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Review Article

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Reworking and Reusing in Premodern Societies: A Comparative Framework for Material and Cultural Continuity

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Abstract

Reworking and reusing connect the persistence of materials with changes in objects, practices and cultural authority. Research across archaeology, anthropology and historical disciplines has developed substantial but unevenly connected approaches to these relationships. This critical narrative review examines their terminology, methods and grounds of interpretation, concentrating on late antiquity to around 1800, principally in Europe and the Mediterranean, with selected South Asian and Japanese comparisons. It proposes selective continuity as a basis for comparison: material, form, function and attributed identity can endure in different combinations, each requiring its own evidence. The framework distinguishes the entity followed, the process reconstructed and the continuity claimed. It relates these distinctions to access, expertise, labour and valuation, explaining why neither scarcity nor an opposition between economic and symbolic motives adequately accounts for reuse. Four cases, organised in two paired comparisons, demonstrate how combining material, contextual and documentary evidence can discriminate between alternative histories, including histories in which identifiable predecessors have disappeared. Four research priorities follow:s separating historical prevalence from archaeological visibility; reconstructing the organisation of access and work; testing how recognised identity affected interventions; and connecting object histories to material flows and environmental consequences. The review argues that interdisciplinary comparison advances when specialist methods constrain shared explanatory propositions. Its contribution is a framework for investigating how the continuation of selected features redistributed possibilities, obligations and losses among successive users.

Keywords: reuse; reworking; repair; recycling; spolia; archaeology; anthropology; sustainability

Abbreviations: CIDOC CRM, International Committee for Documentation Conceptual Reference Model; SDG, Sustainable Development Goal; TEI, Text Encoding Initiative.

Introduction

The Great West Window of Winchester Cathedral preserves medieval glass in an early modern arrangement. After Parliamentary troops shattered the cathedral's glazing in 1642, surviving fragments were recovered and reassembled in the west window shortly after 1660 [1, pp. 17–18] (Figure 1). The glass remained part of the cathedral's architecture, while its imagery entered substantially altered compositions. Material survival accompanied the disruption of an earlier visual order. This relationship between persistence and transformation poses a central problem for the study of reuse: keeping inherited things available could require changes to the configurations, functions and associations through which they had previously acquired significance.

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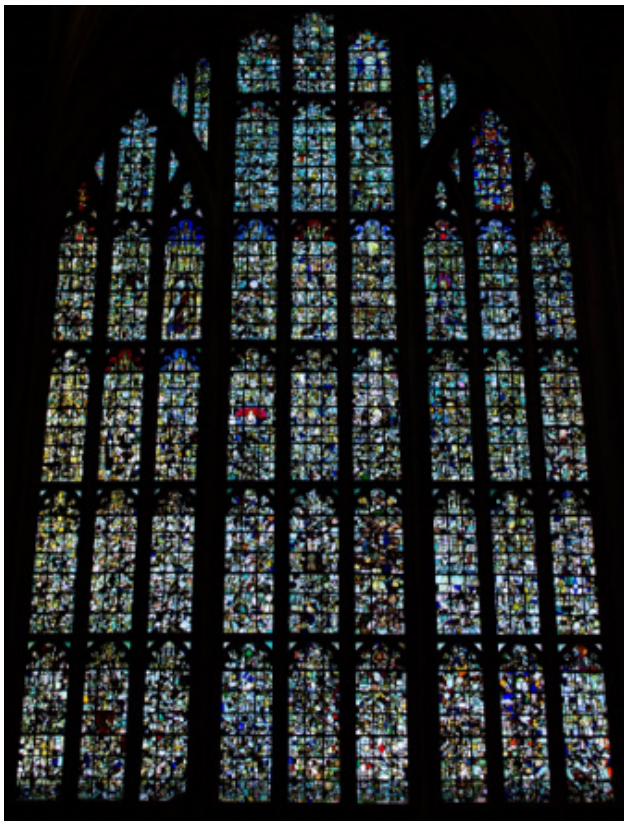


Figure 1. The Great West Window of Winchester Cathedral. Medieval glass recovered after the destruction of 1642 was reassembled shortly after 1660, retaining earlier material within a changed visual arrangement [1, pp. 17–18]. Photograph: JackPeasePhotography, 2014, via Wikimedia Commons, CC BY 2.0 (https://creativecommons.org/licenses/by/2.0/). Image reproduced without alteration. Source photograph

Such practices are documented across established traditions of research. Studies of the Roman economy place recycling within ordinary systems of production and consumption [2]. Histories of clothing, repair and second-hand exchange reconstruct the occupations, institutions and informal relationships that sustained circulation [3-6]. Scholarship on spolia examines how inherited components made the past available for architectural, political or devotional purposes [7]. Recent work by Rozanne Versendaal, Andrea van Leerdam and Natalia I. Petrovskaia likewise calls for an integrated approach to material reuse and circularity in premodern book cultures [8]. These approaches connect resource management with possession and authority. They also complicate explanations based on scarcity alone. An old object's usefulness depended on access to skills, rights of possession, expectations of performance and judgements of suitability. Reuse could sustain livelihoods or valued associations; it could also accompany dispossession and the termination of earlier practices. Describing it as an "anthropological constant" recognises recurrence without explaining this variability.

The difficulty of connecting these literatures exceeds terminological inconsistency. A manuscript specialist may follow a leaf between bindings; an archaeometrist may reconstruct substances after identifiable objects have disappeared; an art historian may investigate the recognition of an earlier origin in a new setting. These studies follow different entities and establish different relationships between past and present. The survival of material, the continuation of a practice and the persistence of an attributed identity cannot serve as evidence for one another without further argument. Contemporary sustainability concerns make those distinctions consequential. Sustainable Development Goal 12 addresses resource use in target 12.2 and waste prevention, reduction, recycling and reuse in target 12.5 [9]. These objectives provide a present context for historical enquiry, but neither explain premodern motivations nor establish the environmental benefits of earlier interventions. Such benefits depend on additional inputs, the alternatives displaced and the distribution of costs. Historical research contributes by investigating how prolonged use was organised, including situations in which retention depended on unequal access to materials and labour.

This article proposes selective continuity as a basis for comparison (Figure 2). Building on object biography and material mutability, it examines how material, form, function and attributed identity persisted in different combinations [10, 11]. Selectivity includes deliberate retention, practical constraint and incidental survival; it does not imply a single intention governing an object's history. The central argument is that these combinations become explicable through the arrangements that authorised intervention,

supplied expertise and assigned value. An adequate account therefore connects what continued with who could sustain or change it, under which conditions, and with what consequences. The review develops this argument through working distinctions, disciplinary comparison, four cases organised into two paired comparisons and a research agenda directed towards propositions that can be investigated across fields.

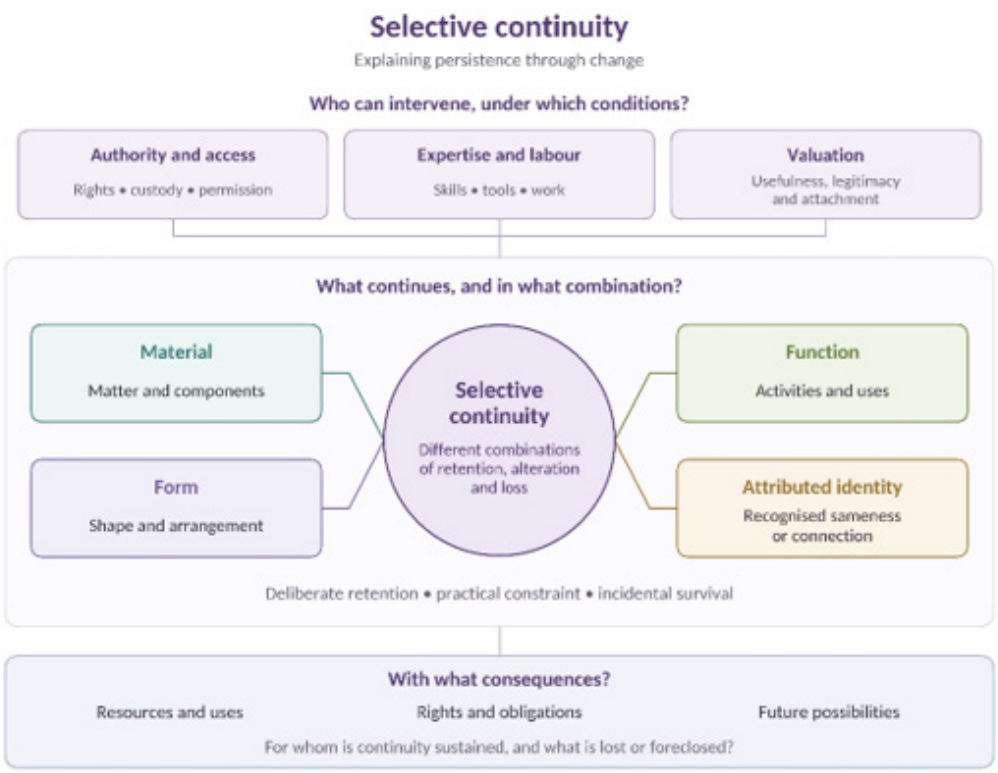


Figure 2. Selective continuity as a comparative framework. Material, form, function and attributed identity may persist in different combinations. Access, expertise and valuation shape interventions, whose consequences extend to resources, rights and later possibilities. Schematic developed for this article.

An important context for the present review is the international, interdisciplinary network Cultures of Use and Reuse, initiated by Julia von Ditfurth (Freiburg), Hannah Ryley (Oxford) and Carolin Gluchowski (Hamburg). Its starting point was the recognition that growing interest in reuse across the humanities had brought distinct scholarly traditions into proximity without necessarily making their concepts, methods or findings comparable. The inaugural workshop, 'Cultures of Use and Reuse: Towards a Terminological and Methodological Framework of Reframing and Recycling' (Oxford, 3–6 April 2023), combined disciplinary discussion with the examination of objects in library and museum collections. This format allowed participants to consider how different analytical vocabularies shaped interpretations of particular material traces. The second workshop, 'Material Matters: Unveiling the Dynamics of Reuse in Pre-Modern Texts, Images, and Carriers' (Freiburg, 31 March–3 April 2025), organised with Jesko Fildhuth, developed this approach through attention to parchment, paper and glass, examining the relationships between the transformation of physical carriers and the transmission of textual and visual content. A third workshop, 'Material Culture in Transformation: The Afterlives of Premodern Stone and Metal Objects', is scheduled for Mainz on 12–14 April 2027, organised with Julia Noll. It will extend the comparison to materials whose durability permits repeated intervention but whose reworking can also erase earlier configurations. The network's methodological ambition is to make disciplinary assumptions explicit, test the transferability of concepts against material evidence, and formulate questions that support collaborative investigation. This review develops that agenda by asking which aspects of continuity different methods can establish and under what conditions their findings become comparable.

Scope and Approach

This review examines how different disciplines identify and explain the continued or renewed use of inherited objects, components and materials. Its organising problem is the relationship between persistence and change: how can scholars establish what continued, reconstruct the conditions that enabled its continuation,

and assess the consequences? The scope follows this comparative problem, bringing together approaches that trace different aspects of an object's history, from the survival of substances and structures to changes in use, ownership and attributed identity.

The principal historical frame extends from Late Antiquity to the end of the Early Modern Period, broadly c. 300–1800. This long chronology permits comparison across changing political, religious and economic arrangements, including circumstances in which objects outlasted the institutions or practices that had sustained their earlier uses. It does not imply a homogeneous premodern material culture or identify industrialisation as the endpoint of reuse: repair, resale and material recovery continued within industrial economies [12]. Earlier archaeological studies and later historical and ethnographic research are included where they clarify processes or expose assumptions relevant to the comparison. The geographical emphasis lies in Europe and the Mediterranean. Selected South Asian and Japanese studies extend the conceptual inquiry by examining cultural translation and the recognition of continuity under different conditions [13,14]. They serve as situated comparisons, without providing representative regional coverage.

The method is a critical narrative review organised around explanatory problems, incorporating foundational studies and scholarship available by 20 October 2026. Literature is brought into comparison through overlapping concepts-including reuse, reworking, repair, recycling, spolia, reframing, object biography and fragmentology-and through reference tracing across disciplinary boundaries. Selection prioritises studies that connect historical interpretation to identifiable material or documentary evidence, together with methodological work that clarifies how such connections are established. Particular attention is paid to disagreements about the unit of analysis, the recognition of intervention and the relationship between physical survival and social continuity. The distribution of references reflects these analytical priorities; it cannot establish the relative size of disciplinary literatures or the historical prevalence of particular practices.

Across the disciplinary sections, comparison follows four questions: what entity is being traced; which observations establish change or persistence; what interpretation those observations support; and what further evidence could distinguish competing explanations. Section 5.1 applies these questions through four cases in two paired comparisons: inscribed supports entering new practices, and earlier glass incorporated through reassembly or remelting. They synthesise existing research and are selected for the interpretative problems they expose, including the separation of material survival from continuity of function or identity. Their purpose is to develop propositions that can be investigated across fields while making the limits of each inference explicit. On this basis, selective continuity becomes a framework for explaining historically specific combinations of persistence and change.

Entities, Processes and Continuities

What Continues

Comparison requires an explicit account of what is being followed through time. An assembled object, one of its components and the material from which it is made constitute related but distinct units of inquiry. A manuscript, for example, may cease to exist as a bound volume while individual leaves survive in later bindings. At the level of the book, dismantling marks the dissolution of an arrangement that brought texts and leaves into a particular sequence. At the level of the leaf, the same event begins a different history of handling, circulation and use. At the level of the parchment, it represents the continued exploitation of a material whose usefulness may no longer depend on the writing it carries. These accounts describe different aspects of the same transformation. Each makes particular continuities visible, and each requires different evidence.

The relationship between these units also changes over time. Dismantling can divide an object into components that subsequently follow separate trajectories; assembly can bring previously unrelated components together. Melting and recasting metal introduces a further possibility: material from several objects may be combined in a new artefact, with the earlier objects losing their recognisable forms. Object itineraries and research on material mutability offer ways of following these movements, divisions and combinations without presuming that a single, bounded object remains the subject throughout its history [15,11]. For the study of selective continuity, their importance lies in showing that the survival of material, the persistence of a component and the continuation of an object's identity need not coincide. A comparative account must therefore specify both its unit of analysis and the evidence that permits movement between units. A reused leaf can establish the survival of part of a manuscript, but reconstructing the former volume requires additional evidence, such as textual sequence, script, dimensions or binding traces. Likewise, compositional analysis may support an interpretation of metal mixing without identifying the individual artefacts that supplied the material. Continuity established at one level cannot automatically be attributed to another. Making these distinctions explicit allows scholars to compare what different methods actually demonstrate: the survival of substances, the movement of components, the reorganisation of objects or the recognition of an enduring identity.

Four dimensions organise the comparison (Figure 3). Material continuity concerns the incorporation of earlier matter into a later object or assemblage, potentially involving mixing, chemical alteration and loss. Formal continuity concerns the retention or reproduction of shape, decoration or arrangement. Functional continuity concerns the activities an object sustains, with intended purposes distinguished from documented uses. Attributed identity concerns its recognition as the same possession, relic, work or monument, or as maintaining a consequential connection with a person, place or past. Such identifications may be authorised, negotiated or contested [16, 17]. These dimensions describe relationships, not degrees of authenticity. A form may be reproduced in new material, while old material may survive the disappearance of its former form and identity.

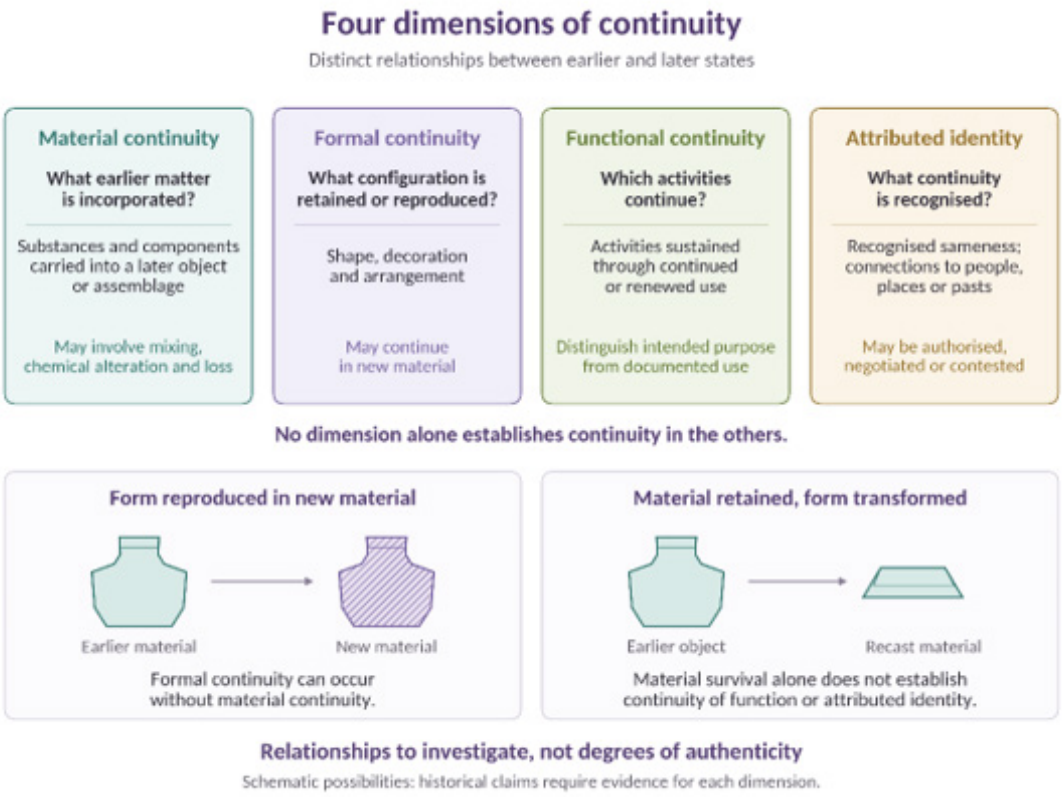


Figure 3. Four dimensions of continuity. Each identifies a relationship between earlier and later states rather than a degree of authenticity. The lower examples illustrate how formal continuity can occur in new material and how material can survive the disappearance of an earlier form. Schematic developed for this article.

Content introduces a related distinction between an existing carrier and what it communicates. A prayer can be copied onto new parchment without retaining its exemplar's substance; a binding leaf can preserve writing that contributes nothing to its later function. Copying may multiply instances while leaving an exemplar intact, whereas dismantling redistributes a finite support. Both require materials and labour, but their continuities are established through different evidence [18-20]. Textual or visual dependence must be demonstrated alongside the material sequence, rather than inferred from it. The condition against which change is assessed also requires definition. Books intended for supplementation and garments repeatedly altered during service need not have possessed a single, stable "original" before their afterlives began. Physical heterogeneity may record successive manufacture, previously used components or later repair. The proposed framework therefore requires a specified configuration or interval. It does not treat every difference within an object as evidence of reuse.

Comparative Terminology

The vocabulary used to describe reuse shapes the histories that scholars reconstruct. Terms such as repair, recycling and appropriation identify different aspects of a transformation while also carrying assumptions about its purpose and significance. Describing an intervention as repair connects physical work to the maintenance or recovery of service; calling it recycling locates recovered material within further production; interpreting it as appropriation foregrounds claims to possession or authority. A single intervention may support all three descriptions, but evidence sufficient for one does not necessarily establish the others. Comparison therefore requires explicit connections between the term employed, the object or component under investigation, and the evidence supporting the interpretation. Within the framework of selective continuity, this means distinguishing three connected questions: what persisted, through which practices and arrangements, and with what significance for particular historical actors.

The term recycling illustrates how disciplinary definitions can organise the same evidence around different questions. Michael B. Schiffer distinguishes recycling, in which a used element returns to manufacture, from lateral cycling, in which it passes between sets of activities [21, pp. 158–159]. The decisive criterion is the element's trajectory through production and use, rather than the extent of its physical alteration: a return to manufacture need not entail melting or the loss of recognisable form. Victoria A. Sainsbury

and colleagues place greater emphasis on physical transformation, distinguishing reuse involving limited alteration from recycling encompassing changes of form, while situating both within material mutability [11]. These definitions draw boundaries along different analytical dimensions. One asks where an element enters a sequence of activities; the other asks how its material configuration changes. An intervention may consequently receive different labels depending on the criterion applied. For comparative research, the task is to make those criteria explicit and examine how material transformation relates to movement between activities. A shared term becomes analytically useful when the processes it denotes can also be compared.

The working distinctions adopted here separate changes in an object's use from interventions in its physical configuration. Reuse denotes the renewed deployment of a previously used object or component after an interruption, or its deployment under an identified change of user, purpose or setting. Repurposing specifies a change of purpose; a transfer between users may leave that purpose intact. Reworking, by contrast, identifies physical intervention in an existing configuration, including cases in which earlier use cannot be established. These terms therefore address different questions: what an object was used for, how it entered another context of use, and what was done to its fabric. Continued use describes service across an interval, while maintenance and repair identify practices that may make such service possible. Maintenance sustains condition or availability; repair addresses damage or impaired performance, without necessarily restoring an earlier state. This distinction between continuity and the work that sustains it is central to the argument. As Stephen Graham and Nigel Thrift emphasise, the apparent stability of material arrangements depends on ongoing activity and demands explanation [22]. Repeated adjustment, replacement and repair can preserve an object's capacity to serve a particular function while substantially changing its material and form. Continued use is thus a historical outcome whose practical conditions must be reconstructed.

These terms are most useful when their relationships are made explicit: a single intervention can involve repurposing, reworking and repair, depending on the entity and process under investigation. A manuscript leaf cut and attached to reinforce a damaged binding, for example, is repurposed as a structural component and physically reworked to fit its new setting. At the level of the receiving volume, its incorporation constitutes a repair that may enable continued use. The leaf's material survival thus supports the functioning of another book, although its place within the original manuscript has been lost. That loss may precede its use in the repair and requires a separate chronology. The example shows why continuity and discontinuity must be attributed to specified relationships: parchment can survive, a component can acquire a new function, and a receiving object can remain serviceable through the same operation. Defining the unit of inquiry makes these descriptions compatible and reveals how the continuation of one arrangement can depend on the dissolution or transformation of another.

The choice of terminology can also introduce assumptions about acquisition and historical meaning that the surviving material does not itself establish. Dale Kinney's analysis of spolia demonstrates how the term's association with spoils can shape the interpretation of incorporated antiquities, encouraging connections between material reuse, seizure and the assertion of authority [23, 24]. Yet similar architectural arrangements can result from different histories of procurement. A column removed from a standing monument and one selected from stored salvage may serve comparable structural or decorative purposes in a later building, while involving different rights of access, acts of intervention and relationships to the earlier structure. Sean Silvia's concept of "inhabited reuse" addresses a related assumption: that incorporation necessarily separates an object from its previous social world. By foregrounding familiarity with antiquities before and after an intervention, it makes continued relationships with older things part of the explanation [25]. Together, these approaches distinguish three questions that the category spolia can otherwise conflate: how a component was acquired, how its incorporation changed its relationships, and how historical actors understood its connection to the past. Establishing that an element predates its present setting answers none of these questions on its own. Each requires evidence appropriate to the claim, linking material observations to the circumstances of procurement, use and recognition.

The categories used by historical actors require equally careful interpretation. Inventories, accounts and regulations describe objects and work for particular administrative purposes: to record possessions, allocate payments, define occupational responsibilities or establish rights. Reinhold Reith and Georg Stöger's urban examples show how repair operated within arrangements governing labour and permission [26, pp. 90–92]. A payment for repair may identify the person remunerated and the recognised purpose of the work while leaving its individual operations unrecorded. Regulations establish permissions and obligations, but do not by themselves demonstrate how work was performed. Likewise, the persistence of an inventory name through substantial alteration may indicate continuity of institutional recognition without establishing continuity of material or form. Such terminology is therefore evidence about how institutions classified and managed things, as well as a source for reconstructing interventions. Its explanatory value emerges when documentary categories are examined alongside material traces and the circumstances in which the records were produced.

Evaluative terms require a further distinction between the consequences of an intervention and the criteria by which those consequences were judged. Describing a transformation as upcycling, for example, implies that value increased. Yet an object's exchange price, practical usefulness, devotional significance and social prestige may change in different directions. A material conversion that generates income for an institution may simultaneously destroy associations valued by former users; extending an object's service may save expenditure for its owner while imposing additional labour on others. These possibilities make valuation a question of historical relationships. An account must identify who assigned value, which qualities mattered to them, and what comparison supports the claim that value increased

or diminished. Where those judgements cannot be recovered, the analysis should distinguish demonstrable changes in use or exchange from inferred assessments of worth.

Taken together, these distinctions make terminology part of the method of explanation. Each designation should identify a claim that can be examined: about an operation, a trajectory of use, an attribution of identity or a distribution of value. A comparative account can then connect these claims while keeping their evidential foundations distinct. Material traces may establish alteration; accounts may identify expenditure or authorised work; inventories and other records may document continued recognition under a particular name. Their combination can explain how continuity was sustained, by whom and at whose expense, while also exposing differences between intended and achieved outcomes. The contribution of a shared vocabulary lies in making these relationships explicit. It enables disagreement to be located in the reconstruction of events, the choice of analytical scale or the interpretation of value and identity, and thereby turns selective continuity into a framework for comparing explanations.

Disciplinary Perspectives

The following approaches contribute different parts of an explanation (Figure 4). Some reconstruct sequences of intervention; others explain access, valuation or recognition. Conservation and documentation shape the evidence available to all of them, while environmental history tests consequences beyond the individual object. These divisions are practical groupings within an interconnected literature, not exclusive disciplinary jurisdictions.



Figure 4. Disciplinary perspectives on reuse. Each panel identifies a characteristic question, an evidential contribution and a limit of inference. The approaches overlap; comparison depends on connecting their claims at an explicit analytical scale. Schematic developed for this article.

Anthropology and Material Culture Studies

Anthropology approaches reuse by asking how an object becomes available for further use in the first place. Availability depends on more than physical survival or material suitability: things circulate under classifications that make their sale, transfer or transformation acceptable, restricted or contested. Igor Kopytoff's account of commoditisation and singularisation provides a starting point by examining how objects become exchangeable or acquire a status that limits their circulation [16]. Arjun Appadurai's "regimes of value" situate these classifications within the relationships through which things move, drawing attention to differences in participants' evaluations and capacities to act [27]. A vessel might

constitute an heirloom for one person and recoverable metal for another. Explaining its transformation therefore requires an account of whose valuation prevailed and how that person acquired the authority or practical capacity to intervene.

The possibility of circulation must consequently be considered alongside the claims that sustain retention. Annette B. Weiner's analysis of inalienable possessions shows how keeping particular things can preserve identity, rank and relationships across generations, even within systems organised around exchange [28]. Conversely, an object's loss of recognised value may make it available for uses previously excluded. Michael Thompson's Rubbish Theory examines movement between categories of transient, durable and apparently valueless objects, making changes in classification part of the explanation for their changing prospects [29]. Nicky Gregson and Louise Crewe bring this question into the practical settings of second-hand exchange, showing how traders and consumers participate in renewed valuation [30]. Read together, these contributions establish that availability is socially produced and can change repeatedly. Discard is one possible route into renewed use, but an object need never become "waste" to change hands or purpose.

Following these changes over time connects the study of classification and value with object biography. Chris Gosden and Yvonne Marshall examine how the histories of people and things become mutually constitutive through particular encounters [10]. Jody Joy clarifies how such an approach can work with documented episodes, without requiring an uninterrupted account from manufacture to deposition [31]. This is especially useful for reuse research, where the evidence often preserves interventions more clearly than the intervals between them. Yet dismantling and recombination can also change the entity whose history is being followed. Rosemary A. Joyce and Susan D. Gillespie's object itineraries accommodate movement, interruption and renewed circulation across settings, providing a way to investigate these less bounded trajectories [15]. The methodological task is to follow changing relationships while specifying when the analysis moves between an assembled object, its components and its materials.

These trajectories also depend on what particular materials permit people to do. Tim Ingold's attention to materials places weathering, condition and practical engagement within the explanation of change [32]. Grain, corrosion, flexibility and susceptibility to heat affect the feasibility of intervention, but their consequences emerge through encounters with tools, skills and working conditions. The ethnographies edited by Francisco Martínez and Patrick Laviolette extend this attention to the judgements through which things become understood as broken or worth repairing [33]. Material condition and social valuation thus meet in practical decisions: whether an intervention is feasible, who can perform it, and what expenditure of work is considered worthwhile. This connection helps explain how the same physical condition can lead to repair, conversion, retention without use or discard under different circumstances.

Applying these insights to premodern societies requires explicit consideration of the grounds for comparison. Alison Wylie's account of analogical reasoning provides a framework for assessing which similarities support an inference and where differences limit it [34]. Ethnography can reveal possibilities that modern researchers might otherwise overlook, including unfamiliar relationships between ownership, value and material intervention. Establishing which possibilities explain a historical case nevertheless requires its own material and documentary evidence. Anthropology's contribution to selective continuity is therefore explanatory as well as conceptual: it directs attention to the arrangements that made particular transformations possible, the claims through which they were justified or resisted, and the subsequent opportunities for possession and use that they created.

Archaeology and Archaeometry

Archaeology approaches reuse through a problem of reconstruction: how did earlier activities produce the objects and deposits that survive? Michael B. Schiffer's distinction between systemic and archaeological contexts separates an object's participation in ongoing activities from its incorporation into the archaeological record [21]. This distinction becomes particularly consequential where objects remained available across several periods of occupation. Guido Furlan's proposal for successive, chronologically bounded systemic contexts addresses the coexistence of objects of different ages in long-lived settlements and the difficulty of distinguishing extended use from residuality [35]. An old artefact in a later layer may have remained in service, been retrieved for renewed use, or entered the deposit as redeposited debris. Its typological date identifies an earlier horizon of production, but cannot by itself establish the route connecting manufacture with deposition. Reuse is therefore one explanation to be tested against the sequence and character of the surviving evidence.

Physical traces can help distinguish these possible trajectories by identifying interventions that an object's classification alone would conceal. Daniel S. Amick examines renewed flaking through weathered surfaces as evidence for separate episodes of working stone [36]. Comparable attention to the sequence of modification informs Ellen Swift's analysis of Romano-British bracelets cut and bent into smaller rings: the altered form becomes historically informative when considered alongside subsequent contexts of deposition [37]. J. Theodore Peña extends this approach across stages in the histories of Roman pottery, distinguishing further uses of vessels from the incorporation of their fragments into construction materials [38]. Together, these studies show why the identification of an artefact's original form is only the beginning of an account of its use. Objects assembled in one deposit may have been collected as inputs for a later activity, making the assemblage evidence of recovery and procurement as well as of earlier consumption.

Where processing removes recognisable forms, archaeometry offers a different route into these histories. Peter Bray interprets copper-alloy composition in relation to sourcing, mixing, alloying, refining and remelting, treating chemical characteristics as the outcome of potentially successive processes [39]. Jonathan R. Wood similarly uses compositional and isotopic relationships to investigate

transformations, including silver mixing, whose contributing objects may no longer be identifiable [40]. The extension from visible modification to chemical evidence does not remove the problem of alternative explanations. Several processes can affect a chemical signal, so an unusual composition cannot independently establish a particular recycling episode. Interpretation depends on contextual patterns, suitable comparative material and a clear account of what was sampled. A replacement component may preserve evidence of repair that differs from the history of the surrounding object; its composition should not automatically be treated as representative of the whole.

The capacity to detect reuse consequently varies with both the material and the intervention. Ian C. Freestone demonstrates this within glass: mixing Roman glasses made with different decolourants can produce recognisable compositional patterns, whereas the recycling of chemically similar glass is harder to identify [41]. Rob Sands's work on wood reveals a different relationship between transformation and evidence. Redundant joints, altered dimensions and chronological discrepancies can preserve earlier configurations even after a timber has entered another structure [42]. Connecting these traces with the history of the tree also requires several chronologies to be distinguished: biological growth, initial incorporation and subsequent reuse. These differences matter for comparison because the absence of a diagnostic trace has no uniform meaning. It may reflect the absence of reuse, the erasure of earlier features, or the limited capacity of a method to distinguish successive interventions.

These limits become especially important when individual cases are used to reconstruct the organisation or prevalence of reuse. Evidence for collection, storage, processing and redistribution is needed to connect particular transformations with wider systems of recovery [2, 43]. Martijn A. Wijnhoven, Claudia Koppmann and Holger Becker combine computed tomography with archaeological context to interpret a 14 kg deposit of mail armour at Bonn as material assembled for repairing other garments [44]. Here, the survival of the stock makes an anticipated operation visible because the material had not yet been fully incorporated into repaired objects. Successful conversion could have dispersed or obscured precisely those relationships. The archaeological visibility of reuse is therefore partly an outcome of how far a process proceeded. Comparative claims require defined units, samples and detection criteria that account for this uneven survival. Archaeology and archaeometry contribute most strongly to selective continuity when they connect evidence of transformation with the conditions under which earlier materials and configurations remain identifiable, making the limits of reconstruction part of the explanation.

Art History and Architectural History

Art and architectural history examine how inherited objects and components made particular relationships with the past available to later users. The study of spolia has been central to this inquiry because incorporated antiquities bring material survival into contact with questions of authority, historical recognition and artistic judgement. Dale Kinney's history of the term exposes assumptions about classical antiquity and artistic decline that have shaped its interpretation [23]. The collection edited by Richard Brilliant and Kinney extends this discussion across periods and media, examining how reuse participated in changing relationships of appropriation and value [7]. These approaches make the significance of an older component a question for investigation. Its incorporation might support a claim to legitimacy or sacred authority, but establishing that claim requires evidence of how its origins were understood and made consequential. Procurement, physical treatment and reception therefore constitute connected stages whose agents and purposes may differ.

Architectural research grounds this interpretative problem in the practical organisation of construction. Dimensions, availability, structural suitability and the labour required for adaptation affected which components builders could select; recutting and placement shaped what subsequent viewers could see. Jon M. Frey's analysis of late antique fortifications in Greece foregrounds these decisions, showing the importance of reconstructing the demands of building with existing materials [45]. This attention to construction complicates the attribution of an entire assemblage to a single programme devised by its patron. A component selected for its suitability could acquire historical associations through its placement, while an element valued for its origins still had to meet practical requirements. Explaining its incorporation thus involves tracing how construction decisions and attributed significance interacted, including changes between installation and later encounters.

The need to distinguish these stages becomes particularly apparent where reuse formed part of political or religious transformation. Finbarr Barry Flood's study of Delhi's first Friday Mosque brings inscriptions, selective alteration and successive interpretations into the same account while attending to their different evidential implications [46, pp. 128–131]. The foundation inscription presents temple materials within a history of appropriation, but the treatment of carved imagery and continuities of craft require examination at the level of particular interventions. Medieval and colonial descriptions, in turn, framed the monument through different historical concerns. The circumstances of conquest are essential to this explanation, yet they do not establish a uniform meaning for every incorporated component or determine how later viewers understood it. The case demonstrates why an account of reuse must connect the circumstances of acquisition with the material work of incorporation and the subsequent production of meaning.

Reframing scholarship extends this inquiry to transformations that depend chiefly on altered relationships around a work. Stefanie Seeberg and Susanne Wittekind examine alteration, supplementation and renewed presentation, while Christina Antenhofer and Heike Schlie situate such processes within questions of cultural appropriation [47, 48]. A new mount, surrounding image programme or liturgical setting can change how a substantially intact object is encountered, classified and used. Conversely, extensive physical change may be understood as sustaining an existing work. Alexander Nagel and Christopher S.

Wood's account of substitution examines how recognised identity could persist through restoration, replacement or reproduction [17]. Considered together, these approaches demonstrate that the extent of material intervention and the degree of perceived continuity need not correspond. An account of selective continuity must therefore reconstruct the historical grounds on which sameness or connection was recognised.

This emphasis on recognition also changes the evidence required for comparison. Paolo Liverani's methodological reassessment and Sean Silvia's concept of "inhabited reuse" direct attention to the circumstances in which older things remained familiar and meaningful [49, 25]. Historical recognition need not have involved precise knowledge of an object's first setting: an inscription could assert an origin that material analysis cannot confirm, while continued familiarity could sustain associations without a detailed account of provenance. Such claims must be examined alongside evidence of procurement, recutting, placement and use. Concealed supports, rejected fragments and building records are particularly valuable because they place conspicuous displays of antiquity within a wider range of material choices. Art and architectural history thereby contribute an account of how continuity became perceptible and authoritative. Their central explanatory task is to establish which earlier associations an intervention sustained or made available, who recognised them, and how those relationships changed through subsequent presentation and use.

Philology and the History of Books

Philology and book history examine forms of continuity that can coincide within a manuscript but also follow different trajectories: the transmission of texts, the survival of physical supports and the continuation of reading practices. Stephen G. Nichols's account of the New Philology foregrounded the particular manuscript and its variations, making the circumstances of individual witnesses central to interpretation [50]. Donald F. McKenzie's attention to the material forms of textual production and reception provides a complementary basis for asking how presentation participates in the production of meaning [18]. Together, these approaches establish why additions, rearrangements and changes of format belong within textual history. For reuse research, however, their relationship to material continuity must remain explicit. Copying an inherited formula onto a new support perpetuates textual content through a different process from altering the leaf on which it was previously written.

Codicology provides the means to reconstruct how these processes intersect within individual books. J. Peter Gumbert's work on codicological units distinguishes stages of production and assembly that the present binding may conceal [51]. A similar combination of texts could result from an integrated copying project or from the later joining of independently produced units. Script, ruling, quire structure and attachment traces help establish which sequence the evidence supports. Kathryn M. Rudy's studies of customisation, modular production and assemblage extend this attention to the interventions through which books remained usable or acquired new possibilities of use: cutting, insertion and rebinding could reorganise their contents and physical structures [19,52]. Hannah Ryley places repair and recycling within the practices of handling, craftsmanship and circulation that sustained manuscripts over time [20]. These contributions make alteration part of the explanation of a book's continuing availability. Where supplementation was anticipated during production, a single completed state provides an inadequate baseline against which to classify every subsequent intervention.

Dismantling introduces a further change of scale, as the history of a volume gives way to the trajectories of its constituent leaves. Fragmentology follows these trajectories into later objects, giving the receiving binding or wrapper an evidential role of its own. William Duba and Christoph Flüeler connect fragments both to the manuscripts from which they came and to the new wholes in which they survived [53]. Seppo Eskola demonstrates the explanatory value of this approach in the Swedish-Finnish collections, where manuscript leaves, the tax accounts they covered and the activities of officials jointly support arguments about provenance [54]. Marina Rustow's reconstruction of Fatimid documents from reused papers in the Cairo Geniza likewise shows how later uses of supports preserved evidence of earlier administrative practices [55]. In such cases, the survival of writing depends on a change in the function of its carrier. That survival does not establish that subsequent users continued to read or value the earlier text; their reasons for retaining the support require separate investigation.

Tracing a fragment into its later setting also raises the question of how it became available for conversion. Krista A. Milne's research on English institutional collections identifies medieval decommissioning alongside later destruction, extending the chronology within which the dismantling of books must be explained [56]. Anna Reynolds approaches the subsequent circulation of waste paper through its practical uses and its literary and pictorial representation, connecting material availability with the ways discarded writing was perceived [57]. Read together, these studies locate conversion within changing institutional needs and assessments of usefulness. A book might become obsolete because its language, liturgy or contents no longer served a particular community, even while its material remained serviceable. The presence of reused leaves therefore requires a history of selection and release; it cannot automatically be attributed to Reformation hostility or physical exhaustion.

The transmission of inherited content offers a complementary route through these changes. The retextualisation examined in the collection edited by Joachim Bumke and Ursula Peters concerns how earlier forms were selected and transformed in new textual circumstances [58]. Magdalena Butz's study of confession formulas in catechetical and poetic settings and Malena Ratzke's analysis of elements associated with the Biblia pauperum in Speculum humanae salvationis manuscripts make such changes of context and use concrete [59,60]. These processes may accompany the reworking of existing books, but textual or iconographic dependence alone cannot demonstrate the transfer of a physical component. The comparative contribution of philology and book history is

to establish where the histories of content, carrier and practice converge and where they separate. Explaining selective continuity requires all three to remain visible: what was transmitted, what material survived, and how particular arrangements enabled further reading or other uses.

Textiles and the Social Organisation of Reuse

Textiles make the relationship between physical alteration and continued service particularly visible. Cutting, turning, patching and replacing linings could sustain an object's usefulness while changing its configuration and retaining selected portions of fabric or ornament. Stefanie Seeberg's medieval examples connect these interventions with craft expertise, material value and culturally specific reasons for preserving older fabrics [61]. Reworking could therefore form part of an object's expected use, making the boundary between service and afterlife difficult to draw. Reconstructing that relationship requires close attention to the sequence of interventions. Seams, abandoned stitch holes and discontinuities in patterns may indicate alteration, but their interpretation must distinguish initial manufacture, historical modification and modern conservation. María Martín Seijo and colleagues' analysis of textiles from Pambre Castle demonstrates how microscopic, chemical and environmental evidence can be combined to recover repeated modifications [62]. Technical examination thus provides a basis for asking how successive interventions sustained or redirected use.

The availability of such interventions depended on the organisation of exchange and access to skilled work. Kate Kelsey Staples connects second-hand trade with credit, fashion and household assets, while Beverly Lemire situates clothing within interdependent systems of manufacture, employment and consumption [63, 3, 64]. These approaches place alteration within the relationships through which garments became available to new users. The collection edited by Jon Stobart and Ilja Van Damme extends this inquiry into industrialising economies, demonstrating the continued importance of second-hand exchange alongside expanding production [12]. New manufacture and reuse could develop together as changing fashions released garments for resale and adaptation. Yet a garment's movement cannot be explained through price and utility alone. Ann Rosalind Jones and Peter Stallybrass show how Renaissance clothing carried memories and obligations between owners [65]. A transfer could therefore redistribute material resources while sustaining, modifying or contesting relationships associated with the garment.

Understanding those transfers requires attention to the work and entitlements through which circulation occurred. Reinhold Reith and Georg Stöger's German-speaking urban examples locate repair within specialised occupations, household employment and activities undertaken outside guild permissions. They also show how garments transferred to servants could constitute remuneration, while the sale of clothing left by deceased residents helped finance institutional care [26, pp. 88–92]. These cases distinguish ownership from the authority to dispose of an object, the execution of work and the receipt of its benefits. The person recorded as paying for an alteration need not have performed it; the institution receiving income from a sale may have acquired that capacity through arrangements invisible in the transaction itself. Explaining reuse consequently involves reconstructing how materials, labour and rights were brought together, as well as identifying the intervention.

This separation of roles is also essential to the analysis of gender and status. Alexandra Gajewski and Seeberg distinguish women's participation as textile makers, donors and recipients, directing attention to forms of involvement that different sources record unevenly [66]. A named donor does not provide a complete account of production, while surviving stitches may establish skilled intervention without identifying its maker. Jérôme Denis and David Pontille's maintenance studies extend this concern with labour to less conspicuous activities: cleaning, inspection, storage and minor adjustment across intervals of upkeep [67, 68]. Their contemporary research helps formulate questions about the work behind apparent stability, although its social arrangements cannot be transferred unchanged to premodern households or institutions. Describing such work as care should therefore initiate an inquiry into responsibility and compensation: who undertook it, whether it was paid or imposed, and whose priorities it served.

Accounts, inventories and textile traces preserve different parts of these relationships. Payments can document expenditure without revealing every operation; inventories can register possession without recording routine upkeep; material examination can establish alteration while leaving its participants unnamed. Their combination makes durability explicable as an outcome of construction, repeated labour and access to expertise. It also requires attention to uneven survival. Textiles preserved in treasuries may retain elaborate histories of donation and alteration, whereas fabrics exhausted through successive practical uses leave a much thinner record. The contribution of textile research to selective continuity lies in connecting what was physically retained with the social organisation of its retention. Continued service becomes an achievement sustained by particular workers, rights and resources, whose costs and benefits were distributed among different participants.

Religious Studies and Cultural Translation

Religious material culture brings the distinction between physical survival and recognised identity into particularly sharp focus. Caroline Walker Bynum situates matter within late medieval understandings of sacred power, making its significance dependent on historically specific accounts of presence and efficacy [69]. Cynthia Hahn's work on reliquaries develops a related question: how did containers, presentation and practices of encounter shape the reception of their contents? [70] Alexandra Walsham and Birgit Meyer extend attention to the practices through which particular remains and media acquired religious authority [71,72]. Together, these approaches explain why material integrity provides an insufficient measure of religious continuity. A relic could retain its recognised relationship to a saint through remounting and institutional transfer, while an intact image could lose its place within the practices that had sustained its cult. The historical

task is to establish which relationships made an object religiously consequential and how an intervention affected them.

Changes within a religious community demonstrate how the preservation of an object could serve different projects over time. Alison Ray's Canterbury study connects the maintenance of books with later interventions associated with the suppression of Becket's cult [73]. A charter of 1226 provided an annual gift of deer whose hides were designated for binding the precentors' books; later manuscripts preserve alterations to Becket-related material. These episodes distinguish the work of keeping a collection serviceable from the purposes for which its contents remained available. Sustaining commemoration and adapting a text to the requirements of a new authority could both involve preserving much of the same book. Joseph Leo Koerner's account of Lutheran imagery similarly examines how images acquired redefined functions within continued worship [74]. Physical retention and religious change could therefore proceed together. An erasure or alteration may establish an intervention, but its relationship to obedience, resistance or attachment requires further evidence.

Movement between communities introduces additional questions about who could redefine an object and whose understanding prevailed. Richard H. Davis traces Indian images recognised as divine persons, trophies, commodities or art, sometimes under competing classifications [75]. Finbarr Barry Flood's analysis of South Asian cultural translation likewise examines the negotiation of affiliations and meanings through encounters across political and religious boundaries [13]. These approaches connect changes of classification with the circumstances of transfer: purchase, donation and seizure created different relationships of possession and different capacities to intervene. Yet cultural association must also be distinguished from a demonstrated history of prior use. Nikolaos Vryzidis's study of Ottoman textiles in Greek ecclesiastical settings separates the reuse of existing fabrics from production responding to Christian demand and from the combination of artistic traditions [76]. A fabric's origin cannot establish that it came from an earlier garment, just as a shared motif cannot independently identify its maker's religion. Interpretation of cultural transfer must therefore remain accountable to the material trajectory it presupposes.

The retention of earlier associations could also depend on physical transformation and concealment. Halle O'Neal's Japanese studies examine how reworking enabled objects and materials to participate in new religious relationships while selected connections with earlier states remained consequential [14,77]. In the case discussed below, a letter attributed to the monk Jōgyō was stamped with Amida images and enclosed within a statue after his death. The earlier writing became part of a commemorative arrangement in which its significance did not depend on continued visibility. This example broadens the comparative question from what remained perceptible to what was understood to remain present. It also shows why the grounds of continuity must be reconstructed within particular practices of attribution, commemoration and emplacement. Similar physical operations need not sustain equivalent relationships across religious settings.

The sources that articulate these relationships are themselves part of the history under investigation. A foundation narrative may legitimate possession, an inventory may record an authorised classification, and a prohibition may express a boundary whose observance remains uncertain. Such statements establish claims about sacred identity and appropriate treatment; their acceptance and practical consequences require examination alongside material traces, deposits and evidence of use. Religious studies thus contribute an account of how continuity was recognised, authorised and contested. For selective continuity, the central question is how particular actors connected an object's matter, form and use with its religious identity-and how competing understandings shaped what could be preserved, altered or relinquished.

Conservation and Technical Art History

Conservation brings the production and preservation of evidence into the history of reuse. The condition in which an object becomes available for research reflects both earlier interventions and subsequent decisions about its treatment. Salvador Muñoz Viñas and Barbara Appelbaum examine how conservation decisions connect assessments of value with custodians' interests and treatment goals [78, 79]. Cornelius Holtorf extends this temporal perspective by considering how conservation shapes the possibilities available to future users [80]. These approaches make the selection of a state for preservation part of the explanation. Removing a lining may expose earlier construction while disturbing evidence of later support; detaching a manuscript fragment may improve access to its writing while disrupting the relationships recorded by folds, adhesive and attachment. A treatment can therefore make one phase of an object's history more legible while changing the evidence for another. For reuse research, present condition must be understood through the decisions that produced it.

Technical art history addresses this relationship by integrating material examination with historical interpretation, as Erma Hermens's account of the field emphasises [81]. Its contribution depends on connecting observations about materials and techniques with questions about making, alteration and use. Chandra L. Reedy's discussion of utilitarian ethnographic objects extends this inquiry through reciprocal engagement with archaeological and anthropological expertise [82]. Ordinary, repaired and composite objects can pose questions about repeated service and material intervention that differ from those associated with attribution or initial manufacture. Broadening the range of objects examined therefore also requires attention to how research questions are formulated and which forms of expertise guide interpretation. For the study of selective continuity, the aim is to reconstruct how successive interventions sustained particular features while changing others.

Achieving this requires a precise connection between an analytical result and the historical claim it supports. Sarah Fiddyment and colleagues' identification of parchment animal origin through peptide fingerprinting illustrates the distinction [83]. Species identification supplies information about a support, but cannot independently establish whether it had already served

another purpose. Its contribution to a reuse history depends on its relationship to layout, trimming, sewing holes, wear and the structure of the later binding. Their account of biocodicology accordingly connects sampling with preliminary examination and conservation constraints [84]. The location of a sample is equally consequential: a result from a replacement component may illuminate a repair without characterising initial manufacture. Analytical findings become historically explanatory when they are assigned to particular components and located within a supported sequence of interventions.

Experimental reconstruction offers a complementary way to investigate that sequence by testing proposed operations and their expected traces. The methods collected by Jeffrey R. Ferguson emphasise research design and controlled comparison, while Pamela H. Smith connects reconstruction with the practical knowledge involved in historical making [85, 86]. Together, these approaches direct attention to the relationship between a procedure, the conditions under which it is attempted and the evidence it produces. Successful replication demonstrates feasibility under specified conditions; establishing historical use requires further correspondence with surviving traces and contextual evidence. Conversely, failure with unfamiliar materials, tools or skills may reveal limitations in the experiment rather than an impossibility confronting historical makers. Experiments are most informative when competing procedures generate distinguishable expectations that can be assessed against the object.

Conservation and technical art history thus require two interconnected chronologies: the sequence of manufacture, service and reworking, and the sequence of collection, examination and treatment. Photographs, sample records and documentation of removed components help establish how the second sequence affects knowledge of the first. They can show whether an apparent discontinuity belongs to historical reuse or later treatment, and whether features now inaccessible were previously recorded. This makes conservation documentation integral to historical interpretation. Its comparative contribution is to connect claims about selective continuity with the conditions under which their evidence has survived, been altered and become observable, allowing the histories of individual components to remain distinct within an object catalogued under a single name or date.

Digital Documentation and Comparability

Digital documentation shapes the conditions under which histories of reuse can be reconstructed and compared. Making dispersed evidence accessible depends on decisions about what constitutes an object, which episodes of its history deserve separate description and how relationships between components are recorded. Chiara Zuanni's account of digital object biographies draws attention to the participation of digital representations in those histories [87]. Johanna Drucker's concept of capta provides a complementary perspective by foregrounding the selection and interpretation through which humanities data are produced [88]. A catalogue centred on maker, earliest date and present location may identify an object effectively while making later modifications difficult to retrieve. For selective continuity, the challenge is to represent the relationships between successive states without allowing the object's current catalogue identity to determine the boundaries of its history.

Existing standards provide resources for addressing this challenge. TEI manuscript description accommodates physical composition, additions, bindings, provenance and dispersed fragments, enabling different aspects of a book's history to be recorded [89]. At a broader level, Martin Doerr's account of CIDOC CRM explains why semantic interoperability requires agreement about the relationships represented, beyond correspondence between field names [90]. The model distinguishes modification, component addition and removal, custody transfer and transformation [91]. These distinctions can clarify historical arguments, but their application requires interpretation. E81 Transformation, for example, concerns the simultaneous end and beginning of physical entities that retain relevant substance or structure but differ fundamentally in nature or identity; a change in significance alone does not meet those criteria. Assigning an event to this category therefore makes a particular claim about physical identity, which must remain distinguishable from historical actors' recognition of continuity. A community might regard a remade object as the same possession even where its physical transformation warrants a different description within the model.

The choice of descriptive unit is equally consequential. Ruth Mullett's Fragmentarium study treats manuscript fragments as functional constituents of their Bodleian host volumes, preserving relationships that a description focused on recovering the earlier text could overlook [92]. This approach connects the fragment's previous history with the work it performs within a later object. To represent both, a record must distinguish the component, the assembled volume and the episode of incorporation while making their relationships explicit. Comparable requirements arise for reused architectural elements and remounted ornaments. Without such distinctions, records may count a component and its receiving object interchangeably, or attach evidence of one intervention to the history of the whole. Digital comparability therefore depends on decisions about analytical scale as well as descriptive terminology.

Those decisions must also preserve differences in evidential certainty. A cut may be securely identified while its date remains approximate and its purpose disputed. Assigning a single confidence level to the entire object history would obscure these differences. TEI's provisions for certainty, precision and responsibility attribution offer ways to qualify individual assertions [89]. Hugh Denard's discussion of the London Charter extends the same principle to visual reconstruction by emphasising documentation of the reasoning behind a representation [93]. A proposed join between fragments, a supplied area or an uncertain dimension should remain identifiable within the reconstructed whole. Otherwise, the visual coherence of the result can give an interpretation greater apparent certainty than its evidence supports.

These requirements connect documentation with the wider conditions of knowledge production examined in Jeremy Huggett's introspective digital archaeology [94]. Collection history,

digitisation priorities, descriptive depth and access to surfaces all influence which interventions become searchable. The absence of a reuse designation may indicate that no intervention was recognised, that no relevant examination occurred or that the record provided no means of describing it. Such absences cannot be compared as though they represented equivalent observations. Digital methods contribute to selective continuity when they make these conditions visible and allow claims to be traced from a comparative synthesis to particular observations, sources and interpretations. Shared standards support that work, but meaningful comparison also requires explicit units of description, identification criteria and records of uncertainty.

Environmental History and the Limits of Circularity

Environmental history extends the study of reuse beyond the object to the systems of land, energy, labour and production that sustained its transformation. Richard Hoffmann's synthesis of medieval environmental history situates resource use within changing relationships between societies and their surroundings [95]. Paul Warde's study of wood resources in early modern Germany gives this problem institutional specificity, showing how competing demands and arrangements of access shaped environmental pressures [96]. Together, these approaches make scarcity a relationship to be explained: a material might be abundant in one location yet inaccessible, unsuitable or costly to obtain for particular users. The same perspective complicates assessments of reuse. Retaining an object could reduce demand for its principal material while requiring additional fuel, transport or labour to make continued service possible.

Environmental evaluation consequently requires distinctions between material recirculation, economic advantage and environmental benefit. The work assembled by Irene Bavuso and colleagues reconstructs agents and systems of recovery that conventional accounts of production can overlook [43,97]. Establishing the existence of such circulation is a necessary step, but does not determine its wider effects. Hervé Corvellec, Alison F. Stowell and Nils Johansson's critique of circular economy research makes explicit why circularity cannot independently establish sustainability [98]. More specific distinctions help formulate the historical inquiry. Nancy M. P. Bocken and colleagues separate extending product life from closing material flows through recycling, while Jouni Korhonen, Antero Honkasalo and Jyri Seppälä emphasise the resource demands and wastes associated with recovery itself [99, 100]. Repair, recutting and melting retain different combinations of matter, form and previously invested work. Their consequences must therefore be assessed through the operations involved and the alternatives they displaced.

The question of displacement is particularly important because recovered material need not reduce the use of newly extracted resources in equal measure. Trevor Zink and Roland Geyer identify this problem in their analysis of circular economy rebound [101]. Applied to premodern cases, their argument generates alternatives to investigate: recast metal might substitute for fresh supply, supplement it or make additional consumption possible. Identifying recycled inputs cannot distinguish between these outcomes. Doing so requires evidence about supply, demand and the relationships between primary and secondary production, alongside the fuel, transport and conversion losses involved. Where those relationships remain uncertain, material recovery can be established more securely than environmental savings.

The organisation of recovery also connects environmental consequences with questions of authority and labour. Dolly Jørgensen's study of late medieval English river pollution shows how regulation and physical clearance formed part of maintaining urban environments [102]. It directs attention to the work and arrangements needed to manage material movement, including collection, transport, processing and disposal. Max Liboiron and Josh Lepawsky's discard studies add the question of who possesses the authority to assign value and disposability [103]. Sale, confiscation and institutional dissolution could all release materials for further use, but through different relationships of entitlement and coercion. Continued circulation may benefit new users while dispossessing earlier custodians or imposing costs on recovery workers. Environmental, economic and social consequences therefore require connected but distinct accounts.

Premodern reuse research contributes to environmental history by reconstructing these relationships at scales extending beyond the surviving artefact. A persuasive explanation identifies what an intervention retained, what additional resources it required, which alternatives it plausibly displaced and where its costs and benefits fell. Quantified comparisons will often remain beyond the available evidence, but a bounded reconstruction can still distinguish supported consequences from unresolved possibilities. Within the framework of selective continuity, environmental analysis asks what sustaining particular materials, forms or functions demanded elsewhere. This makes the historical variability of reuse central to its relevance for sustainability: the consequences depended on the arrangements through which continuity was achieved.

Discussion

Comparing the Grounds of Interpretation

The framework developed here becomes explanatory when cases are selected to investigate particular relationships between persistence and change. The following discussion therefore organises four cases into two paired comparisons. The first examines how earlier writing participated in the renewed use of inscribed supports; the second examines how different operations recovered the useful properties of earlier glass. Each pair starts from a shared analytical problem rather than an assumption of equivalent materials, institutions or motives. Their purpose is to identify which features mattered within particular arrangements of use and which combinations of evidence can explain their retention. Differences in chronology, geography and institutional setting remain integral to the comparison; the cases do not constitute controlled tests of a single causal variable.

The first comparison concerns the relationship between the survival of writing and the purposes served by its carrier. In Seppo

Eskola's Swedish-Finnish material, medieval manuscript leaves became covers for early modern tax accounts. One missal bifolium was inverted so that its wider lower margin could accommodate the heading of Jon Nilsson's account for 1560 [54, p. 17, fig. 1]. This intervention made an existing feature of the leaf useful within an administrative arrangement. Parchment and liturgical writing survived together, but the new function did not require the restoration of the leaf's place in a missal. Its orientation and new heading provide positive evidence of how the receiving institution reorganised the support around another task.

The letter attributed to the monk Jōgyō presents a different relationship between earlier inscription and subsequent use. Halle O'Neal examines how the letter was stamped with Amida images after his death and enclosed within an Amida statue [77]. Her interpretation connects the paper and handwriting with the deceased and with practices of commemoration. Here, the support's earlier history contributed to its later religious significance. The relevant continuity concerned its relationship to the writer, without necessarily requiring continued attention to the letter's original message. Enclosure changed the conditions of access while sustaining that relationship.

The comparison therefore turns on the role of an inherited feature within a later practice. In the administrative wrapper, the new orientation and heading demonstrate the adaptation of a written support; they do not establish how officials regarded its liturgical contents. In the commemorative letter, the relationship between handwriting and the deceased forms part of the explanation for incorporation. The analytical distinction is between the survival of an inscription and its consequential participation in a new arrangement. This distinction avoids assigning either an exclusively practical or an exclusively symbolic character to reuse. Instead, it asks which properties and associations particular practices made relevant.

The second comparison concerns the relationship between material recovery and the preservation of configuration. At Winchester Cathedral, medieval glass shattered during the Civil War was reassembled in the west window after 1660. Roberta Gilchrist situates this restoration within a history of religious disruption that later narratives of architectural continuity can obscure [1, pp. 17–18]. Earlier fragments again performed a glazing function, while their recombination did not reproduce the former iconographic arrangement in full. The case thus distinguishes continuity at the level of constituent material and renewed architectural service from continuity of the earlier composition.

The ninth-century workshops at San Vincenzo al Volturno recovered earlier glass through a more extensive transformation. Nadine Schibille and Ian C. Freestone combine compositional analysis with workshop evidence to argue that Roman mosaic tesserae and window glass supplied material for new vessels, decoration and glazing. Tesserae provided prepared colours as well as glass substance. The authors also propose that access to an earlier building through patronage may explain procurement, while treating that reconstruction as a hypothesis requiring further investigation [104]. This case connects the loss of earlier configurations with the continued exploitation of selected material properties and with the institutional arrangements that made recovery possible.

Read together, the glass cases show that the extent of physical transformation does not provide a sufficient measure of what continued. Reassembly can preserve fragments while changing the relationships among them; remelting can eliminate their shapes while making selected properties available for further production. Colour is particularly instructive because it crosses a simple division between matter and appearance: earlier glass could supply both a workable substance and properties used to create a new visual effect [41]. The comparative question is therefore which features an operation retained, mobilised or rendered irrelevant, and how access to materials and expertise shaped that outcome.

The paired comparisons summarised in Table 1 support two methodological deductions. First, continuity must be specified as a relationship between an inherited feature and a later activity: survival alone does not explain what that feature contributed. Second, the consequences of an intervention depend on the scale at which they are examined. The dissolution of a book, image programme or mosaic can release components or properties that sustain a different arrangement. Neither deduction establishes a universal motive for reuse. Together, however, they identify what historical explanation must connect: the features available for retention, the practices and institutions that made them useful or significant, and the transformations through which they acquired a further role. This gives selective continuity explanatory force beyond the classification of operations.

Table 1. Paired comparisons of selective continuity.

Comparison	Case	Relationship investigated	Comparative deduction
Earlier writing in a later practice	Missal bifolium reused as an account cover [54]	Earlier writing survives while orientation and available space serve administrative use.	Physical survival and continued participation in a practice require separate evidence.
	Letter attributed to Jōgyō [77]	Handwriting and support acquire a commemorative role through their connection with the deceased.	An earlier association can become consequential through transformation and concealment.
Earlier glass in a later configuration	Winchester Cathedral's west window [1]	Fragments return to architectural service within a changed arrangement.	Material and functional continuity can coexist with a changed visual arrangement.
	San Vincenzo al Volturno [104]	Earlier glass supplies substance and prepared colours through remelting.	Loss of component form can accompany the continued exploitation of selected material properties.

From Identification to Explanation

Across these cases, interdisciplinary comparison becomes explanatory when it changes the range of histories that the evidence can support. The contribution of an additional method lies in the constraint it places on a particular proposition. Two catalogue descriptions derived from the same attribution do not provide independent corroboration. In the manuscript comparison, administrative evidence helps establish how the support entered a later practice, while commemorative evidence explains why an earlier personal connection could matter within another. In the glass comparison, workshop remains constrain the interpretation of compositional patterns by identifying a setting in which processing occurred. Neither combination establishes every stage of procurement or reception. Agreement is only one productive outcome of combining evidence: disagreement may show that sources concern different stages, entities or relationships. The question is what an added source enables an explanation to establish, revise or exclude.

Selective continuity connects this assessment of evidence with questions of historical causation. Establishing that some material survived while form or function changed describes an outcome; explaining that outcome requires reconstruction of the conditions under which it became possible. Relevant conditions include workable materials, access to components, available expertise and arrangements permitting or requiring intervention. Assessments of usefulness, legitimacy and attachment shaped which features were retained, although preservation could also result from practical constraint or incidental survival. A sacred attribution might restrict dismantling while justifying expenditure on repair; demand for recovered components might encourage disassembly while leaving an earlier identity irrelevant to subsequent use. These possibilities identify relationships for investigation. Retained fabric alone cannot establish which operated in a particular case.

The framework consequently organises explanation around three connected questions (Figure 5). First, what made an intervention possible, including the rights, skills, resources and existing configurations on which it depended? Second, how did those conditions shape the particular combination of retention, alteration and loss? Third, what possibilities and constraints did the resulting object or material create for subsequent actors? This sequence does not presume a single governing intention. Features retained for practical reasons could later acquire historical significance, while associations deliberately sustained by one intervention could be neglected or contested by later users. The comparative gain is to explain why continuity took a particular form under particular circumstances. Material properties matter through their relationship to tools, expertise and access; attributed identities matter through the practices and authority that sustained or challenged them. Outcomes may then reshape those relationships by making objects newly exchangeable, restricting their treatment or providing materials for further conversion. Selective continuity thus connects the reconstruction of interventions with the organisation of later possibilities. It provides a basis for research questions that compare how different arrangements of access, labour and valuation produced different combinations of persistence and change.

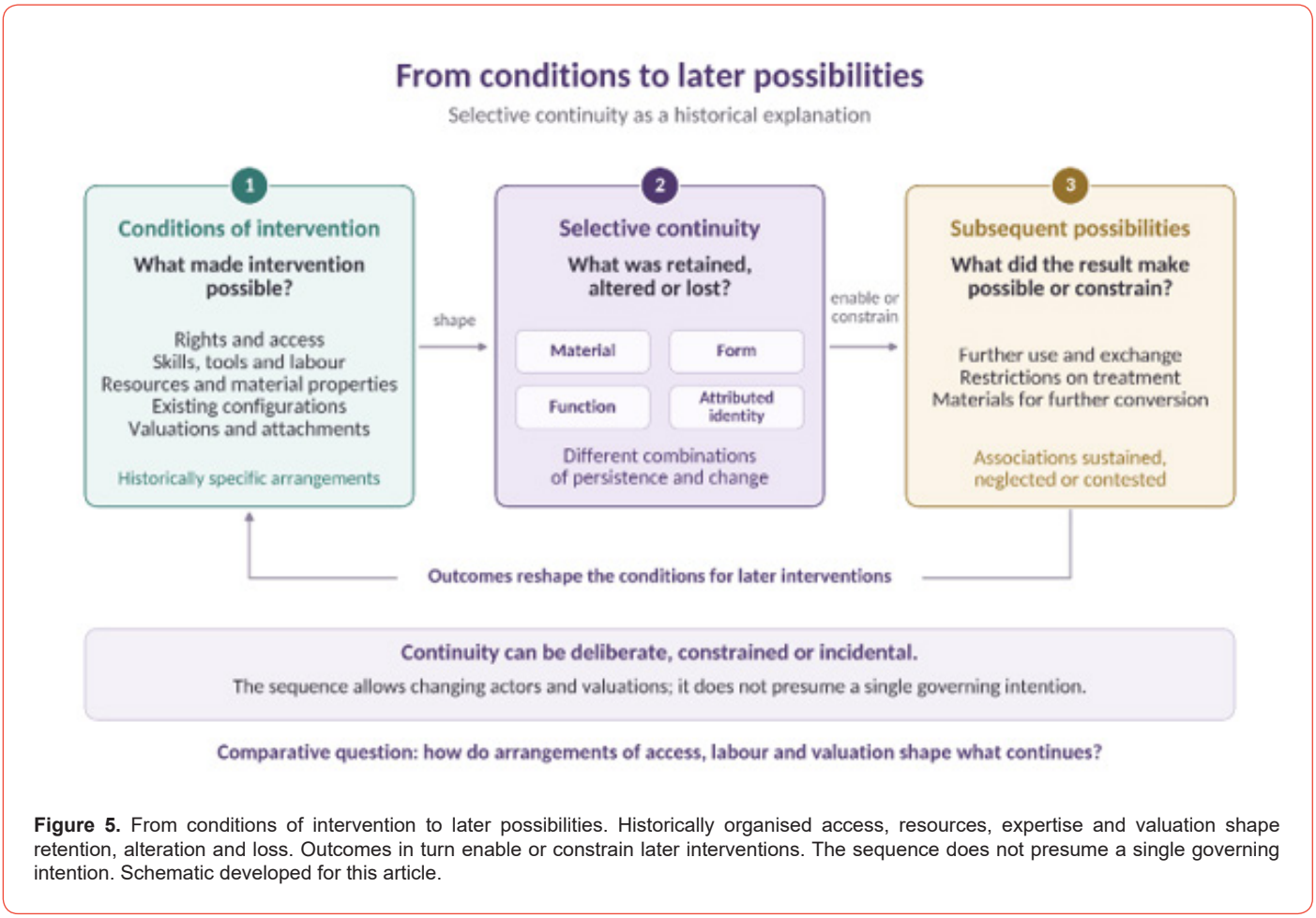


Figure 5. From conditions of intervention to later possibilities. Historically organised access, resources, expertise and valuation shape retention, alteration and loss. Outcomes in turn enable or constrain later interventions. The sequence does not presume a single governing intention. Schematic developed for this article.

Research Questions and Remaining Gaps

The principal challenge is to explain variation in reuse across settings while accounting for unequal opportunities to observe it. The preceding review identifies four connected priorities: establishing comparable chronologies and measures; reconstructing access to materials and expertise; investigating the grounds on which continuity was recognised; and connecting interventions with wider material flows and consequences. Together, these priorities turn selective continuity into a programme of comparative inquiry (Figure 6). They ask which arrangements produced particular combinations of persistence and change, what evidence could support that explanation, and which alternatives remain plausible.

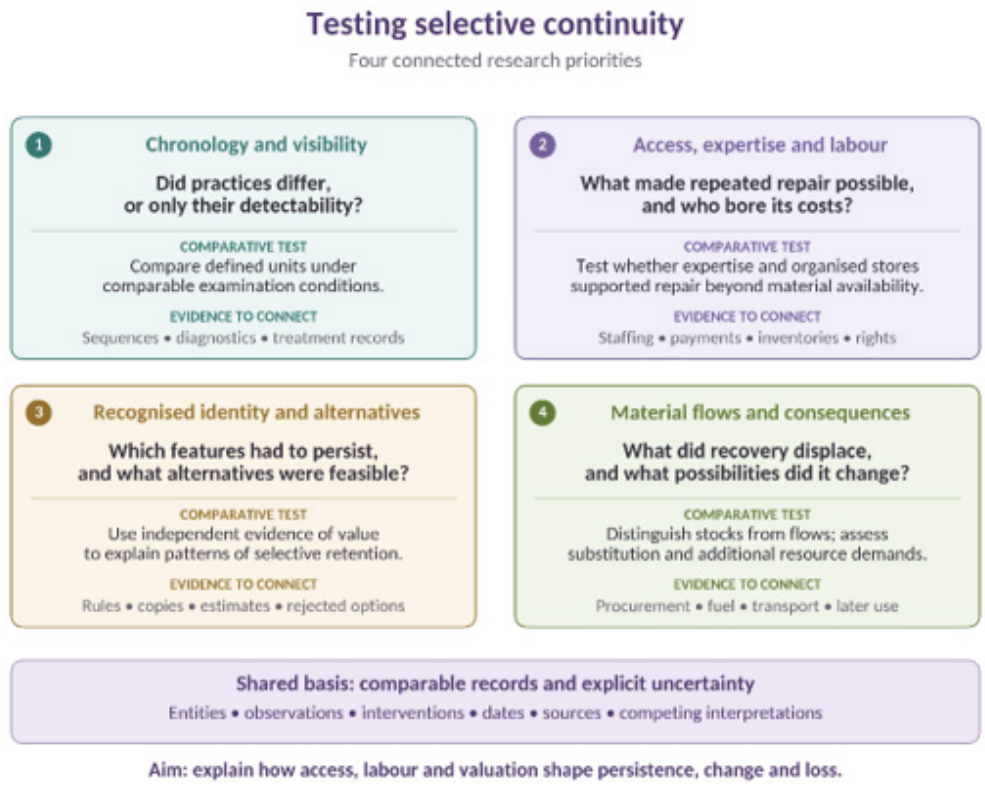


Figure 6. Comparative research priorities for selective continuity. Four lines of investigation connect questions with possible comparisons and relevant evidence. Shared records of entities, observations, interventions and uncertainty support cumulative testing. Schematic developed for this article.

Chronology and Visibility

The first priority is to distinguish variation in historical practice from variation in its archaeological or documentary visibility. Manufacture, initial incorporation, alteration and deposition require separate chronologies. The interval between an object's production and burial may encompass service, storage, abandonment and retrieval; it cannot automatically be treated as a continuous period of use [42,35]. Claims about longevity must therefore specify whether their evidence establishes material survival, intermittent availability or sustained service. The corresponding problem for prevalence is the choice of unit. Repaired vessels, manuscript fragments, quantities of recovered metal and years of service measure different phenomena. Several leaves from one manuscript may represent a single dismantling followed by multiple episodes of redistribution, making the number of surviving fragments an unreliable proxy for the number of interventions.

A stronger basis for comparison requires explicit records of how interventions were identified. Examined surfaces, diagnostic features, conservation effects and criteria distinguishing modification from manufacture should accompany the classification of an object as reused or repaired. Studies could then compare defined groups examined through comparable procedures and ask whether apparent differences persist after accounting for material, context and recording practice. Where opportunities for detection remain unknown, conclusions should concern the distribution of recognised traces rather than the prevalence of reuse as a whole.

Maintenance presents a particularly demanding test because successful upkeep may leave little evidence of discrete intervention. Cleaning, adjustment and protective storage can sustain service without producing the conspicuous traces associated with repair [67,68]. Connecting material examination with accounts of expenditure, inspection or custodial responsibility could reveal forms of continuity that object-based classifications underrepresent. The research gap thus concerns both the recovery of overlooked practices and the reconstruction of the conditions under which they become observable.

Access, Expertise and Labour

A second priority is to explain how surviving objects became accessible to people capable of intervening in them. Physical availability did not necessarily entail permission to dismantle, access to storage or transport, or the expertise required for conversion. Collection, sorting, assessment and preparation often preceded the operation visible in a finished object [64,26]. Reconstructing these activities requires distinguishing custodians, commissioners, intermediaries, workers and beneficiaries. Their relationships help explain why similar material resources could support different patterns of retention and transformation.

One proposition for comparative investigation is that sustained expertise and organised stores supported repeated repair beyond what the availability of old material alone would predict. Institutions with broadly comparable supplies but different arrangements for staffing, storage and payment offer one possible comparison. Changes within a single institution may provide another: did the appointment or loss of specialist workers coincide with changes in repair, replacement or procurement? Such associations would need to be assessed against competing explanations, including wealth, demand, object condition and the survival of records. The aim is to identify the contribution of organisational capacity to continued use.

Changes in rights provide a related line of inquiry. Seizure, institutional dissolution or market regulation may have increased circulation by altering access to existing resources. Transfer records, administrative discontinuities and subsequent procurement could help distinguish this mechanism from responses to material shortage. These comparisons must also identify how benefits and burdens were distributed. An institution's savings could depend on another community's dispossession, while extended service could require work imposed on dependants. Decision-making authority, remuneration and obligation therefore belong within the explanation of successful retention, rather than appearing only as its social context.

Recognised Identity and Available Alternatives

A third priority is to investigate which features historical actors treated as necessary to continuity. Where texts, rules or practices independently assign significance to a component, researchers can ask whether interventions preferentially retained it. Where recognition depended principally on form or institutional role, substantial material replacement might remain compatible with an enduring identity [17]. The crucial requirement is to separate evidence of valuation from the pattern it is invoked to explain. Survival cannot simultaneously serve as the sole proof of a feature's importance and the outcome attributed to that importance.

Comparisons can investigate these relationships by varying one aspect while keeping others sufficiently comparable. Similar objects held by different institutions may reveal the consequences of custody or regulation; different materials worked within one workshop may expose constraints of equipment and expertise. For texts and images, comparison between new copies and altered carriers can clarify when inherited content was sufficient and when a particular support remained consequential. Estimates, rejected repairs, prohibitions and abandoned attempts are especially valuable because they reveal options considered but not realised. Their interpretation must establish that an alternative was available under contemporary conditions: theoretical repairability does not demonstrate access to the necessary skills, resources or permission.

Regional and multilingual research should also test the categories through which these comparisons are made. South Asian and Japanese studies already challenge assumptions about bounded cultures, material integrity and recognised identity [13, 14]. Terms translated as repair, renewal or preservation may concern different entities, responsibilities and obligations. Establishing those relationships before treating the terms as equivalent may require revision of the proposed dimensions themselves. Wider comparison advances the framework when it tests its explanatory adequacy across different historical arrangements.

Object Histories, Material Flows and Consequences

A fourth priority is to connect particular interventions with systems of supply and consumption [2,43]. A repaired vessel, a scrap deposit and a mixed alloy provide evidence for different stages of material circulation. A stockpile establishes the presence of material at a particular moment; reconstructing a flow requires evidence about accumulation, processing and use over an identified period. Workshop contexts, procurement accounts, transport records and storage arrangements can help distinguish household retention from specialised recovery and market redistribution. Where processing removes identifiable predecessors, the inquiry must follow material assemblages and their supply relationships at the scale the evidence supports.

Environmental assessment adds the question of which feasible alternative an intervention displaced. Recovered metal might replace fresh supply, supplement it or enable additional consumption [101]. These possibilities imply different consequences, even where the proportion of recovered material is identical. Fuel requirements, transport, conversion losses and subsequent service must therefore enter the comparison wherever the sources permit. Quantification can clarify these relationships when its assumptions are supported. Where they are not, an explicit account of known demands and unresolved effects is more informative than a calculation of savings based on assumed substitution. A study may establish the retention of one resource while leaving its wider environmental consequences uncertain.

The consequences of intervention also extend to later possibilities of use and recognition. Dismantling releases components while dissolving an assembled configuration; recasting recovers metal while erasing inscriptions and joins; repair sustains service while potentially constraining subsequent alteration. These outcomes connect technical histories with changing relationships of memory, authority and access. Cumulative research therefore requires records that link components, observations, interventions, dates, sources and competing interpretations. Such documentation would allow propositions about expertise, rights and valuation

to be compared across cases while preserving uncertainty and evidence of loss. The central research objective is to explain how the conditions that enabled one continuity also created the possibilities and constraints confronting later actors.

Conclusion

Premodern reuse becomes historically explicable when continuity is treated as selective: materials, forms, functions and attributed identities could persist in different combinations through changing arrangements of access, labour and valuation. A manuscript leaf might survive the dissolution of its book; a sacred association might endure through remounting or concealment; recovered matter might remain in circulation after the objects that supplied it had lost their recognisable forms. Such outcomes require an account of what persisted, through which interventions and relationships, and with what consequences. Selectivity encompasses deliberate retention, practical constraint and incidental survival, without presuming a single intention governing an object's history.

This review has proposed a framework connecting three analytical decisions: the entity followed, the process reconstructed and the continuity claimed. Their alignment determines what an explanation can establish. The paired cases demonstrate that an inscribed support can acquire a new administrative function or carry an earlier personal association into commemoration; reassembled glass can retain fragments without restoring an earlier composition, while remelting can recover useful material properties after component forms disappear. These are different relationships between inherited features and later activities. Interdisciplinary comparison advances when one source or method qualifies, strengthens or challenges the propositions supported by another. A shared vocabulary serves this purpose when it makes differences in scale and evidential requirements explicit.

The framework also shifts explanation towards the conditions that enabled particular combinations of persistence and change. Material survival made some interventions possible, but access to expertise, organised stores, rights of disposal and judgements of value shaped which possibilities were realised. These relationships provide grounds for comparative research into the distribution and form of reuse. Investigating them requires attention to maintenance, rejected alternatives and materials exhausted through successive uses, alongside the conspicuous survivors that dominate many collections. It also requires the conditions of detection and documentation to remain visible, so that differences in surviving evidence are not mistaken for differences in historical practice.

The relevance of this inquiry to sustainability follows from its account of consequences. Extended use could conserve resources and sustain livelihoods while consuming energy, imposing labour or extinguishing another community's claims. The retention of one feature could depend on the loss of another, and the benefits of an intervention could change as objects passed between users and settings. Historical comparison makes these relationships available for scrutiny without assigning reuse an inherent environmental or moral value. The central question is therefore whose continuity an intervention sustained, through whose work and authority, and which future possibilities it enabled or foreclosed. Selective continuity connects the reconstruction of material processes with the explanation of value and power, making persistence itself a historical outcome to be investigated.

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Conflict of Interest

No Conflict of Interest.

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