a result, the Delphi method has found broader application across these domains (Linstone & Turoff, 1975, 11). The Delphi method is well suited as a research instrument when there is incomplete knowledge about a problem or phenomenon (Skulmoski et. al., 2007). Precisely because of these characteristics, the Delphi method is also applicable to archival theory and practice, which in recent years has faced multiple challenges related to the professional processing of archival records, the adoption of new technological solutions (digitization, digitalization, artificial intelligence), and the accelerating pace of technological change. In this context, the method can be employed as a tool for measuring and supporting forecasting and for enhancing informed decision-making across a wide range of disciplines (Rowe & Wright, 1999, 353).

Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem (Linstone & Turoff, 1975, 3). The methodological instrument typically involves questioning experts through interviews or questionnaires, with the explicit aim of avoiding direct confrontation among panel members (Dalkey & Helmer, 1963, 458). To accomplish this structured communication between experts we need: some feedback on individual contributions

of information and knowledge; some assessment of the group judgment or' view; some opportunity for individuals to revise views; and some degree of anonymity for the individual responses (Linstone & Turoff, 1975, 3). The core principle of the Delphi process is controlled, indirect interaction among expert's participants with substantive knowledge of the research domain with the objective of progressively narrowing differences in judgment over successive rounds of inquiry (Fink Hafner et al., 2019, 3; Czinkota & Ronkainen, 1997, 829). The ultimate goal is to achieve expert consensus regarding the solution to a defined problem. According to Skulmoski et al. (2007, 1), the method is particularly suited to generating solutions aimed at improving problematic situations, identifying opportunities, proposing solutions, and forecasting future developments.

The basic elements of the Delphi method, as described by Dalkey and Helmer during its early development, include: (1) repeated individual questioning of a panel of experts, (2) anonymity among panel members, and (3) the provision of interspersed, structured feedback on group opinions (Dalkey & Helmer, 1963, 458). For the method to be effective, it must be designed in such a way that questions "challenge experts to justify their responses," thereby enabling the generation of more refined and higher-quality data (Grime & Wright, 2016, 3).

Finally, the "holy grail" of research lies in the establishment of methodological rigour, which reflects the researcher's responsibility to ensure adherence to defined procedures and to eliminate confounding factors wherever possible to produce reliable and defensible results. This denotes the researcher's obligation to ensure strict adherence to established procedures and, where feasible, to control or eliminate confounding variables to achieve reliable and reproducible results (Hasson & Keeney, 2011, 1695).

Figure 1 illustrates the Delphi method conducted in three rounds. The process begins with the definition of the research problem, followed by the selection of experts. In the first round, questionnaires are distributed to the experts; once the completed questionnaires are returned, the responses are analyzed and used to prepare the questionnaire for the second round. The same procedure is repeated in the third round, culminating in a final analysis of the results.

According to Linstone and Turoff (1975), a Delphi study typically proceeds through four distinct phases (see figure 1). The first phase involves exploration of the topic, during which each participant contributes information they consider

relevant. The second phase focuses on determining the group's overall perspectives by identifying areas of agreement and disagreement, as well as clarifying the meanings assigned to concepts such as importance, desirability, or feasibility. When substantial disagreement emerges, the third phase examines the underlying reasons for these differences and evaluates their validity. The final phase consists of a comprehensive assessment in which all previously collected information is synthesized and the results are returned to participants for final consideration.

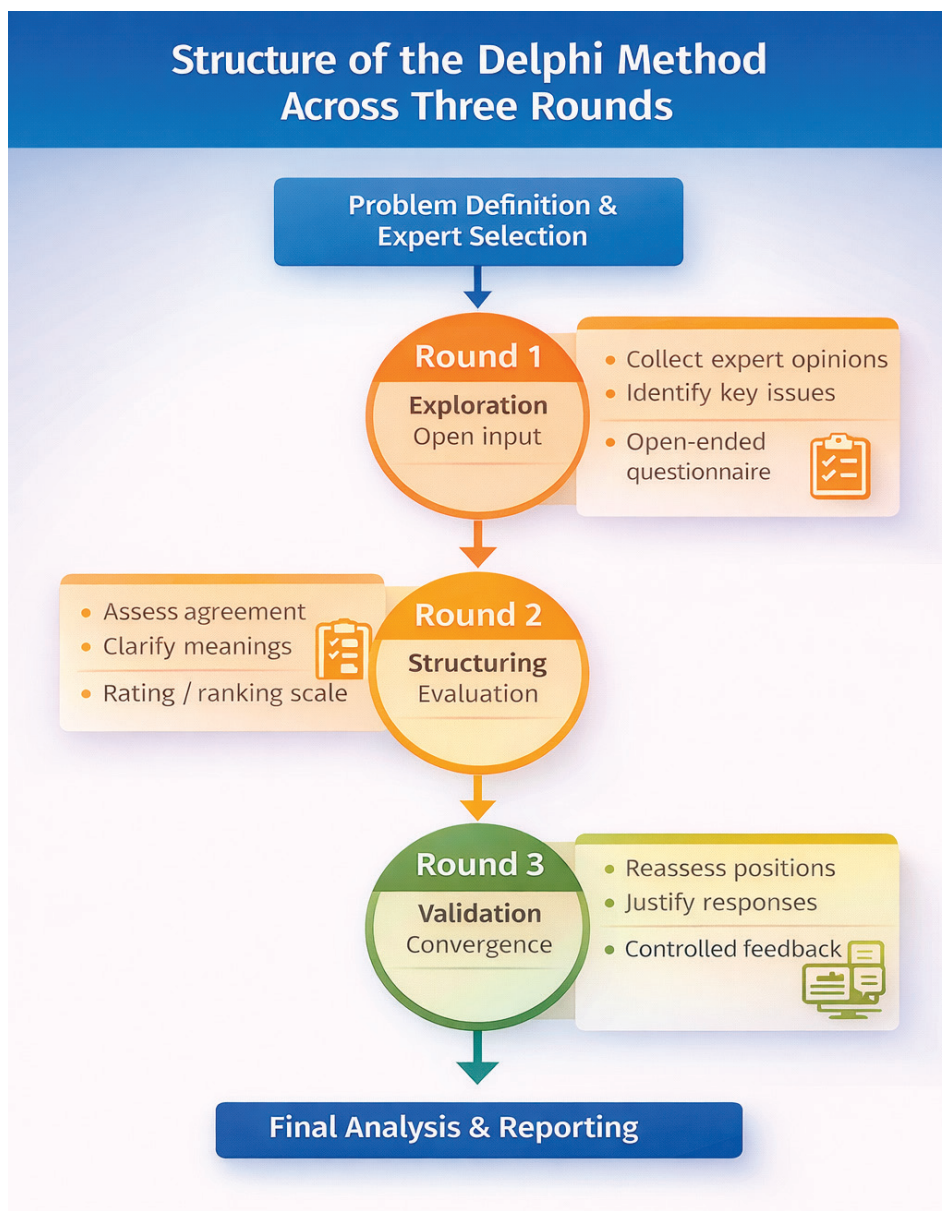


Figure 1: Structure of Delphi Method in Three Rounds

4.1 METHODOLOGICAL LIMITATIONS OF THE DELPHI METHOD

Conducting a Delphi study is frequently associated with considerable temporal and organizational demands. When the research instrument contains a substantial number of statements, participants are required to devote extended periods to the completion of iterative questionnaires, thereby increasing respondent burden (Hsu & Sandford, 2007). In such cases, the cumulative workload across multiple rounds renders the process both time-consuming and labor-intensive for researchers and panel members alike. This structural characteristic contributes directly to participant attrition, which represents a recurrent methodological vulnerability of Delphi designs (Fink Hafner et al., 2019). Attrition may further result from the prolonged temporal commitment required, reduced engagement between successive rounds, or dissatisfaction with procedural aspects of the study (Donohoe & Needham, 2009). Donohoe and Needham (2009) additionally caution that attempts to mitigate drop-out through monetary incentives or moral persuasion may compromise methodological integrity by introducing response bias. Consequently, while the Delphi method remains valuable for structured expert consultation, its practical implementation requires careful management of questionnaire scope, panel fatigue, and retention strategies in order to preserve both participation rates and the validity of findings. A further methodological limitation arises from the iterative feedback structure that is inherent to the Delphi process. Because the method relies on repeated rounds of controlled feedback and reassessment, maintaining sustained and robust participation across all stages may prove challenging. The cyclical nature of the procedure creates a structural risk of declining response rates over time, particularly when participant motivation diminishes or survey fatigue increases (Hsu & Sandford, 2007). An even more significant concern relates to the marked reduction in participation typically observed in the final rounds of Delphi investigations. As noted by McKenna, the concluding stages of many Delphi studies are characterized by comparatively poor response rates, which may affect the stability and interpretability of the aggregated results (McKenna, 1994). This progressive attrition can compromise the reliability of consensus measurement and weaken the overall robustness of the methodological design. A further potential weakness of the Delphi method lies in the considerable degree of discretion afforded by researchers during its implementation. Given

that the procedure relies fundamentally on the quality, synthesis, and presentation of controlled feedback between rounds, the analytical rigor and interpretative neutrality of the research team are of decisive importance. The responsibility for accurately summarizing responses and structuring subsequent iterations places substantial methodological authority in the hands of the researcher. In addition, there is no universally accepted criterion for determining what constitutes a sufficient level of consensus within a Delphi study, which further complicates the evaluation of results (Fink Hafner et al., 2019; Donohoe & Needham, 2009).

Moreover, the assumption of independence among expert judgments may not always be held in practice. If panel members maintain professional or institutional contact outside the formal Delphi framework, their responses may be influenced by informal communication, thereby compromising the intended anonymity and independence of opinion formation (Dalkey & Helmer, 1963). Such interdependencies can affect the authenticity of consensus and represent a structural limitation of the method (Fink Hafner et al., 2019).

5 DELPHI VARIANTS

The Delphi method encompasses a range of methodological variants (see figure 2). The following section presents the most common types of the Delphi method and highlights their key differences.

- The classical Delphi method is an iterative, anonymous expert elicitation method designed to achieve consensus on complex issues characterized by uncertainty and limited empirical evidence. It is based on repeated rounds of questionnaires combined with controlled feedback and statistical aggregation of group responses, enabling experts to reconsider and refine their judgments. The distinctive feature of the method lies in its capacity to systematically transform independent individual judgments into a structured group consensus while minimizing the influence of dominant individuals, authority bias, and groupthink, which are common in face-to-face expert deliberations (Dalkey & Helmer, 1963; Linstone & Turoff, 1975; Rowe & Wright, 1999; Khodyakov et al., 2023).

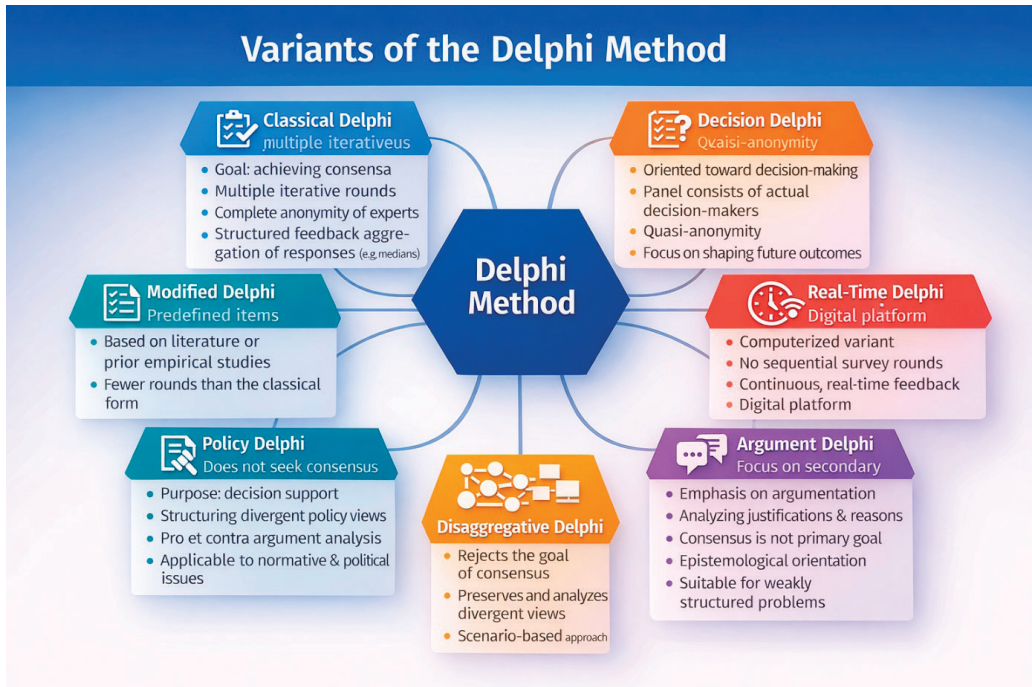


Figure 2: Variants of Delphi method

- The Policy Delphi method is a variant of the Delphi method specifically designed for the systematic analysis of complex, controversial, and value-laden policy issues. Unlike the classical Delphi, which seeks convergence of expert opinion, Policy Delphi aims to generate and structure the strongest possible opposing views on policy options and their consequences. In the Policy Delphi, the communication process is designed to produce the best underlying pro or con arguments associated with various policy or resource allocation alternatives. The primary purpose of Policy Delphi is not decision-making, but decision support. It is intended to present policymakers with a comprehensive map of available options, underlying assumptions, arguments pro and contra, and anticipated consequences, thereby improving the quality and transparency of policy deliberation. A central methodological risk of the Policy Delphi is its misinterpretation as a decision-making instrument rather than as a decision-analysis tool. For this reason, the objective of the study must be clearly defined in advance, emphasizing that the process is intended to structure and analyze policy options, not to produce binding decisions. In many public organizations, responsibility for decisions is often diffused.

Normatively, a decision should be taken by a single accountable individual, whereas the function of the Policy Delphi is to provide systematically organized information and ensure that all relevant options are placed on the table. To achieve this, the process must explicitly explore dissent rather than prematurely seek consensus. Once initiated, a Policy Delphi cannot guarantee any specific outcome if methodological integrity is to be preserved. Sponsors must recognize that consensus may or may not emerge, even if the respondent group is composed to make agreement unlikely. As a structured forum for ideas, the method may also surface sensitive or controversial issues, creating risks of misinterpretation or premature disclosure. Furthermore, as with any policy process, misuse is possible through selective editing, omission of viewpoints, or strategic presentation of results. Accordingly, researchers conducting a Policy Delphi must possess a thorough understanding of it (Turoff, 1970; Linstone and Turoff, 2002).

- The Modified Delphi adapts the classical design by introducing predefined items derived from literature reviews, interviews, or prior empirical studies. An acceptable and a common modification of the Delphi process format to use a structured questionnaire in Round 1 that is based upon an extensive review of the literature as an open questionnaire such as in classic Delphi. It is commonly used in applied research fields, where the research problem is already partially structured. The number of rounds is often reduced to increase efficiency (Hsu & Sandford, 2007). McKenna (1994) cautions that excessive modification may compromise the methodological rigor and validity of the Delphi process.
- The Decision Delphi method is a variant of the Delphi method designed to support and structure decision-making rather than forecasting or policy analysis. It focuses on situations where future developments are primarily shaped by the actions of a limited number of actual decision makers, who therefore constitute the Delphi panel. Unlike classical and policy Delphi, Decision Delphi aims not to describe or predict reality, but to actively influence and “create” future outcomes through coordinated decision processes, employing a model of quasi-anonymity in which participants are known but individual statements remain anonymous. In the context of a Decision Delphi, strict anonymity is generally not considered appropriate. Instead, it is replaced by a form of

quasi-anonymity in which the identities of participants are known, while individual statements remain anonymous. Through the central administrative coordination of the process, participants will typically become aware of one another's involvement in the exercise. Under such conditions, once panelists learn that colleagues from the same institution are also participating, they may feel less constrained to articulate formal institutional positions and more inclined to express their personal expert judgments, as they no longer perceive themselves solely as representatives of their organizations. In contrast to classical or policy-oriented variants, the outcomes of a Decision Delphi are not intended as neutral forecasts; rather, they are designed to exert a direct influence on future developments. Such influence, however, must remain exclusively within the authority of the decision makers themselves, namely, the panelists. Consequently, the aggregation, computation, and evaluation of group opinions must be conducted with particular methodological rigor and without interference from the views of the research directors. In this setting, the risk of manipulation—whether intentional or inadvertent—is especially pronounced and constitutes a critical methodological concern (Rauch, 1979).

- The Real-Time Delphi (RT Delphi) method is a computerized variant of the Delphi method that eliminates sequential rounds and replaces them with continuous, real-time feedback. Participants view aggregated group responses (e.g., averages or medians) and justifications immediately upon entering or revising their judgments, allowing them to update their inputs dynamically. This round-less design significantly reduces the duration of Delphi studies while preserving core principles such as anonymity, controlled feedback, and iterative reflection, making RT Delphi particularly suitable for time-sensitive decision-making and policy analysis. The principal limitation of the Real-Time Delphi method lies in its current developmental stage, as it remains primarily a proof-of-concept prototype. Consequently, further methodological and technical development is required before the approach can be reliably implemented in full-scale research applications, particularly in asynchronous environments. Among the key developmental requirements are the establishment of comprehensive administrative tools enabling efficient editing of initial inputs, real-time presentation of aggregated results, and systematic monitoring of study progress over time (Gordon & Pease, 2006).

- The Argument Delphi, also referred to as the Argumentative Delphi, is a variant of the Delphi method that shifts the analytical focus from numerical convergence toward the explicit elicitation, exchange, and critical assessment of arguments and justifications underlying expert judgments. Rather than prioritizing consensus, the method emphasizes the epistemic quality, coherence, and plausibility of reasoning, making it particularly suitable for foresight, technology assessment, and weakly structured problem domains. While Kuusi (1999) conceptualizes Argument Delphi as a means to advance understanding through the systematic confrontation of competing arguments, Cuhls (2024) further develops this approach by highlighting the role of structured feedback on arguments to enhance transparency and interpretability of results, albeit at the cost of increased cognitive and analytical demands on participants and researchers. The main limitation of the Argumentative Delphi approach lies in its high time and organizational demands, as both participating experts and researchers must process a large and continuously expanding number of arguments. As new arguments are added in successive rounds, questionnaires tend to become increasingly extensive, which may reduce participants' overview of the material and encourage the selection of frequently chosen arguments, thereby unintentionally reinforcing consensus effects. Similar limitations arise during the analysis phase. The large volume of qualitative data complicates systematic evaluation, and although text analysis tools may support processing, they often fail to capture important nuances and contextual differences. As a result, analysis frequently remains qualitative in nature, while less frequently mentioned arguments, despite their potential analytical value, may receive insufficient attention. An additional limitation is that extensive qualitative findings are often only partially included in reports and publications due to space constraints and the increasing preference for shorter and more visual outputs. Consequently, the method may generate more information than can be effectively communicated, creating a paradox in which the principal strength of the approach, rich argumentative input, simultaneously becomes a methodological weakness (Cuhls 2024, 136).
- The Disaggregative Delphi method is a variant of the Delphi method that explicitly rejects the goal of consensus and instead seeks to preserve and systematically analyze divergent expert views. Rather than aggregating responses

toward a single central tendency, this approach groups individual judgments into clusters using statistical techniques such as cluster analysis, which are then interpreted as alternative scenarios. According to Tapio (2002), disaggregative Delphi enhances scenario formation by reducing researcher bias, avoiding oversimplification, and making better use of the richness of Delphi data, particularly in policy-relevant and contested domains where disagreement is substantive rather than noise. A central methodological limitation arises from the use of cluster analysis, as it does not determine an objectively valid number of scenarios; rather, the final decision remains within the discretion of the researcher (Tapio, 2002, 84). Consequently, the delineation of scenario structures is partly contingent upon interpretative judgment. Moreover, responses grouped within the same cluster may emphasize underlying factors in markedly separate ways. Such internal heterogeneity complicates the construction of analytically coherent and substantively consistent scenarios (Tapio, 2002, 98).

6 EXAMPLES OF THE USE OF THE DELPHI METHOD IN ARCHIVAL SCIENCE

This section presents seven examples of how the Delphi method has been applied within archival science:

- **An Analysis of the Effectiveness of Records Management (Austin and Moseley, 1994)**

A four-round Delphi study was conducted to develop a consensus-based definition of effectiveness in records management. The research sought to determine which core functions constitute an effective records management system, addressing the absence of an established industry standard. Thirteen experts, each an Air Force Institute of Technology graduate with a minimum of four years of professional experience, participated in iterative rating and ranking exercises using structured questionnaires. In the first two rounds, experts rated nine predefined records management functions on a seven-point importance scale; in the third and fourth rounds, they ranked these functions to establish their relative priority. Consensus converged around five foundational functions storing records, screening for compliance, retrieving records, assigning disposition instructions, and indexing while automatic destruction was consistently judged least desirable.

The study also faced several methodological challenges, including a small expert panel, an administrative error in feedback during the first round, conceptual overlap in questionnaire items, and limited generalizability due to the homogeneous expert group.

- Consulting records management oracles - a Delphi in practice (McLeod and Childs, 2007)

A three-round modified Delphi study was employed to explore international expert perspectives on the role, value, and future of ISO 15489. The aim was to examine complex conceptual issues that had emerged during a longitudinal investigation of the standard's impact in the United Kingdom. Eight purposively selected experts from four countries participated anonymously in an email-based process using open-ended questionnaires designed to elicit both convergent and divergent views. Common factor among experts was their involvement in records management field. Each round focused on a distinct thematic area: the role of standards in records management, the nature and structure of records management standards, and the future trajectory of ISO 15489. Responses were analyzed qualitatively, and thematic summaries were fed back to participants after each round. The study revealed broad agreement that ISO 15489 provides a high-level framework for best practice but also highlighted tensions concerning its strategic versus operational character, its potential as a compliance standard, and the need for stronger promotion and integration into governance and risk-management practices. Methodological limitations included the small expert panel, reliance on qualitative analysis, the absence of numerical consensus measures, and the use of discrete thematic rounds rather than a cumulative convergence process.

- Appraising the value of statistical records of the European Central Bank for retention scheduling purposes (Beneito Arias, 2008)

A three-round traditional Delphi study was conducted to determine justified and consensual retention periods for the 29 classes of statistical records produced and received by the Directorate General Statistics of the European Central Bank. The research sought to answer what retention value should be assigned to these records in order to design a functional and defensible corporate retention schedule. Twelve experts: General Statistics managers, statisticians, and European Central Bank records management specialists participated anonymously and provided

written feedback through structured questionnaires. Round 1 gathered initial retention periods using appraisal variables such as administrative, research, legal, and cost-benefit value; Round 2 enabled experts to review aggregated results and refine their judgments; and Round 3 aimed to finalize consensus on a draft retention schedule. The study achieved full agreement for 15 of the 29 record classes and demonstrated that end-user participation can produce meaningful and implementable retention guidance. Methodological challenges included significant initial divergence of expert opinions, time pressures due to the holiday period, the overly broad scope of the first questionnaire, and differing perspectives between statistical and records management professionals, all of which complicated the process of achieving uniformity.

- A Delphi Study Assessing Long-term Access to Electronic Medical Records (EMR) (Nicholson, 2008)

A two-round Delphi study was conducted to identify what measures are necessary to ensure long-term access to electronic medical records (EMR) as technologies evolve. The aim was to gather informed expert judgment on risks, requirements, and preservation strategies essential for sustaining EMR accessibility. Six experts from medical informatics, EMR administration, information systems, and electronic archiving participated in Round One, with three continuing into Round Two. The first questionnaire comprised two open-ended questions addressing long-term access needs and the feasibility of such access in the future, while the second round asked participants to evaluate and comment on the synthesized results. The findings revealed strong consensus that long-term access poses a significant challenge and requires standardization, active digital preservation techniques, robust backup and redundancy, and organizational commitment to appropriate archiving practices. Methodological limitations included the small and diminishing expert panel, the brevity of second-round responses, reliance on email-based communication, and early termination of the study, all of which constrain the depth and generalizability of the results.

- A study of digital curator competences: A survey of experts (Madrid 2014)

A three-round modified Delphi study was conducted to identify and validate the core competences required of digital curators within the library, archives, and museum environment. The research sought to define a coherent competence frame-

work to support curriculum development and professional practice, addressing the absence of a clear professional profile for digital curators. Sixteen international experts drawn from academia, libraries, archives, and digital preservation practice evaluated an initial set of 18 competence statements generated from literature and key-informant interviews. Using structured Likert-scale questionnaires supplemented with open comment fields, experts refined, expanded, and rated competences across three iterative rounds. Consensus was achieved on 20 competences, alongside an agreed definition of a digital curator, encompassing both operational skills (such as appraisal, authenticity assurance, interoperability, and preservation risk assessment) and managerial abilities (including policy development, project planning, and legal compliance). Methodological challenges included limited sectoral representation particularly the absence of museum professionals panel homogeneity, reliance on researcher-defined statements in a modified Delphi design, and the potential constraints this imposed on creativity and dissent.

- Information Competencies of Historians as Archive Users: A Slovenia/UK Comparison (Vilar et al., 2016)

A two-round Delphi study was conducted to examine archivists' expert perspectives on the information competencies of amateur and professional historians in Slovenia and the United Kingdom. The study sought to identify differences in user behavior, required skills in both physical and digital archival environments, and the implications for archival support practices. Nine archivists participated five from Slovenia and four from the UK responding first to an open-ended questionnaire covering five thematic areas: types of archival materials used, attitudes toward digital versus physical sources, necessary research competencies, differences between amateurs and professionals, and the archivist's role in assisting each group. In the second round, experts reviewed synthesized cross-national findings and refined their views. The results revealed strong consensus that both user groups require traditional archival skills alongside emerging digital competencies, while also highlighting cultural and experiential differences in attitudes toward archival materials and support needs. Methodological limitations included the small expert sample, the indirect nature of studying users through archivists' perceptions, national differences in digitization practices, and the constraints of a two-round design.

- **Metadata in Digital Preservation and Exchange of Electronic Healthcare Records (Gotis and Nagibin, 2017).**

A two-round Delphi study was conducted to identify the essential metadata categories required for a national Common Specification³ for Swedish electronic healthcare records. The expert panel consisted of four specialists representing major Swedish regional archives and electronic healthcare records management organizations, each with experience in digital preservation, metadata modeling, and large-scale electronic healthcare records transfers. In the first round, experts proposed and described metadata categories deemed necessary for transferring electronic healthcare records between information systems and to e-archives. Their inputs were synthesized into nine unified categories. The second round enabled participants to review the consolidated list, suggest any missing elements, and designate categories as mandatory or optional. Consensus was achieved after the second round, as most participants had no further additions. The resulting categories were subsequently validated through an interview with the Swedish National Archives and Sydarkivera, confirming their alignment with national terminology, international metadata standards, and practical requirements for interoperability and long-term preservation.

A comparative analysis of the examined Delphi studies demonstrates that the method is highly effective in archival science, particularly when addressing complex issues that lack established standards, empirical indicators, or unified professional criteria. The most robust findings emerge from studies with three or more rounds and a balanced panel of experts which yield more stable judgments and a stronger combination of qualitative and quantitative synthesis. In contrast, two-round studies provide faster results but exhibit limited generalizability and greater sensitivity to individual viewpoints. Across all studies, Delphi serves as a valuable tool for structuring and resolving multidimensional problems related to standardization, competency frameworks, and long-term preservation. Common methodological limitations include small and homogeneous expert groups, participant attrition, differing national practices, and inconsistent interpretations of

³ Common Specifications (CS) are structured formats designed to standardize the exchange of information across different IT systems. They serve several purposes: supporting the procurement and implementation of e-services for e-archives and electronic records within Swedish local authorities and regions; facilitating the exchange of information between operational business systems; and enabling the transfer of data to e-archives and, ultimately, to permanent archival repositories (Gotis and Nagibin, 2017, 2).

core concepts. Despite these constraints, the Delphi method remains a powerful mechanism for generating informed consensus in archival research environments where expert judgment is essential and empirical evidence is scarce.

7 DISCUSSION

Archival theory and practice encounter a range of new challenges in their work. The areas of research on interactions in archives can be examined through several conceptual and methodologically distinct domains, which together form a comprehensive framework for contemporary archival theory and practice:

- Preparation of records and archival materials for acquisition: Research in this area focuses on the appraisal and valuation of records. Key research questions address the principles (archival, legal, cultural, and scientific) according to which records acquire enduring value for society, culture, and science. Attention is paid to whether appraisal can rely solely on classical archival definitions and criteria, and to the role and responsibility of the archival profession in cooperation with records creators during the appraisal process. The appraisal of archival materials represents a classic example of a weakly structured problem domain, in which empirical evidence is often insufficient, and decisions rely heavily on professional judgment and normative value frameworks. In this context, the Classical Delphi method is particularly suitable, as it enables the gradual formation of expert consensus regarding criteria for enduring archival value through iterative, anonymous feedback and controlled aggregation of judgments (Dalkey & Helmer, 1963; Linstone & Turoff, 1975). The Modified Delphi method is especially appropriate when research builds upon pre-existing normative and theoretical frameworks such as ISAD(G), the OAIS reference model, or national archival regulations allowing these foundations to be systematically validated, refined, and operationalized (Hsu & Sandford, 2007). The Argument Delphi method is methodologically justified when the research aim is to uncover the underlying reasons for divergences in expert interpretations of archival, cultural, and scientific value, thereby emphasizing epistemic reasoning rather than convergence (Kuusi, 1999; Cuhls, 2024). Furthermore, the Policy Delphi method is well suited to the investigation of normative and regulatory

dilemmas, such as the relationship between records creators and archival institutions and the allocation of responsibility within appraisal processes (Turoff, 1970; Linstone & Turoff, 2002).

- Acquisition of records and archival materials: This research domain examines the procedures used by records creators when transferring records to the archive, relationships and interactions within organizational and production environments, and the comparison between traditional and electronic acquisition processes, especially regarding metadata capture and quality. It also addresses interactions between records creators and the archive after acquisition, as well as the terminology applied in these processes. The acquisition of archival materials involves clearly defined operational procedures, institutional responsibilities, and technological solutions. Research in this domain can effectively employ the Modified Delphi method, which facilitates the optimization of acquisition workflows based on predefined transfer phases and metadata requirements, while maintaining methodological rigor (Hsu & Sandford, 2007). The Decision Delphi method is particularly appropriate in cases where acquisition is not merely an analytical issue but requires coordinated decision-making among a limited group of actual decision-makers, such as archival professionals, information technology specialists, and records creators (Rauch, 1979). In addition, the Real-Time Delphi method is suitable for time-sensitive changes in acquisition processes, for example during the implementation of electronic transfer mechanisms or automated metadata capture systems, as it allows for continuous feedback and rapid iteration (Gordon & Pease, 2006).
- Professional processing and description of archival materials: This area includes the study of the formation of archival units in accordance with archival standards and principles (fonds, collections, records), the structure and naming of descriptive units, and the elements of archival description. Special emphasis is placed on the application of national and international archival standards, the preparation of inventories and guides, reference and classification systems, and the integration of advanced technologies, particularly artificial intelligence into archival processing and descriptive practices. Professional processing and archival description constitute areas in which formal standards exist, yet their application in practice is subject

to varying interpretations, particularly in the context of introducing artificial intelligence into descriptive workflows. In this domain, the Classical Delphi method supports the development of shared professional positions regarding the interpretation and application of descriptive elements and standards (Linstone & Turoff, 1975; Rowe & Wright, 1999). The Modified Delphi method is appropriate for validating and adapting existing descriptive models to new technological and organizational contexts (Hsu & Sandford, 2007). The Disaggregative Delphi method allows for the identification and systematic analysis of distinct professional schools or practices that should not be forced into artificial consensus, thereby preserving the diversity of expert perspectives (Tapio, 2002). The Argument Delphi method, in turn, reveals the epistemological foundations underlying differences in expert understanding of descriptive principles and the automation of archival description (Kuusi, 1999; Cuhls, 2024).

- Access to and use of archival materials: The starting point of this research area is the fundamental purpose of archiving: ensuring access to and usability of archival materials. Research focuses on access tools and retrieval systems (including comparisons between traditional and digital environments and common search-related challenges), procedures and regulations governing access for internal and external users, and the legal frameworks regulating access and use, particularly in relation to copyright, related rights, and data protection. Access to archival materials is a highly normative and legally constrained domain in which consensus is often neither achievable nor desirable. The Policy Delphi method enables the structured presentation of conflicting perspectives, including public access interests, personal data protection, and copyright considerations, without imposing premature agreement (Turoff, 1970; Linstone & Turoff, 2002). The Argument Delphi method is suitable for analyzing the legal and ethical justifications that underpin access regimes and for making implicit assumptions explicit (Kuusi, 1999). The Disaggregative Delphi method supports the development of alternative access models reflecting differing normative priorities (Tapio, 2002), while the Real-Time Delphi method is particularly useful in the design and continuous evaluation of digital access systems in rapidly evolving technological environments (Gordon & Pease, 2006).

- Preservation and long-term safeguarding of archival materials: Research in this domain addresses the technical, organizational, and material aspects of preservation. It examines archival infrastructure, protective measures, and the challenges of long-term preservation of both analogue and digital archival materials. Long-term preservation requires a high degree of professional consensus, as the consequences of preservation decisions are long-lasting and often irreversible. The Classical Delphi method is therefore well suited to achieving agreement on preservation risks, strategies, and priorities through structured expert reflection (Dalkey & Helmer, 1963; Linstone & Turoff, 1975). The Modified Delphi method allows for the systematic assessment and refinement of existing technical and organizational preservation models (Hsu & Sandford, 2007). The Decision Delphi method is appropriate in situations where research directly informs strategic decisions related to infrastructure development, digital migration, and the prioritization of preservation actions (Rauch, 1979).
- Impact of the technological environment on archival work: Archives operate within complex and rapidly evolving technological environments. Research in this area focuses on the impact of technological change on archival processes, the use of multiple information systems, and the possibilities for efficient, reliable, and standardized migration of metadata from legacy systems to contemporary digital environments. Technological development creates uncertain and rapidly changing conditions in which stable consensus is frequently unrealistic. The Argument Delphi method facilitates a deeper understanding of differing expert interpretations of technological impacts on archival work by foregrounding reasoning and justification rather than convergence (Kuusi, 1999; Cuhls, 2024). The Disaggregative Delphi method is methodologically appropriate for developing multiple, coexisting scenarios of technological development and adoption (Tapio, 2002), while the Real-Time Delphi method enables the continuous adjustment of expert assessments in response to fast-paced technological change (Gordon & Pease, 2006).
- Organizational structure and governance of archives: This research domain explores organizational, managerial, and procedural aspects of archival operations, their integration within broader institutional frameworks, cooperation with other archival and related institutions, and the influence of staffing policies and professional competencies on the quality, efficiency, and sus-

tainability of archival work. The organizational structure and governance of archives constitute a strategically and politically sensitive research domain in which divergent interests are unavoidable. The Policy Delphi method structures debate around alternative governance and organizational models and supports informed policy deliberation rather than decision enforcement (Turoff, 1970; Linstone & Turoff, 2002). The Decision Delphi method supports coordination and alignment among key decision-makers in organizational and governance contexts (Rauch, 1979), whereas the Disaggregative Delphi method allows for the identification and comparative analysis of different governance models without enforcing artificial convergence (Tapio, 2002).

When considering the application of the Delphi method, it is essential to recognize that a critical prerequisite for its successful implementation is the sustained motivation and active engagement of the participating experts. Insufficient motivation may result in participant attrition, particularly after the initial round, when experts fail to perceive direct benefits or relevance in continued participation. This methodological risk must be explicitly addressed in the research design. At the same time, it should be noted that archives across different institutional and national contexts encounter broadly comparable challenges.

According to Sablatzky (2022, 1), the justification for conducting a Delphi study lies in the theoretical assumption that collective group judgments are superior to individual judgments. This perspective holds that even highly qualified and well-informed individuals may not generate optimal solutions in isolation; however, when individual perspectives are aggregated and iteratively refined, the most robust and well-founded ideas tend to emerge. This theoretical foundation is further supported by Linstone and Turoff (1975, 501–502), who emphasize that experts, stakeholders, and process participants involved in Delphi studies inevitably possess different mindsets, divergent ways of interpreting reality, and distinct bases of expertise upon which they draw when proposing solutions. The structured and anonymous nature of the Delphi process allows these heterogeneous perspectives to be systematically articulated, compared, and reassessed without the distortions commonly associated with face-to-face group dynamics.

Methodological vigilance is required with respect to what Hsu and Sandford (2007) identify as the potential of molding opinions within the Delphi process.

Cyphert and Gant (1971) explicitly cautioned that the Delphi technique could “be used to mold opinion as well as to collect information” (p. 273), thereby underscoring the susceptibility of iterative feedback mechanisms to influence participant judgments rather than merely aggregate them. Similarly, Dalkey and Helmer (1963) observed that “some ‘leading’ by the experimenters inevitably resulted from the selection of the information supplied,” indicating that the manner in which feedback is curated and presented may introduce subtle directional bias. Because the researcher determines which statistical summaries, arguments, or qualitative comments are redistributed to the panel, the neutrality of the process is contingent upon rigorous analytical discipline and transparency. An additional concern relates to the distinction between general statements and highly specific, topic-related information. Participants with less in-depth knowledge of the issue under examination may lack the capacity to identify or prioritize the most salient statements formulated by subject-matter experts. Consequently, nuanced or technically sophisticated contributions risk being overshadowed by more general formulations. Empirical observations further suggest that participants may adjust their ratings upward after receiving inaccurate or false feedback, in some cases assigning above-average scores to statements they had previously evaluated more critically. Such dynamics highlight the epistemic vulnerability of the Delphi method to conformity effects and feedback-induced bias.

The usefulness of the Delphi method in archival research conducted in conditions of rapid technological progress and the continuous evolution of software and technological solutions is clearly demonstrated by the study *Forecasting and Assessing the Impact of Artificial Intelligence on Society* (Firschein et al., 1973). Conducted in the 1970s, this research examined how experts in artificial intelligence assessed the future development, applications, and societal implications of AI technologies. Specifically, the study sought to identify anticipated time limits for the emergence of particular AI-based products and to assess their potential impact on society. The aim was to produce a systematic, expert-grounded technological forecast to support long-term societal planning. The Delphi study on the future of artificial intelligence had a significant long-term impact because it demonstrated, already in the 1970s, that expert-based forecasting can reveal not only anticipated technological developments but also their societal risks and

governance challenges. First, the study showed that AI progress would unfold unevenly, with breakthroughs concentrated in specific domains such as expert systems, language technologies, and robotics and observation that proved correct in later decades. Second, it highlighted early concerns about ethical and societal implications, including surveillance, automated decision-making, and military applications, many of which became central issues in contemporary AI governance debates. Third, the study demonstrated the value of structured expert consensus methods (such as Delphi) for anticipating disruptive technologies, shaping later foresight practices in government, defense, and technology policy. Finally, by emphasizing both the transformative potential and the dangers of AI, the research helped establish a framework for viewing AI not merely as a technical field but as a societal force requiring long-term planning, regulatory oversight, and interdisciplinary engagement.

The application of the Delphi method is particularly well suited to technological questions in archival practice. Areas such as digitization and digitalization processes, the management of LTO library infrastructures, archival information systems, and, more recently, the integration of artificial intelligence into archival workflows represent complex and interdisciplinary problem domains. In such contexts, the Delphi method enables the inclusion of experts from multiple professional backgrounds and supports the structured elicitation of informed judgments in response to clearly formulated research questions. Consequently, the Modified Delphi method is especially suitable for addressing issues related to archival information systems, digitization strategies, and the application of artificial intelligence in professional archival processing, as it allows research to build upon existing empirical findings, standards, and best practices.

The Classical Delphi method, by contrast, is particularly appropriate for exploratory and forward-looking research, such as forecasting future developments in archival formats or anticipating challenges related to data migration between technological systems in response to rapid technological obsolescence. One of the most frequently cited concerns regarding the use of the Delphi method relates to the duration of the research process, especially in studies employing three or more rounds. While this temporal aspect represents a legitimate methodological limitation, it must be weighed against the depth, robustness, and reflexivity of the results produced.

8 CONSLUSION

The Delphi method is particularly appropriate for use in archival theory and practice in situations where research problems are poorly defined, ambiguous, or even initially unknown. Such conditions are common in archival research, especially in contexts shaped by rapid technological change and evolving professional paradigms.

The Delphi method is highly relevant to archival theory and practice due to its capacity to facilitate interdisciplinary scientific collaboration. It is necessary to identify the fundamental principles and enduring standards that govern the functioning of archival theory and practice, recognizing archival science as an independent academic discipline characterized by its multidisciplinary and interdisciplinary scientific foundations (Klasinc, 2019, 16). Research on the application of artificial intelligence in professional archival processing, for example, requires not only the expertise of archivists but also the involvement of information scientists, engineers, and technology specialists. The Delphi method provides a structured and methodologically sound framework for such interdisciplinary cooperation, enabling the integration of diverse forms of expertise into a coherent analytical process.

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