Expertise
and insight
for the future

Ann-Cathrin Rothlind

Assessing Breakpoint Values in Conservation Decision-Making – for stewardship ethics managing change

Metropolia University of Applied Sciences

Master´s Degree

Master of Culture and Arts

Thesis

Date 17 May 2021

Tekijä Otsikko Sivumäärä Päiväys	Ann-Cathrin Rothlind Konservointipäätöksenteon katkaisupisteiden arviointi – kohti muutoksenhallinnan vastuullista hallinnointia 123 sivua + 6 liitettä 17 toukokuuta 2021
Tutkinto	Konservaattori, (Ylempi AMK)
Tutkinto-ohjelma	Konservoinnin tutkinto-ohjelma (YAMK)
Erikoistumisvaihtoehto	Taidekonservointi
Ohjaajat	Paula Niskanen, pääohjaaja Nina Robbins, pääluennoitsija

Puolen vuosisadan aikaisia maalauskokoelmahallinnon päätöksentekoprosesseja tarkasteltiin Ruotsissa sijaitsevan Skoklosterin linnan historiallisessa talomuseossa takautuvan tapaustutkimuksen ja kokeellisen tutkimusasetelman avuin, jossa Foucaultin laadullinen diskurssianalyysi suoritettiin konservointitiedon viitekehyksessä. Kirjallisista lähteistä koottuja diskurssisisältöjä analysoitiin vuosikymmenittäin vertailemalla näitä kokoelmakuntokartoitustietoihin. Konservointitapausesimerkkien avulla tutkittiin missä määrin konservointitietotaito heijastui ratkaiseviin arvoihin päätöksenteossa. Tapaustutkimus osoittaa konservointitieteen poikkitieteellisyyden olevan haaste päätöksenteolle. Historiallisissa talomuseoissa kankaalle maalatun taiteen kestävän konservoinnin turvaamiseksi tutkimus painottaa esineiden kuntotiedon jakamisen ja käytön merkitystä konservointipäätöksenteossa. Päätöksenteon tulee perustua esineiden merkityksellisyyttä vaurioittavien vahinkotekijöiden tunnistamiseen. Päätöksenteon tueksi suositellaan tutkimusasetelmien rakentamista todellisissa olosuhteissa, missä kuntoarvio-, vauriotekijä- sekä elämänkaaritekijätiedot voidaan harkinnallisesti jakaa konservointipäätöksenteon tueksi historiallisten talomuseoiden kokoelmahallinnoinnissa.

Avainsanat	Konservointi-restaurointi, hallinnointi, päätöksenteko, maalaus kankaalle, historiallinen talomuseo, aktiivinen konservointi, dokumentaatio, poikkitieteellinen

Author Title Number of Pages Date	Ann-Cathrin Rothlind Assessing Breakpoint Values in Conservation Decision-Making – for stewardship ethics managing change 123 pages + 6 appendices 17 May 2021
Degree	Master´s degree
Degree Programme	Master of Culture and Arts
Specialisation option	Paintings conservation
Instructors	Paula Niskanen, Project Manager Nina Robbins, Principal Lecturer

Half-century of decision-making processes managing a collection of paintings on canvas were studied in a historical case-study in the historic house museum setting of Skokloster Castle in Sweden. To investigate decision-making in retrospective, an experimental research design was set up by performing a Foucauldian qualitative discourse analysis in a conservation knowledge framework. Discourse content from written sources was analyzed decade vise together with quantified collection condition survey data. Conservation examples were used as a touchstone to discuss breakpoint values reflecting conservation knowledge in decision-making. The historical review shows the challenges in decision-making acknowledging the intrinsic interdisciplinary nature of conservation-restoration. For sustainable conservation-restoration of paintings on canvas housed in historic houses, the study underlines decisions rely on shared knowledge of primary documentation on damage functions affecting significance. Study settings designed in real-life conditions are recommended to support conclusions arrived at assessing state of preservation, damage functions present and life-expectancy for shared and discerned conservation-restoration decisions in historic house museum settings.

Key words	conservation-restoration, stewardship, decision-making, paintings on canvas, historic house museum, remedial conservation, documentation, interdisciplinary

Contents

“Alle Regeln sind gut und nothwendig. Es giebt aber Etwas, was über aller Regel schwebt, und das ist der feine Tact. Sein Wesen läβt sich nicht in Worten fassen; es wäre unnüβ, darüber zu reden. Glücklich der Mensch, welchem diese himmliche Gabe verlieβen ist; er weis es, daβ die Regeln nur eine subtile Mechanisierung sind – nuβliche Wegweiser bis dahin, wo Niemand mehr ihn leiten kann, als Er selbst”.

—Christian Phillip Koester (1784-1851), German painter and restorer

Prologue

The focus of the thesis is conservation-restoration (hereafter C-R) decision-making in retrospective, specifically assessing disciplinary conservation knowledge used in assessing conservation needs and actions managing a collection of paintings over a period of fifty years in a historic house museum setting. Formed as a public museum a new era in the historic stewardship of the collections housed within Skokloster Castle would begin. The change from domesticity to museal brought the building with its collections into the sphere of conservation where decision-making processes aim to maintain historical structures on a permanent basis with "The intention in conserving and restoring monuments…to safeguard them as no less than works of art than historical evidence" as formulated in the Venice Charter (ICOMOS 1965).

What will come is an introduction to the historical developments and background to the context of the historical case-study aimed to study the fulfilment of the intentions expressed in the Venice Charter and in relation to conservation theory and practice in a historical and present notion. The context of the historical case-study being safeguarding a collection of paintings housed in a historic building. In what follows is a short introduction into the special context of the study setting, the historical developments of and background to the change in mandatorship of Skokloster Castle.

Skokloster, the largest castle ever built by a private person in Sweden, was to stand a monument over time. As symbols for observation and measurement, to understand the cyclicity of planetary movements, and establish celestial coordinates in time and universe Field Marshal, Count Carl Gustav Wrangel (1613 – 1676) had the four towers of the castle decorated with armillary spheres. The oldest astronomical navigational instruments were positioned there for a reason. Time is present at Skokloster as a multilayer weave of Swedish, European, and global early modern history - a universe of ideas handed down by 13 generations following Wrangel. Carl Gustav Wrangel´s device expressed his desire for the eternal and divine originating from Ovid's metamorphoses, reappropriated in the 17th century book of emblems to: "**Non Est mortale quod opto" –** what I desire is not mortal pictured by Ganymede rising to the skies on the wings of an Eagle. The whole inscription quotes: **"Munde immunde vale, Est mortale quod opto,**

Sidera, sublimi vertice summa petam" – Take wing, my Soule, and mount up higher For, Earth, fulfills not my Desire (Rollenhagen 1615). Born at Skokloster estate as the son to the Baltic Field marshal Herman Wrangel (1587 – 1643), Carl Gustav Wrangel when proprietor of the estate erected his country house, Skokloster Castle, as a family estate for all future. As a Swedish statesman and military commander of Baltic German nobility he was the Lord of eight castles in Sweden, in Pomerania, where he was the Commander in Chief of Swedish Pomerania, and in Northern Germany. In 1644 he defeated the Danes at sea in the Battle of Fehmarn, leading the Swedish navy also in the Battle of the Sound 1658. In 1664 he was appointed Lord High Constable of Sweden and member of the Privy Council.

The social, cultural, and political relations and activities of Wrangel and the succeeding holders of the entailed property, established by Wrangel´s daughter Margareta Juliana Wrangel (1642 – 1701) in 1701, are manifested in the building architecture, interior furnishings and the mixed collection of fine art, weapons, textiles, scientific instruments, natural specimens, archives of letters and manuscripts, documents, and books in vast libraries. Awakening experiences of the sublime, the noble and the splendid, standing on the Lake Mälaren for future generations, Skokloster Castle had become a museum already in the 18th century. Historical developments would in the middle of the 20th century eventually steer the private property of Skokloster castle towards becoming a public museum. A new law regarding entailed estates was passed by the Swedish government 6th December 1963 (Kling, 1964). According to the law all fee-tailed private estates were to be dissolved after the last tenant-in-possession had died. For Skokloster Castle, widely acknowledged as a particularly noteworthy cultural property with valuable collections, preparations would begin for the acquisition of both the building and the collections housed within, to be acquired by the Swedish state (Bohman 1967).

Built, between the years 1654-1676, with more than 80 rooms, containing an international collection of 50, 000 objects, both the building envelope, as well as the collections needed restorative actions. On acquisition an expert board with museal, archival, and librarianship expertise would be assigned, in which a conservation committee would administrate conservation work (Edenman 1967). Experts appointed were: Board Chair Axel Rylander, Governor of Uppland, Vice Chairman and executive

delegate of the board, Åke Meyerson, Secretary-General of the governmental inquiry, MUS 65, Committee of Museum and Exhibition experts, Erik Reuterswärd, Director General for legal affairs, and Chair for the Royal Coin Cabinet, Boo von Malmborg, historian, genealogist and Senior Curator for Nationalmuseum, also keeper of the National Portrait Gallery of Gripsholm castle with the Royal Castles´ Collections, Sten G. Lindberg, First Librarian for the National Library of Sweden, Eric Hedqvist, Curator and Secretary for the MUS 65 investigation committee, and Curator Arne Losman. For the Collection of paintings plans had been made ahead by conservator Gunnar Schiller (1921 – 1982), Nationalmuseum, and director of the experimental training of conservators, Björn Hallström (1931 – 2001) at the Royal Institute of Art (Böttiger et al. 1980, 42). Hallström, consulted by the last proprietor in 1966, concluded in his report to the conservation committee the technical condition of the painting collection as generally poor, and continuously deteriorating. As a result, in 1967, Director General of Nationalmuseum, Carl Nordenfalk (1907 – 1992) would initiate a collaboration between Nationalmuseum (hereafter NM) and Royal Institute of Art with its Institute of Technology of Artistic Materials (hereafter ITAM). Hallström was assigned as head consultant for administering stately commissioned conservation of paintings initially under the flag of NM, later with the two institutions, NM and ITAM, as well as for ITAM only (Hallström, B. 1967, 1 – 2). On 1st of September 1967 work would begin with building restoration, conservation of textiles, weapons, paintings, furniture, and library inventories.

What follows is a study of the first five decades of managing the collection of paintings on canvas. The Skokloster Castle Collection comprises 1, 000 works of art of which 600 are portraits, the other 400, depict landscapes, still lives, history paintings, genre paintings, allegories, mythological motifs, and religious paintings. Seemingly untouched for centuries, the collection would grow through purchase, inheritance, gifts, and war booty. Of the 1,000 works of art 480 are painted on canvas representing materials and technique of easel painting typical for Northern Europe during the Early Modern era. The majority, 390 of the paintings on canvas, are from the 17th century. Twenty-one works were painted in the 18th century, sixty-three in the 19th century, and the remaining paintings were executed in the 16th and the 20th century. The decision-making processes considering C-R of the above mentioned collection of paintings on canvas is the object of study in this thesis and discussed here below.

1 Introduction

Through centuries “the careful and responsible management of something trusted in one´s care”, the definition of **stewardship**, has been the sustainable way to manage domestic concerns. Today the term stewardship, stemming from the 15th century, is promoted in preventive conservation of cultural heritage, but also in other areas of sustainable preservation of resources and assets (Merriam Webster 2020; Wikipedia, 2020). This tradition of stewardship ethics, a living tradition in managing family realms and country houses in the Early Modern period Europe and Sweden is a tradition worth to recall and re-activate managing change in historic house collections – today esteemed as national heritage.

Managing a collection of paintings in their original context, as in the case of Skokloster Castle – a historic house - time appears a dominant dimension. Here the sense of the past is evident both in the visitor experience and the heritage narrative. For conservators, museum curators and architectural preservationists, in their role as guardians of cultural heritage, the objective is to keep the structures and the artifacts intact as long as possible. In a philosophical notion this is working against time. In this introductory chapter the main objective of the study, the theoretical and methodological framework for the experimental study setting is presented after which previous studies into C-R decision-making are reviewed.

1.1 Main objective of the study

The overall objective of the study was to interrogate C-R decision-making in a retrospective analyzing the impact of decisions made on the state of preservation of the collection of paintings on canvas. The study design includes a time period of five decades which makes the case-study historical in its perspective. The historical case-study aimed to interrogate conservation theory insights of cultural heritage management – looking back in time interpreting and deconstructing C-R decisions starting from the acquisition of the building with its collections, overlooking the following five decades as a public museum managed by the Swedish state. The study is a critical exploration into decision-making in conservation-restoration as a process. The research question was initiated by

my personal experience assessing the condition of the collection of paintings known as being housed in a castle where the collections were exceptionally well preserved. After completion of the collection condition survey a revaluation needed to take place. Instead, another picture would appear in which the state of preservation of the collection was found to be of great concern. Archival sources and collegial discourses during the years would raise questions and bring forth many interesting aspects worth of studying, for example prevailing views considering the state of preservation of the paintings on canvas and adopted principles and methods of C-R but also disciplinary conflicting views upon causal relationships of damage functions present. The question is which phenomena perceived in paintings on canvas made the stakeholder representants decide to act. How was deterioration and damage assessed? Which principles were followed in order to preserve the authenticity of the works of art and which perceptions or views deterred decision-makers to act? In the latter case the question is whether decisions were based on C-R knowledge or were there other conflicting motifs such as ethical or economical views hindering decision making or was it just due to ignorance decisions were deferred or deterred?

These observations and the past decade of experience of conservation of the collections housed in the castle, and the many professional discussions would formulate the present research question aiming to explore how multidisciplinary cultural heritage professionals perceived, assessed, and consulted C-R needs considering preventive conservation needs in general, and remedial conservation and restoration needs in particular for safeguarding the newly acquired historical collection of paintings on canvas. The study was aimed to investigate which breakpoint values in the consulting process directed, deferred, or deterred C-R decisions. Next an overview of the theoretical framework of the study is presented.

1.2 The theoretical framework of the study

In this chapter I will present the theoretical framework of the thesis starting by defining the research question and positioning it within the field of Heritage conservation. The historical case-study set-up was designed to investigate the challenges of the theoretically interdisciplinary field of conservation, including the development and use of

disciplinary knowledge in C-R decision-making during the period of study. In an attempt to study the professional discourse in a science philosophical sense the study focused on heritage conservation as a modification process in time, in which the nature of relationship between value, representation, and conservation is assessed in a social dimension and in a conservation knowledge framework.

1.2.1 Heritage conservation – an interdisciplinary science managing change

This study lies at the core of Heritage conservation. The pivotal moment is theoretically positioned more precisely within the definition of the role of conservation, also described as a process in time, by Sarah Staniforth CBE in her Forbes Prize lecture:

> …conservation is to manage change, …preventive conservation measures slow down the rate of deterioration, but a point is reached at which so much change has occurred that the significance of an artifact is lost (Staniforth 2000, 6).

Staniforth points out the importance of preventive conservation measures, but eventually in time a point of no return is reached when conservation may need to become remedial. C-R decision-making requires gathering of information since conservation often includes several disciplines from the sciences and the humanities. Also, remedial conservation is always conditional. The decision-making process relies on the objectivity of the in-data, the evidence of the findings of the examination and assessment of needs results in conclusion to a diagnosis including the actions and measures arrived at to safeguard the significance of the artifact, that is meaningfulness: the quality of having historical, cultural, devotional, emotional, aesthetic, or symbolical value. By definition conservation becomes interdisciplinary involving subjects and objects, tangible and intangible values and phenomena, and this activity need to be maintained on a regular basis to manage change in relation to the past, present and the future.

The intersection of change marks the point of departure for the research question. It is the juncture where the state of preservation of an artifact is perceived, described, and understood as deteriorating affecting the tangible and intangible characteristics in an unacceptable way. This is when the conditional C-R actions and measures of heritage conservation professionals are expected to be considered to safeguard the significance

of the artifact to be transferred to future generations. As my study is a historical case-study it will be interpretative in the sense of investigating theoretical insights of how disciplinary knowledge in conservation was reflected upon in C-R decision-making processes. For conservation as a discipline and a science, the past fifty years have been a time of theory and practice development both internationally and nationally. Conservation today is defined as an applied science, but it is still the ontology (i.e., the study of what exists in reality), and the epistemology (i.e., how we create knowledge of what is) of C-R as a discipline and a profession, that makes meeting the strategic outcomes of conservation a challenge. Theoretically the C-R profession, represents the scientific and humanistic approaches guided by normative documents, professional guidelines, and ethics as well as established standards in the cultural heritage field. Contemporary conservation-restoration practice is affected by theoretical and ethical principles and by social factors. They are often discussed separately, but their effect on the processes of conservation-restoration is complex and intertwined (Belishki and Corr 2019, 89).

It was not until the years between the two world wars that conservation began its development as an academic discipline and profession. The first **International Congress for the Scientific Methods of the Examination and Preservation of Works of Art**, held in Rome 1930, defined the task for painting conservators for the first time as: “To preserve and to show to its best advantage every particle remaining of a painting” (Ruhemann 1963).

The international charters, as well as the founding of the International Institute of Conservation (IIC) in 1950 have been important landmarks in the development of 20th century conservation and its spectrum of ethical landmarks (Janis 2010, 45). Since the Athens Charter of 1931, not yet mentioning conservators, but architects and technicians, The Venice Charter of 1964 identifying conservation as a discipline, and the 1984 ICOM Definition of the conservator-restorer profession based upon the writings of Georg Sigmund Graf Adelmann in 1965, together with the latest European Confederation of Conservator-Restorers Organization´s (hereafter E.C.C.O.) Professional Guidelines of 2002 have defined the role of the conservator as we know it today (ICOMOS 1931; Graf Adelmann 1965; ICOMOS 1965; ICOM-CC 1984, E.C.C.O. 2002). Robyn Sloggett, in

her examination of the continued relevance of the ICOM-CC Definition of the C-R profession from 1984 concluded that: "…certain parts have been privileged in conservation theory and practice but remains a robust, effective and relevant document for contemporary and pluralist conservation practice "– regardless of the changes in the cultural heritage field (Sloggett 2014).

The activities of the conservator in the 1984 *Definition* are `technical examination, preservation, and C-R of cultural property´ (ICOM-CC 1984). Interestingly, the 1984 Definition in defining the `documentary quality of the historic object´ opens up for a broad understanding of the condition of the work – not precluding re-creation or documentation as satisfactory responses to issues raised by deterioration (Sloggett 2014). In 1964 the Article 4 of the Venice Charter emphasized the importance of continual maintenance, expressing the aims and objectives of conservation to be: "…an activity that will maintain a heritage asset on a permanent basis and that this can be facilitated in the case of monuments if a socially useful purpose can be found" (ICOMOS 1965). For the conservator, the E.C.C.O. 2002 definition states:

> …The Conservator-Restorer contributes to the **perception, appreciation and understanding of cultural heritage in respect of its environmental context and its significance and physical properties** (E.C.C.O. 2002).

In the E.C.C.O. definition the conservator-restorer is to contribute to the perception and understanding in respect of the physical properties, significance, and environmental context of cultural heritage. But the conservator does not act in solitude. Assessment in conservation is in fact, a process defined as causal analysis and resolution i.e., identifying and analyzing causes of degradation and other problems to take specific action, to arrest, retard or mitigate, the occurrence of phenomena (causes) from producing damage (effects). This process occurs only partly in the solitude of the conservator. Historically and today museal conservation is theoretically and ethically expected to contain stakeholder consultation, and as formulated in Article 2. in the Venice Charter: "The conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the study and safeguarding…heritage", stating the importance of involving all necessary specialists within the field of Heritage conservation (ICOMOS 1965). This call for interdisciplinarity

to safeguard cultural heritage brings forth the need for bridging knowledge in conservation in a process with both scientific and social dimensions – a heritage modification discourse.

1.2.2. Conservation, value, and representation

The aspects involved in assessing and evaluating change in cultural heritage have been described through a cyclic or linear process in time. For chemist Friedrich Cramer (1923 – 2003) these complex cyclic or linear interrelations in time are contained in the social dimensions of human interaction with artifacts and their value-laden properties. As a process, conservation can be viewed as a modifying process in time reflecting the aspects of durability and change in which heritage itself is contained – and due to the twofold structure of time durability and change are inseparable (Cramer 1994, 19 – 25). A similar process is presented by Joel Taylor and May Cassar in their model for the symbiotic relationship between conservation and value heritage in which heritage is seen as constantly adapting to its environment, surviving in the form that it does due to its `best fit´ with the qualities that are valued at that period of decision-making. The cyclic or linear interaction according to Taylor and Cassar is described as phases in figure 1. (see Figure 1. in chapter 1.2.2).

In the beginning of a cycle various agents of change affect valued elements of heritage – their use and representation. These changes in turn are perceived in various ways affecting conservation decisions by relating representation and intervention as a symbiotic relationship between conservation and value. What is perceived as a damage affects not just conservation decisions, they also affect object value, always providing an important context, which in turn influences not only what we have access to but the way in which we have access (Taylor and Cassar 2008, 4).

Joel Taylor pushed these interconnections further in suggesting that the embodied form – the `site´ is only heritage when those values are communicated – this way bringing in a third aspect, that of a discourse, where heritage values are by nature `discursive´, and the necessity of understanding the role of conservation as mediator of "…the message and the medium – and what might be possible in the future in terms of how value will be, and can be, embodied" (Taylor 2015). The aims and objectives for conservation defined

by Sarah Staniforth as `managing change…through negotiation…to secure the transfer of maximum significance from past to future for the benefit of all people everywhere´ (Staniforth 2002). Theoretically all the above definitions contain three common premises for conservation relevant in time: stewardship (management), communication (discourse), and significance (value).

Therefore, defining change in relation to value, significance, representation, and use becomes central in C-R decision-making. Historically conservation decisions have been made by stakeholders in collection management e.g., by boards of directors, curators, politicians, art historians, architects, technicians, or economists. The role of the conservator up until the early decades of the 20th century has mainly been the responsibility for carrying out the practical interventions, those being only one aspect of the field of conservation (Ashley-Smith 2016, 126). Depending on the institutional traditions of communicating perceptions of change, and the following expected or diagnosed impact on the significance of the painting have varied. Human perceptual processes are partly innate visual skills, evolutionary developed abilities, but they can also be learned and depend on knowledge. If this fact is to be transferred into a professional context it would imply conservators to see differently of those with another professional background. Helmut Leder reports on psychological studies in experimental aesthetics where art experts tended to look differently at paintings in comparison with lay persons. Art experts noticed compositional traits, whereas lay persons were more interested in recognizing the pictured objects and the relation of these to the known world (Leder 2002).

Training has proved to affect our way of perceiving in many other fields of expertise “whereas untrained viewers attend to denotative information, experienced viewers seem to capitalize on relational information in judging art” (Hekkert 1995). There are also indications of the benefit of familiarity or experience in reading artifacts, as has been proved by the “mere exposure”-hypothesis presented in 1968 by Zajonc who asserted an object shown more often due to its familiarity gained a more positive response by the experimental viewers (Hekkert 1995; Leder 2002, 10). Human perception contains complex mechanisms in rendering pictorial representations of two dimensional surfaces depicting three dimensional images.

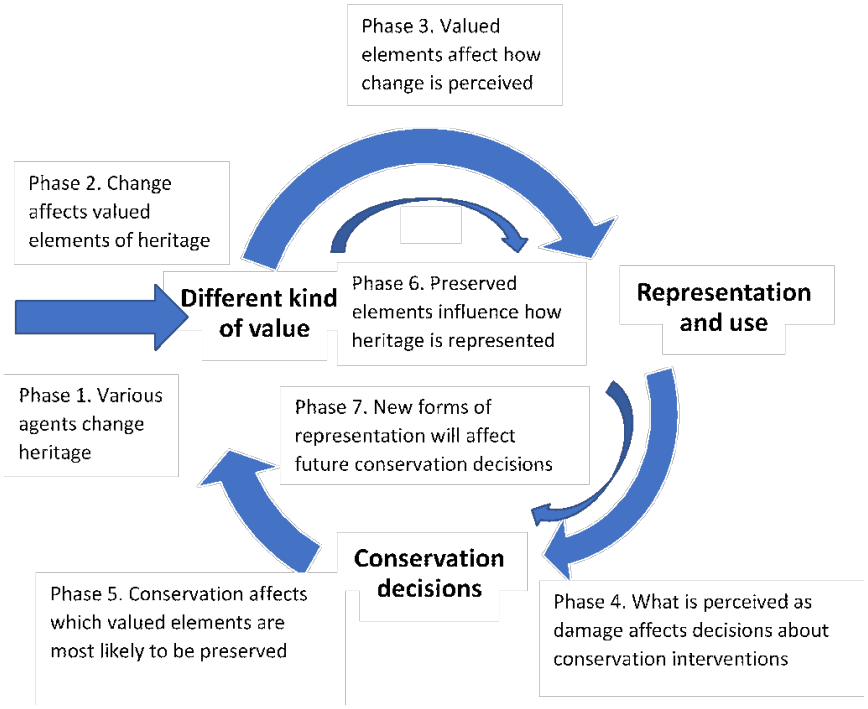


Figure 1 The relationship between value, conservation, and representation, which can be both cyclic and linear. Redrawn from Taylor and Cassar 2008.

Our neuropsychological ability to process light, surface structures, colors, contours, lines, rhythm into forms, symbols, picture stories etc. is far beyond the scope of this study. Instead, we need to consider how our perceptions are connected to C-R knowledge and the consultation process for communicating information regarding findings indicating unacceptable change.

In theory our perceptions of deterioration caused by various agents of change is related to experience. The evaluation of value and significance is in turn dependent on our knowledge of the world. In science these abilities are defined as hermeneutic constructivism. The philosophical orientation studying these phenomena is called hermeneutics aiming to understand hidden meanings of e.g., language in texts, practices created in constructivism that is in our process of creating knowledge through the interplay between the subject and the object where the subject constructs the reality (Moon and Blackman 2014). In the following chapter our relation to disciplinary

knowledge and expertise in conservation theory and practice is discussed from a philosophical point of view.

1.2.3 The challenge of the interdisciplinary nature of Heritage conservation

Conservation theory and practice requires cooperation between specialists due to its ontology and epistemology in diverse disciplinary backgrounds – those of the natural sciences and the humanities. Professional guidelines for conservators provide directives but do not inform of practice. The guidance given in normative documents, professional guidelines, and ethics is concerned with respecting the authenticity of cultural heritage. Theoretically authenticity as a concept in conservation is complex being dimensional and relational, but as proposed by David A. Scott it can be considered to have three foundations: the material, the historical, and the conceptual. Scott supposes the participating stakeholders representing several different fields when assessing authenticity result in the development of a fragmented, performative, and congested discourse (Scott 2015, 303). Previous research has identified conservation decision-making as a challenge and a source of conflict. Problems may relate to the maturing of the still very young discipline, or the consequence of being interdisciplinary. For Heritage conservation the interdisciplinary question to answer making a C-R decision is how we define change. The fact that damage is observer- and context-dependent, and not all measurable change is relevant to a particular user, would according to Jonathan Ashley-Smith indicate that selection of the relevant stakeholder group in the definition of the value function is crucial (Ashley-Smith 1995). The problems of sharing views have been discussed extensively in a theoretical or philosophical sense during the history of C-R but more extensively during the 20th century by several writers as the development of the conservation discipline has evolved as an academic science. An interesting historical overview has been written on the theme by Ségolène Bergeon Langle who identifies "…Controversy as a failure in the exchange of knowledge, whether because the levels of the protagonists are too disparate or because one side sees rupture as a strategy of gaining power" (Bergeon Langle 2001). During the 1994 Dahlem workshop Mary Orna, rapporteur for the group, commented on conflicting viewpoints within participating cultural heritage scientists discussing durability in artifacts:

> …they promoted vigorous expression of opposing positions, sometimes with more passion than clarity", raising the awareness of "deeply ingrained differences in epistemology, scientific, and scholarly language…not easily overcome (Orna et al. 1994, 52).

Stefan Michalski approaches the same issue considering the challenges in sharing conservation decisions from a philosophical and psychological point of view – defining our innate ways of perceiving, evaluating, and forming our views of the world through words as a decisive factor for success or failure (Michalski 1994). Joel Taylor asserts influential preservation doctrines to be as much a product of the context and practical situations as they are products of different philosophies and cultures reflected in the discourse related to cultural heritage – involving a good deal of abstraction (Taylor 2015). In this sense language as discourses contribute centrally to producing the subjects we are, and the objects we can know something about (including ourselves as subjects).

The question is which locus of interest would need to be prioritized from within academia considering the divide of the scientific and the humanist view – is a synthesis possible through the exchange of knowledge, or by creating a dialogue between related fields to fill existing knowledge gaps? Which are the consequences of Heritage conservation being interdisciplinary by definition. To which extent are we applying theories from different disciplines as tools or are we assessing change with reference to multi-disciplinary skills, experience, and knowledge remaining within our own disciplinary knowledge framework? Are there other perceptions present in decision-making that direct, defer or deter integrating knowledge from different disciplines? In my work I will refer to the theories in hermeneutics of the German philosopher Hans-Georg Gadamer (1900 – 2002). Language, in the hermeneutic constructivism of Gadamer, provides the means to understand how disciplinary knowledge was used and reflected upon in a timely continuum of multidisciplinary interactions making C-R decisions. For us as contextual subjects of knowledge scholarly language are the means of consulting decision-making – our language reflects our thinking and actions in symbolic interaction —" language has its true being only in dialogue, in coming to an understanding" (Gadamer 1989, 443).

For this study I found a recently published paper by Johannes Persson, Henrik Thorén and Lennart Olsson as important staking out a new and extremely interesting field of philosophy – that of interdisciplinarity. In their article they define, as they state themselves, probably for the first time: **the interdisciplinary decision problem** discussing it through the ontological and epistemological differences in sciences by referring to Popperian optimism and Kuhnian pessimism (Persson et al. 2018)**.** The following presentation is very brief based on the work of Persson et al. on the interdisciplinary decision problem.

Table 1 The interdisciplinary decision problem (Persson et al. 2018)

	Incompatible epistemologies and ontologies	**Compatible epistemologies and ontologies**
Kuhnian pessimism: Perceiving barrier to integration	**"true positive"**	**Popperian risk of being unable to solve cross cutting problems (Type II error)**
Popperian optimism: Not perceiving barrier to integration	**Kuhnian risk of destroying well-functioning discipline (Type I error)**	**"true negative"**

Represented in Table 1 **The interdisciplinary decision problem** (chapter 1.2.3), by a 2 x 2 matrix the problem with two options and states, describing options and states with benefits and risks the potential outcomes of entering an interdisciplinary collaboration is shown to be dependent upon in which spirit the parts enter the options: one being the Popperian optimism of the Austrian-British philosopher Karl Popper (1902 – 1994). Popper explained historical reasons and administrative convenience, and partly the tendency of theories to grow into unified systems to be the explanation of the division into disciplines:

> But all this classification and distinction is a comparatively unimportant and superficial affair. We are not students of some subject matter but students of problems. And problems may cut right across the borders of any subject matter or discipline. (Popper 1963, 88)

The American philosopher Thomas Kuhn (1922 – 1996) on the other side writes as interpreted by Persson et al. from the view of natural sciences promoting firm disciplinary borders for researchers not to lose their academic or scientific identity.

The interdisciplinary problem builds on the distinction between Type I and Type II errors in science e.g., it is important to avoid implying that there is a causal link where there is none (Type I error), and for a decision-maker it is often more important not to overlook a causal link when there is one (Type II error). In the interdisciplinary decision problem model Kuhnian risk mimics Type I and the Popperian risk mimics Type II (Persson et al., 2018). For future development of interdisciplinary sciences, the risks and benefits depend on the strategies taken – if one science is Popperian and the other Kuhnian. As Persson et. al conclude the Popperian risk is that we are not able to solve problems that cut right across the borders of any subject matter or discipline – missing opportunities. The Popperian approach being beneficial if the sciences involved are Popperian, giving rise to Kuhnian risk in case of being mature sciences with strict disciplinary matrices described by Kuhn. In their conclusion Persson et al. find it possible for interdisciplinary science to progress if we avoid being too disciplined by disciplines:

> …interdisciplinary science may not (citing Popper) flourish if science becomes the exclusive possession of a closed set of specialists´ (Persson et al. 2018).

Similar paths of thought are to be traced in Gadamer´s description of the hermeneutic phenomenon which he actually does not see a problem of method at all – yet it too is concerned with knowledge and truth. Texts are not only understood in tradition where insights are acquired, and truths known and even within the sciences the phenomenon of understanding has an independent validity in science it also pervades all human relations to the world. With Gadamer the concept of knowledge within C-R and the concept of truth and the phenomenon of understanding seem to be possible to seek only to some extent within science through the scientific method:

> …human sciences are connected to modes of experience that lie outside science: with the experiences of philosophy, of art, and of history itself. These are all modes of experience in which a truth is communicated that cannot be verified by the methodological means proper to science (Gadamer 1989, XX-XXI).

Hence, truth is communicated in discourse as the embodiment of the interdisciplinary decision problem in paintings conservation. For my thesis, the theories of The Three Worlds by Karl Popper support the views of Gadamer. In Poppers theory the world of physical states and processes are accommodated in word 1, and the mental world of psychological processes belongs to world 2, hence knowledge, the ontology of the products of human mind and culture are seen as evolutionary products belonging to world 3. For Popper works of art and knowledge are "intellectual products" shaping our environment as languages; myths; ideas and scientific theories; art works, songs, and stories about the world in which we live. In an evolutionary context they must be viewed instrumentally, as exosomatic artefacts. "Chief amongst them is knowledge…in the objective or impersonal sense, in which it may be said to be contained in a book; or stored in a library; or taught in a university (Popper 1979, 286; 1980, 144).

In the light of science philosophical theories of both Gadamer and Popper the role of language is emphasized in creating knowledge, transferring our relation to our traditions, and the world of cultural heritage that reflects what persists in objects but also what changes in things. One of the relativities embraced by language´s relation to the world is the world of objects that science knows, and from which it derives its objectivity. For this Gadamer presents the concept of "being-in-itself", the character of a determination of the will, and what exists in itself is independent of one's own willing and imagining. This position of being-in-itself allows use of it for one´s own purposes – the Greek concept of kath' hauto, meaning primarily the ontological difference between the essence of what can exist in it and what is subject to change, and its entity in its substance. In the sense of modern science what exists is determined as certain knowledge which permits us to control things:

> The certified facts are like the object (Gegenstand) and its resistance (Widerstand) in that one has to reckon with them**. What exists in itself, then…is relative to a particular way of knowing and willing** (Gadamer 2004).

It is this philosophical phenomena - the relativities embraced by language's relation to the world, and especially the language used by conservators which is problematized in critical contemporary conservation theory presented by Salvador Muňos Viňas. Decision-making is perceived as subjective within the field of conservation, and therefore criticized by Salvador Muňos Viňas who considers the qualitative evaluation and the notion of damage to be subjective in nature. According to Muňos Viňas this applies for all conservators´ actions: risk assessment, diagnosis and following interventions are subjective 'acts of taste' influencing the notion that the conservator has about the object's 'true nature', and the decisions he/she will make in order to 're-create that condition in a given way' (Muñoz-Viñas 2005, 107-108). Here we have to note that for Muñoz-Viñas there exists no "being-in-itself" in objects – only our relative way of knowing.

Referring to studies in the field of psychology the reasoning in conservation has been deemed to be cognitively biased, casuistic, intuitive as reported by Marçal et al., but still general ethical rules, reflexive, and casuistic thinking are considered as useful tools for conservators emphasizing the role of developing the biography of the artwork (Marçal et al. 2014). Another position is presented by Jonathan Ashley-Smith considering the critical hands-off trend of today in managing change in Heritage conservation. Concerned about the expansion of preventive approaches into the curriculum and the workplace knock-on effect on the development and maintenance of skills he considers there in that context is a slow drift in the interpretation of ethical guidance, leading to a conservative view of what can or should be achieved - a drift that may be a sign of purposeful progress or it may merely result from aimless indifference. Therefore, he would propose bespoke ethics where:

> In either case it may be possible to manage the rate of change by encouraging individuals to express in detail their personal ethical beliefs, rather than relying on shifting interpretations of general ethical principles (Ashley-Smith 2018, 6).

Ethical considerations are interpretative mainly due to the many different qualities of attributes defining the object which are not easily put in a hierarchical order to be respected or weighed against each other, nor communicated in making decisions. As Ashley-Smith sates, however, the regulation of conservation, in as much as it deals with

interventive treatment, is quite weak and is based almost exclusively on the interpretation of (deliberately) generic principles, continuing on conservation undergoing both regulatory and ethical drift, where the direction of the drift is towards a hands-off approach to conservation problems (Ashley-Smith, 2018, 11). In the light of this drift the antagonistic, critical discourse in conservation need to be reflected upon, since the general ethical principles lay the foundation for the discipline – at the same time realizing that all human actions on objects, in relation to individuals, societies and the world always are deemed subjective hence, subjectivity is not a unique specific phenomena present in C-R only but in all scientific disciplines, and all human actions. The subjectivity present is also challenged by time in the transfer of meanings i.e., re-definitions of heritage values, scientific knowledge within the multidisciplinary field of cultural heritage preservation, and the roles and authority structures of the professionals responsible for intervention decisions. What remains unchanged in science is the use of language in seeking the truth by method.

In Gadamer´s writings a dynamics is expressed, that between knowledge as a means for controlling things and what exists in itself independent of our willing and imagining. A similar division in a controlled existence "in itself" as expressed by Gadamer is to be found in Karl Popper´s growth-promoting theory on the causal evolution of knowledge, which he represented by means of a tetradic schema (Popper 1979, 287):

P1→TT→EE→P2.P1→TT→EE→P2.

Here "P1" stands for the "initial problem"; "*TT*" stands for "tentative theory" designed to solve it, "*EE*" stands for "attempts at error-elimination", and "P2P2" represents further problems that arise out of the critical process. The subjective sense of knowledge, belonging to Poppers world 2 relates to psychological processes and states, mental dispositions, beliefs, and expectations, generically termed "thought processes". In the objective sense knowledge, by contrast, consists not of thought processes but of thought contents, that is to say, the content of propositionalized theories where the objective thought content is that which: "…remains invariant in a reasonably good translation" (Popper 1980, 156)

1.2.4 The knowledge framework of C-R

What then is the knowledge framework of conservation-restoration? Is it compiled of all sciences relevant for "knowingness" to make discerned C-R decisions in the management of cultural heritage? How have C-R decisions been communicated in the knowledge framework of C-R if it exists? Was there one identified and referred to by those participating in the negotiation process? By whom were the decisions made and how were they motivated? These questions have relevance for our understanding of our actions and measures in relation to our cultural heritage. In the above discussion overlooking the theoretical framework of this study the challenge of interdisciplinarity in Heritage conservation may limit the sustainable development of different ways of knowing within academia. Anne Toomey et al. propose different disciplinary ideas and methods to be used as tools, an approach that can result in novel, unexpected answers to familiar, timeworn questions. This way of engaging directly with the production and use of knowledge outside the academy is the realm of transdisciplinary work bridging the divides within academia. Whereas multidisciplinary drawing knowledge from different disciplines usually stays within their boundaries – interdisciplinarity analyzes and synthetizes, being:

> "…an integrated approach to answering a question that recognizes the limitations inherent in the compartmentalized system of academic research…the ultimate aims of interdisciplinary research can either be theoretical (towards the consilience of knowledge) or practical (providing solutions for society (Toomey et al. 2015).

To study C-R decision-making as part of a process described as cyclic or linear in time the historical interventions and decisions made needed a knowledge framework enabling assessment of the language and knowledge used in defining and describing as well as delivering remedy to the perceived changes in paintings requiring an intervention. For theories of the role of language I used Hans-Georg Gadamer´s and Michel Foucault`s (1926 – 1984) theories. The rationale for using a qualitative method, informed by and consistent with the work of Michel Foucault was to interrogate decision-making from Foucault´s theoretical framework as a history of 'focal points of experience' which he studied along three axes: **the axis of knowledge**, the rules that govern discursive practices that determine what is true or false; **the axis of power**, or the rationalities by

which one governs the conduct of others; **and the axis of ethics**, or the practices through which an individual constitutes itself as a subject (Arribas-Allyon and Walkerdine 2017, 111). The `focal points of experience´ are congruent with the factors of interest for the study: the theoretical knowledge framework of C-R, social aspects of disciplinary roles, and ethical factors considering the safeguarding of significance and authenticity. Discourse for Foucault approximates the concept of 'discipline' in two ways: it specifies the kind of institutional partitioning of knowledge we find in medicine, science, biology, etc. referring to techniques and practices through which objects, concepts, and strategies are formed. In 'The Order of Discourse', Foucault asserts the hypothesis:

> I am supposing that in every society the production of discourse is at once controlled, selected, organized, and redistributed according to a certain number of procedures, whose role is to avert its powers and its dangers, to cope with chance event, to evade its ponderous, awesome materiality (Foucault 1972, 216).

For my experimental study design, I found the concept map for the C-R decision-making process launched by the E.C.C.O. working group in 2011 as fit for this very special purpose of visualizing the framework of knowledge present in the processes of decision-making. Firsthand developed for evaluating competences necessary for conservation-restoration presented in a concept map form, this visualized concept map, a theoretical and conceptual framework of knowledge within academia enabled visual orientation in the complex multivariate and multivalued environment of the C-R field of knowledge and practice (Corr et al. 2011). The concept map encompasses the activities, aims, and objectives of C-R in a flow chart form, reflecting broadly accepted policies and operations to reach direct output and strategic outcome (Hutchings 2011).

The interconnected actions form a central spine - the C-R decision-making process (see Figure 2. Central spine of C-R process, chapter 1.2.4.). The spine represents the order of actions and measures indicating actions necessary for taking the following steps. For conservation purposes the concept map allows recognition of operations regardless of the field of specialization, also acknowledging areas necessary for broad professional assessment – areas included in consulting both the natural sciences and the humanities as well as stakeholder interests. The whole concept map contains built in hierarchies aiding the identification of the links between different concepts in an intellectually robust

taxonomy of knowledge and skill (Hutchings 2011, 13 – 18). For the Knowledge and skills map for an experienced Conservator-Restorer please, see Appendix 6.

The C-R process contains the decision-making narrative in which the assessment challenge for why, what and for whom conservation is done resides. The complete framework, the expanded model of the C-R process comprises besides the central spine the knowledge framework of C-R also the processes of collecting objective scientific data for analysis from the diverse disciplinary fields of physics, chemistry, biology, art history, architecture, history, aesthetics, ethics, economy, politics, legislation etc. Collecting data is partly collaborative requiring peer or collegial consultation and negotiation (E.C.C.O. 2011).

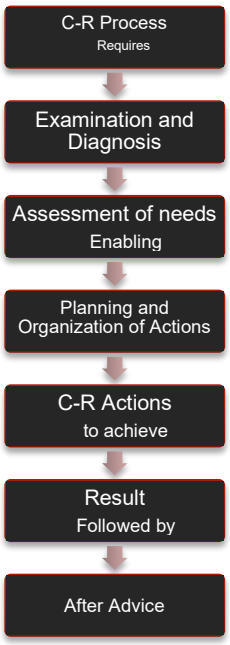


Figure 2 Central spine of C-R process.

In the concept map knowledge is calibrated to a schema based on taxonomy theories of five levels of necessary knowledge and the expertise requirements of the profession. Representing concepts that are linked together to form propositions symbolizing the ‘‘negotiated significance’’ between the different facets of C-R, these propositions visualize areas of knowledge needing consideration when making informed decisions

indicating at different levels of experience the skills necessary for completing the tasks necessary (Hutchings 2011, 14). By forming the C-R decision-making narrative the concept map: …“illustrates the centrality of the conservator and by extension C-R knowledge and skills to decision-making and management of cultural heritage” (Belishki and Corr 2019, 96). Visualizing seemed an interesting option for the analysis of knowledge areas present in decision-making, hence, the concept map applied in the case-study as a conservation knowledge framework was used as a `key´ – as a method of analysis for interrogating knowledge taxonomy and skills in consulting C-R decisions using the theoretical framework of a Foucauldian qualitative discourse analysis (hereafter FDA) for deconstructing the expert discourses presented here below.

The study aimed to interrogate how change caused by damage functions in paintings on canvas was reflected upon in decision-making and how the decisions made affected the state of preservation assessed through collection condition surveys on collection level. The study aimed also to gain an understanding of the challenges in C-R decision-making as an interdisciplinary process. On collection level the study aimed to review the impact of decision-making processes on the current and future significance of the collection of paintings on canvas in time.

Focusing mainly on 17th and 18th century oil paintings on canvas housed in a historic house museum setting change by natural ageing, damage functions, and by foreign hand in oil paintings on canvas is explained. To provide C-R credibility as a scientific discipline systematic records of actions and measures on culture heritage have been developed. The method of examination in conservation is called documentation, and the product of the documentation process, a written and pictorial report, on object, or collection level, is referred to as a condition report, or collection condition survey, respectively. The main purpose of documentation in conservation is to provide a record, or as the term itself is defined as: documentary evidence or proof. The etymological root from the Latin word "docere" can be distinguished as: the message (e.g., enumeration of facts, objective statement of fact or event) and the evidence (e.g., as an argument or complex argument) (Merriam-Webster 2021). Documentation is hereby referred to as a carrier of information and as proof relying on objective assessment of facts compiled as a condition report containing documentation in written and pictorial format describing the construction, the

nature, extent, and location of the damages present. For documentation to be sound criteria for necessary interdisciplinary communicability need to include an open language explaining damage phenomena and the presumed causes descriptively using technical language systematically and explanatorily but restrictively to ensure accessibility and accountability (Schiessl 1994).

Defining and evaluating change by documentation of the state of preservation by condition reporting or by compiling collection condition surveys aim to evaluate rate of change and the effects of change on use-value, function, and significance. In this study the interdisciplinary nature of C-R decision-making reflected in professional perceptions as well as the role of expertise in consulting was investigated. In a broader sense the case-study was an attempt to assess the use of conservation knowledge in decision-making processes with a special focus on **breakpoint values** in decision-making. Breakpoint value as a concept is in this study understood as a point of discontinuity, change, or cessation, condition etc., at which discussions can no longer continue because people cannot agree on the basis of disciplinary knowledge regarding the damage (change) occurred. The hypothesis of the study is that breakpoint values may indicate the presence of an inter-disciplinary decision problem directing or deterring C-R decision-making (for a complete list of definitions used in the thesis, please see Appendix 5).

1.2.5 Key concepts of the study

In this thesis heritage **conservation** is used as defined by ICOM-CC, that is: "…all measures, and actions aimed at safeguarding tangible cultural heritage while ensuring its accessibility to present and future generations. Conservation embraces **preventive conservation, remedial conservation,** and **restoration** (ICOM-CC 2008/2017). The term conservation serves as an `umbrella term´ for all three: preventive and remedial conservation and restoration, that is all the measures and actions on tangible cultural heritage (Antomarchi et al. 2008). In this study the definition of the actions and measures is mainly identified according to the following criteria considering the aim of mainly addressing remedial conservation, that is current and future deterioration, their indirect and direct impact on the materials and structure of cultural heritage items as a group of

items resulting in modifying their appearance. The C-R decision-making process includes **documentation** used in the study as defined in **conservation** as a method of examination, a carrier of information and as proof relying on objective assessment of facts compiled as a condition report containing documentation in written and pictorial format describing the construction, the nature, extent, and location of the damages present. **Documentation** is a fundamental activity preliminary to, during and after any **conservation** actions or measures.

The term **historical case study** refers to a longitudinal case-study or a retrospective case-study. The study setting is defined as **historic house museum** setting, where I use the concept of **historic house museum** in the meaning of historic furnishings displayed in a way that reflects their original placement and usage containing a collection of the traces of memory, belongings and objects of the people who once lived in a **historic house** transformed into a museum.

In this study parameters to describe system performance i.e., **change** will be used. To describe graceful deterioration, the description of **change caused by normal ageing** is used. According to the definition by IIC where functions of **unacceptable change**, dependent on **agents of change**, which in turn implies a value-based decision needs to be applied to the analytically determinable change i.e., empirically derived **rate of change** (deterioration). Main potential categories of deterioration factors of agents present in a historic house setting will be used, These are **physical, chemical**, or **biological** that may act on a cultural heritage object singly or in co-associations that are synergistic, antagonistic, or independent, and are defined as **damage functions**, also called **agents of change**. When referring to change caused by Man the term of **change by foreign hand** is used to indicate actions and measures related to the C-R history of the painting on canvas.

When evaluating the **use-value** or cultural **significance** these terms are used in the meaning of expressing the aesthetic, historic, scientific, or social value for past, present, and future generations. The **use-value** may compete and change over time and have different meanings for different stakeholders being direct or indirect also involving economic aspects as e.g., exhibits.

For describing the overall evaluation of the careful and responsible management of something trusted in one´s care during time of office I use the term **stewardship** approximating the sustainable way to manage domestic concerns, and in this study managing a collection of paintings on canvas. The latter type of object, **painting on canvas** is firsthand possible more specifically to define as physical objects that is a unique object of art, painted on a canvas with a preparation layer upon which one or more layers of pigmented oil binding media have been applied covering the picture support, and which derives primarily its significance by having been painted by a person. The attributes of paintings on canvas, and their metaphysical characteristics can be defined more specifically in their physical material and conceptual form, the individual style of the artist and the content of the message and modality – all aspects giving different degrees of significance to the **painting on canvas**.

In the analysis of decision-making in the E.C.C.O. competence map, which reflects the knowledge and skills framework for C-R the word **concept** refers sometimes to semantic units or units of meaning in the graphical approach of organizing and visualizing areas of interrelated knowledge. Two or more concepts are connected, forming propositions visualizing interrelated areas of knowledge. To refer to institutionalized patterns of knowledge that govern the formation of subjectivity the term **discourse** is used.

1.3 Methods

Deconstructing historical discourses containing decision-making processes in managing collections required access to written documentation of decision-making processes. In many cases finding relevant documentation may be difficult looking far back in time. Skokloster Castle, housing rich object collections of high quality had for long occupied a special position as cultural heritage, hence, plans for the acquisition, and the process of becoming a museum had begun several years before the acquisition date. A thorough documentation of the quality of the collections and their state of preservation had been made in which the costs for conserving the paintings collection was estimated to 1, 2 million Swedish Krona (Edenman 1967, 6). Activities of the first decade were extensive after which state funded restorative campaigns would decline. Over the decades

collection management activities have been documented in many different forms, and it is this material that has been the source of data for my research.

1.3.1 Historical case-study method

To have an in-depth understanding of the decision-making-processes historical case study was chosen as a research method. The method is known as suitable for addressing questions related to change, continuity, development, and evolution concerned with the way, especially language, has developed and evolved through time. In my theoretical review language was identified as the main means to study C-R decision-making processes, and a study in retrospective overlooking five decades a historical case-study- method was chosen as a research strategy. Encouraged by Gadamer who in his main work **Truth and Method** asserts it to be true that in whatever tradition we consider the historical "worlds" succeeding one another in time to be different if compared from the world today or the ones passed the world is always a human world presented to us as verbally constituted, and:

> ...as verbally constituted, every such world is of itself always open to every possible insight and hence to every expansion of its own world picture and is accordingly available to others (Gadamer 1989, 444).

As an experimental both in a theoretical and empirical sense the aim of the retrospective case-study was to investigate the kaleidoscopic (i.e., constantly changing, or fragmentized) nature of the knowledge base of C-R decision-making processes in the historic house museum setting managing a collection of paintings on canvas overlooking a time period of five decades.

1.3.2 Qualitative discourse analysis in a C-R knowledge framework

Acknowledgement of `subjectivity´ in decision-making is a central element in constructing a methodological tool for tracing knowledge and power – the workings of `positivity´ in discourse according to Michel Foucault (Graham 2005). The Foucauldian discourse analysis (hereafter FDA) is applicable to any context or setting as long as it contains a historic sensitivity towards the objects and problems investigated – especially suitable for expert discourse and interaction (Arribas-Allyon and Walkerdine 2017, 114). For

Foucault discourse provides a set of explanations of the local and heterogeneous subject positions within discourse and power. That subjects occupy 'positions' within discourse means we can only write, speak or think about a social object or practice in specific ways within a given historical period thereby positioning FDA within the philosophical tradition of hermeneutics being at the same time critical. Choosing the FDA seemed theoretically promising to expose the multidisciplinary professional discourse in combination with the historical case-study research design for the interpretation of the historical conditions for conservation knowledge usage in remedial C-R decision-making. Using a qualitative discourse analysis method, informed and consistent with the work of Michel Foucault, allowed exploration and analysis of communication of conservation knowledge in conservation practice in real-life situations. In his "The Archaeology of Knowledge" Michel Foucault states that systems of knowledge are governed by rules that determine the limits of thought and language within a given historical period (Foucault 1972). Therefore, FDA was expected to assist the exploration of the strategies used in decision-making exposing the rules, divisions, and systems of a particular body of knowledge, approximating the concept of discipline by specifying the kind of institutional partitioning of knowledge we find e.g., in medicine, science, biology, economy or culture. Since heritage conservation discourses have been noted to involve a good deal of abstraction being a product of the context and practical situations as they are products of different philosophies and cultures reflected in the discourse related to cultural heritage FDA seemed to meet these requirements (Taylor 2015).

What then is the knowledge framework of conservation? How to interrogate disciplinary knowledge in an interdisciplinary field with diverse scientific epistemologies regulated by normative texts on ethics, guidelines, and standards – which are the rules that determine the limits of thought and language in an interdisciplinary field making C-R decisions?

To perform an FDA a knowledge framework was needed. Interestingly, the concept map launched by E.C.C.O. working group in 2011, visualizing the C-R decision-making process seemed an interesting option (Corr et al. 2011). Of particular interest were the strategies used during multidisciplinary consulting interrogating which strategies were used in succeeding or failing to make decisions. Which breakpoint values within the disciplinary knowledge framework were decisive? Were they to be identified as

theoretical or ethical, or were they social, economic, or other and how were they negotiated? By choosing the E.C.C.O concept map as a “key” for the analysis of decision-making the real-life processes were analyzed historically within the present knowledge framework for the conservation discipline. It is important to note at this point that The graphic presentation is based on universally accepted standards of ethical behavior and practice, represented by accepted and established definitions. When used as a process map it represents how professionals act or reason. The experimental two-phase analysis method, combining the FDA qualitative discourse analysis method reflected upon the E.C.C.O. C-R process reflecting the decision-making narrative was chosen to elucidate the historical challenges, and the practices through which actors constituted themselves as subjects of knowledge making decisions to direct or deter conservation-restoration actions and measures.

1.3.3 Data collection and analysis

In collecting data for analysis relevant sampling of written material containing discourses on C-R process and decision-making was done by choosing archival material starting with the years preceding the stately acquisition, the time for formation of the public museum and then representative material for the following five decades. First, documentation considering establishing the management organ, the board of trustees and it´s work in form of meeting protocols, collection condition surveys, conservation campaigns, research reports and articles, conference reports, letters, conservation reports etc. were read and sampled using the FDA theoretical framework in combination with the E.C.C.O. concept map knowledge framework for analysis of fields of knowledge present in the multidisciplinary discourse. Second, selection of “corpus of statements” for the FDA was made – i.e., knowledge content, expressed explicitly or implicitly, was coded from written material: e.g., collection condition surveys, conservation reports, scientific articles, board meeting protocols, committee reviews and exhibition publications. Third, the results are discussed thematically using the **concepts** of the E.C.C.O. concept conservation restoration process map, in which the concepts and their links symbolize `negotiated relationships´. The map as a whole emphasizes the specialist nature of professional conservation-restoration – experimentally used in the historical case-study as a taxonomy of a knowledge and skills framework. The chapter

headings in this article indicate the **concepts,** (text in **bold** in the text) present in the conservation-restoration process, forming the `prisms´ equal of the kaleidoscopic, the constantly changing views present in time describing the analytical procession of conservation-restoration process.

1.3.4 Secondary data – Collection condition surveys for assessing change

To assess the implications of C-R decisions in time quantified collection condition survey data, that is the state of preservation of the collection of paintings was reviewed as secondary data in the study to assess the impact of decision-making strategies. They are discussed looking at C-R decision-making examples decade vise within the time frame of half-century of the historical case-study. The quantified collection condition survey data would together with information considering the historical environmental conditions provide data for a general assessment of damage functions present in relation to identified agents of change.

The main sources of data for the study were the written documentation for the qualitative discourse analysis (FDA) of decision-making, and second (secondary data) the works of art, the information inherent in the object i.e., primary documentation. The historical preservation state of the paintings documented and compiled in collection condition surveys was compiled of the Skokloster collection of paintings in 1968, 1999/2000, and 2011. For comparison and reference, collection condition survey data compiled in 1993, for the National Portrait Gallery collection of paintings housed in the Renaissance castle of Gripsholm was reviewed. The condition of the works at the time of examination were compared considering the absolute, relative, as well as state of preservation over time comparing the quantified and classified descriptors in the compilation analysis of conservation needs – especially remedial conservation needs assessed in 17th and 18th century paintings on canvas – the state of preservation being the focus of the study. Considering the reference collection of Gripsholm Castle historical decision-making strategies regarding building restoration and conservation interventions, together with the quantified data for the state of preservation of the collection of paintings on canvas were reviewed. Unaccepted change i.e., structural damage related to poor climatic conditions, the main focus of the study, were grouped into major or minor damage

described as present by the surveyor in the picture support; the preparation layer; picture and varnish layer. The data describing the state of preservation of the different layers of the composite was collected statistically from the condition reports for comparison on collection level.

Remedial conservation decisions in conservation practice are only called for if an artifact is diagnosed showing signs of unacceptable change. For the study quantified data describing object condition recorded in the collection condition surveys of 2011 and the reference collection of 1993 were designed to enable comparison of types of damage related to damage functions affecting value-laden properties, that is object significance, authenticity, use-value, and function. Deterioration types recorded for the study were: deformation of picture support (canvas unlined and lined); cupping and flaking of paint layer down to ground or canvas; losses in picture layer; crazing, blinding; and yellowing of varnish. Also, the presence of visible mold and particle accretions on painting structure were recorded (for the compilation of collection condition survey data please, see Appendix 1.). Condition reports from the collection condition surveys of 1967 and 1999/2001 were used for comparison in a broader sense using quantified and prioritized reported actions in collections condition survey reports and collection conservation plans indicating need of remedial conservation or restoration. Certain types of unaccepted change were not identified in the Gripsholm collection but reported for the Skokloster Collection Condition Survey compilation, for example co-association of damage functions, such as bio-deterioration caused by mold growth, particle deposits and accretions, and low T with freezing cycles related to environmental conditions were not reported at Gripsholm Castle during the time of the survey. These types of unacceptable change assessed in the Skokloster Collection of paintings are reported in separate columns in the collection condition survey comparison (for details please, see Appendix 1).

As this study interrogates decision-making the reasons for C-R need to be defined. The questions why, how, and for whom the collection of paintings need C-R need to be asked. The first question, the why, addresses the necessity of C-R intervention. Conservation is defined as all measures, and actions aimed at safeguarding tangible cultural heritage while ensuring accessibility to present and future generations. The question here is the

endurance of paintings on canvas housed in a historic house museum. It is the interface of the object, and its environment that are crucial, as Michalski points out,

> … conservators do not set standards for the preservation of objects; it is the physical properties of the …work of art which determine how it will endure (Michalski 1994).

Consideration of the aspect of life-time, how slow or fast the deterioration process is, and what is reckoned as an acceptable rate of deterioration of a work of art to be called controlled and "graceful" is necessary. Can we accept another rate of change in corresponding artifacts in another environment or should agents of change act equally globally? Conservation of objects exposed to unsuitable environmental conditions risk becoming frequent and cyclic inevitably resulting in a shorter life-span. Especially at risk are museum collection highlight objects prone to be treated more often due to frequent use or loans. This is why use-value and function in museal setting and in particular in a historic house-setting is studied in relation to theoretical, ethical, and social perspectives on heritage conservation management.

1.3.5 Historic house museum with mixed collections setting

The case-study was conducted in Skokloster Castle, a 17th century historic house museum setting housing mixed collections. Already a museum in the 18th century, with regular visitors. In the beginning of the 20th century visitors could read an entertaining guidebook, published in 1903, by the Swedish Art historian, Olof Granberg (1858 – 1933). This book is today the only `study´ considering the significance of the Collection of paintings, but also containing interesting comments on change in objects. Granberg takes the visitor on a guided tour in the castle – today an interesting experience of time travel for the reader looking through the eyes of the art historian experiencing the castle with its rich collections (Granberg 1910).

The objects of study, the collection of paintings on canvas, of which the major part have been housed in the Baroque castle for centuries would on the acquisition of the building with its collections by the Swedish state in 1967 change from domesticity to an institution to become – a documentary historic house museum – a definition proposed in 1993 by

Sherry Butcher-Younghans. Accordingly, a documentary historic house museum recounts the life of a personage or place of historical or cultural interest in which the environments must contain the original objects, and if possible, in their original layout (Butcher-Younghans 1993).

The fundamental difference between a historic house and a historic house museum is that the latter goes beyond the edifice as such to include the collections and original furnishings. This integrity of the overall project gives the historic house museum an ability to evoke the past, which in turn makes it a monument of great social and political significance (Pinna 2001, 8).

The environmental conditions of the collection relevant for this study are historically, and during the period of interest for the case-study described as an uncontrolled indoor climate considering temperature (T), with temperatures during winter below freezing, and relative humidity (RH) levels above 90 % RH: characterized by high thermal inertia and a high and unstable RH. Indoor temperature (T) has small short-term fluctuations and follows the average outdoor T with a time lag. Due to the relatively leaky building envelope, there are large, short term fluctuations in RH, driven by changes in the absolute humidity outdoors in combination with strong winds (Broström et al. 2020).

1.3.6 Macro-context

The timely setting of the case-study is historical, overlooking the time period from 1967 until 2017, five decades of managing the building with its ensembles as a state historic house museum. The management of historic house museums is complex due to the multifaceted character of the site as a museum, but as Pinna points out, also the symbol of events, epochs and regimes which cannot be eliminated without destroying the house itself (Pinna 2001, 7). In historic house museums this level of complications set for decision-making present a standard – the objects are preserved in their in many cases original context – a value in itself to be preserved. These aspects require balanced and informed statements of mission of the institution responsible in making discerned preservation decisions.

Sweden as a country has, to cite Gösta Selling, probably the world's´ oldest legislation for the protection of ancient monuments, King Gustavus Adolphus II would create the post Director General of Antiquities in 1630, and monuments were put under legal protection in 1666 (Selling 2012). That date is a decade before the building work of Skokloster Castle would stop as Count Carl Gustav Wrangel in 1676 died on his way back from Germany in his castle Spyker on the island of Rugen, today Northern Germany.

In 1967 when Skokloster Castle became a public museum and a state owned listed historic building it also became superintended by the **National Board of Antiquities** and the **National Board of Building and Planning** according to the new law for the protection of historical buildings passed by the government in 1960 (Kling 1960). The Swedish state, following national legislation, and recognizing international normative charters, of major importance the 1931 Athens Charter and the 1964 Venice Charter regulating cultural heritage protection and ethics, the representants of the Board of trustees were through their home institutions also informed by the international member organizations for protecting cultural heritage, the International Council of Museums and the International Institute of Conservation of Historic and Artistic works of Art (IIC). In 1984 the Conservator-Restorer´s profession was defined by the ICOM in Copenhagen (ICOM-CC 1984) originally based on the writing of Georg Simon Graf Ballestrem, first published in German in 1965 (Graf Ballestrem 1965).

1.3.7 Reliability, and validity of the research – reflexivity

The methods applied in this historical case-study are both qualitative and quantitative. Subjectivity is stressed in hermeneutic constructivism where meaning is created in the interplay between the subject and the object. In the research design this is understood as knowledge being co-created in the researchers´ interaction with the data, which is also reflected in the choice of methods of analysis – being hermeneutic and interpretive.

The starting point is that reality can never be reached outside discourses and so it is discourse itself that has to become the object of analysis. The analyst has to work with what was actually written, exploring patterns, across the statements and identifying the social consequences of different discursive representations of reality. The subjectivity is

present in my role as a paintings conservator but also in the role of the analyst, which puts me in the position of being part of the culture under study with which I am partly familiar e.g., with the objects in the collection, as well as with some of the discourses as anecdotal stories. Analysts are often part of the culture under study sharing many of the taken-for-granted, common-sense understandings expressed in the material.

The difficulty is that it is precisely the common-sense understandings that are to be investigated: analysis focuses on how some statements are accepted as true or 'naturalized', and others are not. Consequently, it is fruitful to try to distance oneself from one's material and, in my case, also trained as a psychologist, with training in qualitative research exploring discourses from that axis of knowledge may provide another perspective in order to find out what makes sense in the historical discourses.

Regarding being the surveyor of the 2011 collection condition survey my aim in performing the survey was as a newly appointed conservator to become informed on the condition of the collection of paintings that now was my responsibility as the paintings conservator of the Collection. Considering collection condition survey data for the reference collection of Gripsholm castle the general classification into preventive and remedial conservation as well as restoration within an estimate of timely prioritization was deemed reasonably consistent, as were the descriptions of damage and deterioration (Dahlén 1993).

The method being heuristic and subjective interpreted from paintings conservator point of view, the credibility, transparency, and dependability of the historical case-study research design relies on the deductive analysis using the concept map as stated by Jeremy Hutchings: "…the conservation-restoration process…reflects professional practice and…the map can be interpreted as a decision-making narrative" (Hutchings, 2011 5-19). The quantitative methodology, in which objectivity is anchored in the positivist paradigm or the existence of one true reality, refers in this study to the reliability of assessment collecting secondary data. The collection condition survey data was retrieved through a systematic assessment of object state of preservation – here objectivity is an essential assumption – the risk of human bias being always present in assessment, evaluation, analysis, and synthesis as well as in experimental design and

evaluation. In this work, discourse refers to institutionalized patterns of knowledge that govern the formation of subjectivity.

2 Previous research

In this chapter a review of previous studies into C-R decision making is summarized beginning with a historical overview after which previous studies are presented in comparison and contrast to the present study.

2.1 Decision-making

C-R decisions have been discussed for centuries – often in a confrontational tone after treatment. The failure sharing decisions overlooking the historical writings seem related to the subject positions of those perceiving the works of art, the position of representing differing disciplinary knowledge backgrounds making failure to bridge knowledge gaps a common trait and source of dispute and disagreement.

2.1.1 Historical decision-making with regard to visible change

In the 18th century historians acknowledged time mellowing paintings, unless they were: ” …without accidents as damps, bad varnish, and the like…” (Hogarth 2004). In the mid-19th century painters, critics, historians and connoisseurs, and dealers raised their voice to a row regarding cleaning controversies, and the public joined in the disputes of the 20th century rows – a history of miscommunication and critics continuing until this day – also within the conservation discipline. In her short history of polemics surrounding the conservation of paintings and sculpture Ségolène Bergeon Langle discusses the historical cleaning confrontations in both the 19th and the 20th century in London National Gallery. The first cleaning controversy orchestrated by painter and dealer Morris Moore (“Verax”) resulted in Sir Charles Lock Eastlake resigning from his post as the keeper of the collections in 1847 having been assigned in 1843. The Select Committee concluded that tastes of the public are conflicting and clashing as to why it was decided the paintings should be left to darken until the public demand something. Judgements were not possible to make compatible because they were personally influenced by

political rivalries. In Eastlake´s view, restoration could not be subject to public criticism stating: the uneven dust of time is better than the hand of the restorer (Bergeon Langle 2001).

Eastlake rejected the passionate attacks of Morris Moore by publishing a book in 1847 to destroy all the secrets of the artists with facts in Methods and Materials of painting of great schools and masters stating in his Preface:

> "…by substituting an approach of historical evidence for the vagueness of speculation, …rendering it possible for modern professors to place themselves in the situation of their great predecessors in regard to merely technical circumstances, one source of interruption, if not discouragement, in the study more essential qualities of art, will be removed" (Eastlake 1960).

To avoid public criticism a protocol for restoration was set up and the prior examination of the work had to be carried out by three people one of them a chemist (Bergeon Langle, 2001 11). The actions of Eastlake were constructive in communicating knowledge by writing a scholarly book and establishing documentation routines of working methods with the collections for which he returned as Trustee in 1850 becoming director 1855. In a way the 1947 exhibition a century later in the London National Gallery repeated the same themes on cleaning controversies. The **Cleaned Pictures** exhibition caused a row that grew and became international as some 70 paintings restored during WWII by the German restorer Helmut Ruhemann (1891-1973) were put on display. The opposition raised amongst artists and art lovers was discussed in the Times mainly regarding Rembrandt's Woman Bathing, Rubens Chapeau de Paille and Velasquez portrait of Philip IV in Brown and Silver. The direction would in the hope of disarming the critics organize an exhibition on not just the paintings put on show but also bringing forth the whole documentation on the C-R processes to show the work had been done in good faith relying on scientific methods – with the contradictory reaction of making the polemics international. On the request of the Trustees an international commission was set up, finding no recent wear had been caused to the works under attack, nor has any ill-advised risk been taken. In the aftermath of this international debate the ICOM would be founded the same year. In discussing the subject positions of the critics and their knowledge background but also their educational tradition background within the field it

is interesting to read the report on the exhibition written by the Swiss restorer Hans Aulmann, of the Öffentlichen Kunstsammlungen Basel, published in the 1948 German art journal Kunstchronik reporting on how the exhibition dramatically illustrates an important part of the problem with the care of paintings worth discussing in detail. Its purpose is to present the viewpoint of the National Gallery Directorate on the question of cleaning pictures – a controversial issue in London for years. The exhibition is aimed at the general public. However, he commented, even after this explanation the general public will not be in the position to seriously evaluate the cleaning. It will always see the big effects and e.g., the new colorfulness of many pictures exclusively as a gain. On the cleaned Rubens **Chapeau de Paille** Aulmann stated:

> ...we are convinced that no art connoisseur on the continent will enthusiastically welcome this scientifically justifiable cleaning. The image is cold and intrusive now – we no longer can feel it is about 300 years since its creation.

Considering the condition of the paintings he thought the work done to be a respectable achievement, the restorers were to be recognized for their dedication and care with which the work was carried out, and the management deserved his full recognition for their decision to attack the old-fashioned falsification in the interest of artistic truth. For the London management and restorers´ it would have been more convenient to do only the most necessary and to leave the pictures with their brown sauce. In his conclusion Aulmann asks:

> Is it really so terrible in London – is a legend being created here? Answering: - In the interest of truth one can only hope that the London exhibition will not cause a new wave of factually unfounded activity in the restorer´s studios. (Aulmann 1948).

The contrast of this short transcript, an analytic peer review to the writings of laymen, artists, and art historians in the Burlington Magazine, The Times and the book published on the exhibition as late as in 1985 titled **The Ravished Image, Or, How to Ruin Masterpieces by Restoration** by Sarah Walden, exemplify the very different subject positions grounded in a knowledge framework. Gerry Hedley in his review of the Ravished Image stated it much wiser to concentrate at the paintings, and the history of art, to try to assess how they were intended to be seen – something conservators are

better equipped to study than they are to be sociologists (Hedley 1993, 167). Or somebody in an institutional position with a long experience of scientific study of painting materials as that of Joyce Plesters who in 1962 answered in the Burlington Magazine the great art historian Ernst Gombrich´s article **Dark Varnishes: Variations a Theme from the Pliny** (Gombrich 2004).

In an article titled **Dark Varnishes – Some Further Comments** Joyce Plesters as a continuation of the cleaning controversy stated it to be of greatest use for art historians without technical knowledge or experience to cite references to technical procedures of the painters of the past strictly as they stand without comment, or sift them in collaboration with those in position by reason of special experience adding:

> The very worst service …rendered to the progress of…studies would be to present to the public references …interpreted in a way which, however superficially assured it may appear to be, turns on a deeper examination to imply an inadequate understanding of a number of the fundamental premises (Plesters 2004).

Indicating the need of interdisciplinary bridging of knowledge, Plesters brought forth facts and assertions of knowledge in her rebuttal built on a long experience in examining paintings representing a national institution. During the 1980`s Gerry Hedley came to write several articles of major importance considering structural conservation issues, cleaning, aesthetics, and humanism in his **Measured Opinions studies in paintings conservation** published in 1993. Considering sharing responsibility, he found the notion of a non-hierarchical relationship between the disciplines of curator and conservator attractive making a remark on the institutionalized dominant role of the curator in some countries deciding what should be done during cleaning:

> …elsewhere, in reality it is the conservator, the active partner, who in fact takes the decisions – in choice of the cleaning strategy there is a need for the knowledge of both.…However these truisms will mean nothing unless the curator and the conservator have some comprehension of one another´s disciplines (Hedley 1993).

In 1990 the first conference held on **Shared Responsibility: A Seminar for Curators and Conservators** chose as its main objective to keep a non-confrontational tone as possible, managing curators and conservators to meet and discuss their views, and

dispel some of the myth and mystery around conservation profession and its activities to understand more fully the shared responsibility in the use of collections (Barclay 1990).

Identifying the growing interdisciplinarity of science the German **Dahlem Konferenzen**, found in 1974, identified the need for science to advance that the concepts, methods, and strategies of related fields must be understood before real progress can be made in any one field. This could maybe be defined as an early strive towards trans-disciplinarity. For this a forum was created using the model internationally recognized as the Dahlem Workshop Model. In 1994 the theme for the workshop was **Durability and Change** discussing the science, responsibility, and cost of sustaining cultural heritage with the broadest possible representation of participants in the field – communicating not in a lecture format but in concentrated discussion – not necessarily aiming at consensus, but to fill gaps of knowledge. The Dahlem workshop report contains several important contributions regarding identifying the status of the scientific approaches to cultural heritage as well as the challenges between the fields and related disciplines in understanding the processes of age and decay. Aiming to bridge the gap between the researchers and the C-R practitioners focusing on compromises discussing what rate of change was acceptable. Focusing on different themes affecting decision-making communication was emphasized in focusing our responsibilities of our own as well as past and future societies – what we fail to conserve today will not exist tomorrow, although how we conserve it is by no means restricted to any longer to material preservation (Krumbein et al. 1994).

2.1.2 Recent research in decision-making

Decision-making in C-R has been perceived as challenging, described by many writers more often to fail, hence, psychological studies in decision-making have been the source of new insights in the mechanisms present for finding the best tactics and skills for sharing conservation decisions from participatory decision-making, cognitive psychology, and experimental moral philosophy. In his Dahlem workshop contribution Michalski concluded sharing decisions to boil down to things, perceptions, and words (Michalski 1994). This theoretical proposition is approximated also in an interesting study by Ijsbrandt Hummelen et al. proposing the concept of symmetry used in archeological

conservation where instead of concentrating on the division of objects and subjects they were concentrating towards the practices in which the relationships between objects and subjects became visible. In their discussion on the cleaning controversies in the 1960´s of paintings in London they proposed to understand conservation as one practice of knowledge and value production by which it would be possible to surpass controversies. They also consider conservation theory could benefit from incorporation of science studies as a reflection of the underlying epistemological issues present in conservation practice (Hummelen et al. 2008, 1042-1045). Theoretically this paper comes close in that it is pointing in the direction of the research design of the present study with regard to the references to the science philosophical position of conservation as a science considering the relation of the subject and the object, and their relation to knowledge acknowledging the interdisciplinary characteristics of conservation theory. The experimental research design in this historical case-study aims to detect and de-construct the use of C-R knowledge in practice in retrospective, analyzing expert dialogue in decision-making process in collection management.

Recently a thorough literature review into decision-making has been provided by Jane Henderson and Robert Waller (2016). On the theme of sharing conservation decisions, Michalski has turned to moral philosophy, and psychological research on decision-making, presenting tools, tactics, and ideas. In the psychological literature he refers to the ability of reflective thinking emerges as beneficial, a type of thinking identified as a separate trait from intelligence for solving decision-making challenges. From psychological research he reports on Kaner who insists:

> To find sustainable decisions for difficult problems we need to sit in the middle of the diamond for as long as it takes to discover common ground. He (Kaner) calls it the “groan zone” (Michalski 2016).

Without shared common ground, (read shared knowledge) there will be none of the “insightful collaboration” needed for a sustainable decision. Tactics for difficult decisions, compared to tactics of routine decisions, require a shift from ‘either/or’ to both/and,’ from ‘analysis of parts’ to ‘synthesis of a whole.’ Sharing must produce long-term unanimity, not just short-term majority rule. Michalski concludes the best tools for decision-making are understood as means to structure and document shared reflection, not to automate

what we find to be difficult problems, that sharing even if attempted usually fails to influence the decision (Michalski 2018).

Another strain of related work has been done by Jane Henderson using interdisciplinary methods from psychology on Bayesian, heuristic, or deliberate decision-making strategies to choose the proper method suitable for more effective conservation decision-making or preservation strategies (Henderson 2011; Henderson and Waller, 2016). In a study of 32 published case-studies on conservation Henderson and Nakamoto focused on the dialogue analyzing consultation processes sharing decisions with stakeholders dividing the processes into three different groups: those sharing during appraisal of the meaning and context of objects; sharing while making conservation decisions; sharing deciding upon about display and storage. The assigned cases were then further divided into two categories – those where stakeholder advice was ´ignored´ and those where it was `acted upon´ (Henderson & Nakamoto 2016). The results showed conservators shared decisions during the first and the third part rarely ignoring stakeholder advice, but when coming to share decisions on conservation treatment stakeholder advice was mostly ignored – implying the reason for this was treatment reflected the area to be viewed as the core of the disciplinary field of expertise. The emphasis in the study is on the social aspects of sharing decisions. The evaluation of the conservation results in relation to the social aspects of disclosure/exclusion are not discussed.

In a very recent study local-level decision making have been informed by creating a lifetime risk approach against which short-term activities can be benchmarked moving from either/or to both/and – thinking by instead of framing consequences from operation or more intense visitor patterns in terms of tangible change the project jointly conceives benefits across the mission of National Trust for Scotland allowing a direct comparison between benefits and consequences. A representative selection of current and possible use scenarios is being generated by the staff of Newhailes House, Edinburgh (Henderson et al. 2020). Another recent study has approached the issue of decision-making from the preventive conservation point of view, namely regarding the necessity to complement the dominant technical approaches with research that take a wider interest in specific contexts, social practices, and negotiated decisions. Aiming to illustrate how the interactions between perceptions and experiences of different

professional groups are pivotal for the management of the indoor climate Leijonhufvud and Henning used ethnographic methods to study decision-making in historic house museums interviewing individuals who either took part in management or were affected by the indoor climate. Discussions among the social actors and ways of negotiating respective priorities were essential features in the management of the indoor climate. Discussions related to the ability to modify the indoor climate - showed a hegemonic discourse concerning preservation as the dominant rationale for indoor climate control. Negotiations considering “acceptable” conditions with respect to preservation reinforced a state of stability regarding indoor climate conditions (Leijonhufvud & Henning 2014). These two latter studies represent the two dominant lines of research in current cultural heritage research – the lines of risk assessment and environmental control in a science dominated strand of preventive conservation.

From a theoretical point of view considering this case-study I find the research of Johannes Persson, Henrik Thorén and Lennart Olsson important in having identified a philosophical challenge within the philosophy of science – that of interdisciplinarity defining as stated above, probably for the first time: **the interdisciplinary decision problem** discussing it through the ontological and epistemological differences referring to Popperian optimism and Kuhnian pessimism (Persson et al. 2018)**.** The challenges in sharing conservation decision-making were identified by ICCROM in 2000 specifying that value based thinking and interdisciplinarity were elements missing from our common skills set. as an emerging ‘hot’ topic in the field of cultural heritage which have led to organizing educational courses during which 46 case studies were discussed over the years and four courses. Interestingly eight case studies explored what happens once the decisions are made evaluating the responsibilities and the sustainability of the decisions concluding that without functioning maintenance programs, or management plans conservation decisions cannot be effective over the long term, nor can the full potential of the heritage itself be realized (Antomarchi and Abend 2018) .

2.1.3 Damage functions present on site

The historic climate of Skokloster Castle has been an object of study for decades. This chapter aims to give an overview of research articles published on the theme of damage functions put in context of agents of change causing unacceptable change in paintings on canvas in museum environments in general, and in particular with the previous studies published on the damage functions present on site at Skokloster Castle.

Risk factors present, according to state-of-the-art research for paintings on canvas, as reported by Stefan Michalski in the late 1990´s, inherent deterioration of traditional paintings is shown to be the effects of T, RH, and miscellaneous air borne pollution (Michalski 1993). Particulate matter on object surfaces act as food source for micro-organisms, attractant, and reservoir for moisture (Turner-Walker 2012). In his recently published paper stuffing, everything known about mechanical properties in one collection simulation, looking at object material properties reactions due to climate and strain inputs calculated through EMC (equilibrium moisture content), elasticity, strain, and stress parameters to predict stress concentration, strength of the material, elongation at break, single cycle fracture probability and fatigue fracture of variable objects including paintings. Michalski notes that data is missing for the viscoelastic parameters of aged material – all parameters counted above are known to change with age (Michalski 2012). Anna von Reden notes the same considering deterioration of aged materials as that of aged canvas supports and moisture needing more research not mentioning the other parts of the painting composite, the preparation, ground, and the paint layer topped with varnish (von Reden 2012). Incorrect humidity, incorrect temperature, water, mold with following biodeterioration etc. resulting in damages of painting materials affecting the value of the objects seem difficult to address through risk-analysis, simulations, and standards without assessing the objects affected on a larger scale. As Stephen Hackney notes:

> In a world of rapidly changing technology, the current preference for minimal physical intervention is understandable, but irreversible changes caused by chemical interactions, especially with oxygen and water, continue to degrade structures. All prevention and retardation treatments, therefore, cannot be deferred (Hackney 2020, 218).

Apart from oxygen and water these risk factors also provide the living conditions for fungi and bacteria, damage function of biodeterioration in painting. The mechanisms are thoroughly described by Piero Tiano concluding the biological attack of paintings only occurs under poor conservation conditions; high humidity levels, soil contact, poor ventilation, and rare maintenance operations – painting materials being composite and organic are more susceptible to microorganisms (Tiano 2002). Sterflinger and Piňar asks whether microbial deterioration of cultural heritage and works of art is tilting at windmills since biodeterioration already mentioned in the Bible, where the priest given the role of today´s microbiologist decides for actions depending on findings (e.g., Leviticus Chap.14, v.36), and with a long history being present in human built environments and on artifacts? State-of-the-art in biodeterioration today acknowledges fungi and bacteria not only cause serious aesthetical destruction of paintings…they inhabit and penetrate into the materials, resulting in material loss, due to acid corrosion, enzymatic degradation, and mechanical attack. – the processes being dependent on:

> (1) the chemical composition and nature of the material itself, (2) the climate and exposure of the object (3) the manner and frequency of surface cleaning and housekeeping in museums. (Sterflinger and Piňar 2013).

In conclusion, the causal factors of damage function due to biodeterioration are understood. According to Urzi and Krumbein it is the dynamic environmental conditions and influences to which objects are exposed rather than the chemical and crystallographic structures, porosity or compactness, low diffusivity to gases and water (Urzi and Krumbein 1994, 112). The question is which factor, in co-association with the interdependent processes, and to which cost the damage function is to be mitigated in conservation for a sustainable management of painting collections? Historical fungal infestation in composite structures, or just simply the original structure made of materials known to be prone to become infested (flax, preparation glue layer, glue containing ground, conservation materials etc.), and impossible to remove from the structures regardless, whether original material or historic infestations without harming the original structure and the objects´ material, historical and contextual authenticity. An anamnesis of infestation in painting structures also narrows the safe climatic limits considering risk for reactivation of inherent infestation. An area in need of future study is climatic limits of

tolerance to mitigate re-activation of microbes within composite material structures. An upper limit for RH is reported to be 70 % RH as above 70 % RH water molecules are less well bound and therefore more likely to become available for fungi particularly if the surface is cool which may be the situation in uncontrolled indoor climates (Hackney, 2020 115).

Besides biodeterioration loss of cohesion is known to be caused by mechanical damage in composite and organic materials in humid environments by hygrometric stress with cyclic damage functions, swelling, deforming canvas, and eventually resulting in loss of paint. If combined with cyclic freezing at temperatures well above freezing point mechanical failure is caused as water freezes causing crystallization stresses in porous materials – all reactions with geometrical factors inherent in the object (Brimblecombe 1994; Valiullin and Furó 2002; Zhang and Liu 2018; Hackney 2020). As Peter Brimblecombe points out, the geometrical factors need to be considered on the micro scale, at one extreme, where surface texture, roughness, and composition affect the thickness of the still air boundary layer, indoor air flows, for example, persisting for very long periods lead to material deposition and soiling at specific locations (Brimblecombe 1994). According to Dario Camuffo internal moisture content of water-absorbing materials in equilibrium with ambient RH at high RH levels will have enough free water adsorbed on the surface or filling pores which will allow for mold growth as hydrophilic materials are always covered with a number of monolayers of water whose number, and reactivity being related to RH porous materials will have a further capacity of accumulating water inside their microcavities. In a highly fluctuating indoor climate with sudden changes the role of water and especially condensation of liquid water occurs when surface temperature drops below the dew point (Ranacher 2001). The periods of time called Time-of-Wetness, and the amount of water condensed on a surface is proportional to the concentration of the amount of water in the air, the drop of temperature below dew point and the duration of time-of-wetness (Camuffo 2010). These times are relevant for canvas paintings as they start to swell and consequently shrink as soon as the T has dropped below the dew point (Moroz 2011). The Time-of-wetness will eventually also affect the DP (degree of polymerization) of the cellulose – water being the decisive factor for hydrolysis (Hackney 2020, 111).

During the first decade since acquisition of the castle with its collections negative indoor climate effects on the preservation state of paintings on canvas were noted in several published articles. The co-association of incorrect humidity and bio-deterioration due to mold growth as damage functions present was made clear. The final conclusions underlined the detrimental effects of manmade causality e.g., a historical conservation method, glue paste lining was asserted as being the main damage function, disregarding the role of the original material compound in paintings on canvas containing flax, glue, varnish etc., also being negatively affected by incorrect RH and incorrect T (Meyerson et al. 1972, 239-299; Makes and Hallström 1972, 3-44; Hallström and Göransson 1974, 3-19; Rangström et al. 1980).

Ove Hidemark, the influential architect, member of the multidisciplinary team representing the National Board of Public Building managing the restorative actions and measures of the historical building, Skokloster Castle, put forward his theory and view regarding the indoor climate asserting it having been beneficial for the collections housed in the castle. His views on building restoration would come to influence the views of the Skokloster Castle trustees viewing easel paintings as part of the architectural whole regardless of being described as by definition `movable cultural heritage´ (Hedqvist 1972a, 7). In the 1978 UNESCO recommendation for the protection of movable cultural heritage, paintings as movable heritage is taken to mean all movable objects which are the expression and testimony of human creation, and items of artistic interest – the view held by the partnering institution NM. The UNESCO recommendation further stated that various risks such as damage, deterioration, and loss should be considered as a whole pointing out that unfavorable lighting, T and RH, atmospheric pollution may in the long run have more serious effects than accidental damage or occasional vandalism (UNESCO 1979).

Overlooking studies made on the historical climate some have looked at the effect on preservation of the collections. Considering the collection of paintings several studies on mold growth were published by Frantisek Makes (Makes 1979; 1988; 1996; Makes and Hallström, 1972). After Makes retirement one single object was sampled, a 17th century painting on panel, together with five other objects from different material categories of the 1, 000 easel paintings in the collection of paintings, along with a

wooden door, (a dummy not recorded in the Skokloster inventory), as examples of proof of a safe indoor climate for the collections. Also, studies on air exchange rates were made (Holmberg and Kylsberg 1999, 1-63; Holmberg et al. 1999, Holmberg 2001, 57-99; Holmberg et al. 2011).

Mattias Legnér and Mia Geijer report on architect Ove Hidemark having argued strongly for his view of the preservation state of the Skokloster collections as proof for the safety of the wide allowable seasonal variations, (from 35 % RH – to above 90 % RH). hence considered acceptable for a museal indoor climate. Hidemark promoted the concept of this seasonal variation indoor climate as applicable for new museum storages to be built, going into polemics against the norms proposed by ICOM arguing for national and cultural traditions within architecture and management (Legnér & Geijer 2015). He would maintain his view of the seasonal variations climate being beneficial by assertion as late as in 2001 in the managing program for the castle building – regardless of the conservators at Skokloster repeatedly working against biodegradation caused by mold in paintings on canvas, and on books in the castle library (Makes 1979; Makes 1984; Hallström & Arvidsson 2001; Hidemark & Nelander, 2001).

The general focus of studies made at Skokloster Castle has during the 21st century been on indoor climate with the main emphasis on finding energy efficient solutions for controlling the indoor climate in the building by aiming to understand how the indoor climate works in the heavy stone and brick building preferably with no environmental control. The focus of the studies made have been mitigation of mold growth due to incorrect RH. An extensive indoor climate measuring campaign performed 2008-2010, to determine the impact of the building envelope on the indoor climate found the Skokloster Castle indoor climate characterized by extremely low temperatures and high relative humidity in the winter. The indoor climate variations were proved larger than one would prefer in a museum, the primary risks identified as mold growth, mechanical damages, and chemical degradation. The climate measurement analysis and AER (air exchange rate) measurements showed that through reduction of air exchange and the effective hygrothermal inertia of the building combined with conservation heating and/or dehumidification the risk of mold growth could be reduced (Broström and Leijonhufvud 2010).

Therefore, during the EU project **Climate for Culture** the National Property Board Sweden launched in collaboration with partnering universities, Högskolan Gotland, University of Gothenburg, and the museum organization a three year (2013 – 2015) – three different strategies -experiment for preventing mold growth. Conservation heating, dehumidification, and adaptive ventilation were investigated due to high indoor relative humidity. Results showed that the initial draught proofing of the rooms had a positive effect on the indoor climate which reduced the need for active climate control. Dehumidification was the most energy efficient method (Wessberg et al. 2016). Also, the influence of air exchange rates on the stability of the indoor climate was studied in 2012 by Andrea Luciani et al. based on measurements from Skokloster castle, the investigation showed that a reduction of the air exchange rate could provide a more stable indoor climate as a correlation between air exchange and RH short-term fluctuations was found, indicating that a reduction of the air exchange rate could be an effective strategy to lower the risk for mechanical damage on hygroscopic materials. An improvement of airtightness generally thought to cause a higher mold growth risk was not considered a risk at Skokloster Castle, with no internal moisture sources. Nevertheless, passive control was probably not enough to lower dangerous RH levels in rooms in the north part of the building and active control was thought probably necessary (Luciani et al. 2012). The impact of the wind pressure on the air exchange rate of the building was studied by Thorun Widström to quantify deviations of different simulation models to investigate mold risk in the building (Widström 2019).

Lately studies in the field have focused on the relation of indoor climate to climate change, a theme discussed by recent studies from monitoring point of view to explore the link between managing collections evaluating the magnitude of risk related to climate change impacts, energy efficiency, carbon footprint and sustainability and the establishment of climate standards for the condition of the cultural heritage objects, buildings, and sites in order to make informed decisions about adaptation measures – advocating monitoring and management should be set-up and work in tandem in a framework of adaptive management where feedback from monitoring provides double looped organizational learning or to continuously monitor the operational performance of buildings, choosing sets of indicators to study deterioration caused by climate change

like weathering of historic structures of buildings (Leijonhufvud & Broström 2010; Haugen et al. 2018; De Silva & Henderson 2011). Broadening the standards for preservation of buildings and collections have been discussed the question of Garry Thompson:

> “is there such a climate as a Museum Temperate Zone, where throughout the year average daily RH remains within the moderately safe limits of 40 to 70 % and heating is rarely required?”(Thompson 1986)

The studies have had a mainly technical focus on building management and climate data monitoring for proposed aims and strategies from architectural and building antiquarian points of view. Indoor climate in a broader sense to be realizable would require interdisciplinary collaboration projects considering the demands of the collections housed within. Studies to identify changes in climate profile that dramatically increase risk of damage in objects have been made by V & A providing specifications derived from extensive environmental record culminated in a new analysis and simple representation of climates and associated risks, so called ‘rhEvents’. Climates were possible to specify as a combination of an untypically broad envelope of acceptable RH and pragmatic limits to allowable changes over time recognizing the need to preserve both the historic structure and artifacts. The discussion of standards for museum climate is complex due to the concept of standard itself being what it is wished to be as noted by Jane Henderson and Shumeng Dai:

> ...it can be as simple or as complex as anyone wishes to consider, and in its broadest sense it goes far beyond a narrow technical description, and in defining and improving practice in collections care operating with a broader conception offers greater benefit and clearer communication (Henderson and Dai 2013).

In research the content of standards is detached from quantified collection survey data on object preservation state – data necessary for discerned decision making for best preservation and mission strategies to sustain cultural heritage. Being imprecise describing measurement standards as 50 % - 60 % RH performance standards are for benchmarking, as Thomson´s Class I and Class II or the ASHRAE standards A, AA…to D where D stands for staying under 75 % RH avoiding damp. providing standards to be applied for building and collection type. As emphasized by Stefan Michalski that for each artifact according to CCI (Canadian Conservation Institute):

> … the damage is not a sudden crossing of an all-or-nothing climate threshold. It is a cumulative continuum that depends on the frequency and size of the climate variation…avoid damp (stay below 75 % RH). (Michalski 1998).

Deviations of benchmarks using strange exceptions as example can be questioned if the wish is to demonstrate that a fixed standard for different materials, ought to be an agreed procedure for arriving at a sensible specification worth discussing as the example given by Tim Padfield asserting the limit of 75 % RH is, as given by Michalski as the upper limit, we can think of allowing in a building housing historic treasures still asks: "What about Skokloster Castle in Sweden? – giving the following description of the conditions:

> Here we **know** that RH is 100 % through the winter because there is a layer of ice on the wallpaper. The ice does no harm: it evaporates in the spring. If the house were warmed a little to reduce the RH, ice might still form, and instead of evaporating, melt, damaging the 18th c wall covering…100 % is **just right** (Padfield 1994,194).

The source of proof for the anecdotal description of 100 % RH through the winter, and the claim these conditions to be just right for 17th century tapestries or gilt leather wall hangings, (and the fact that the castle does not have 18th c wallpaper clad rooms) would certainly need to be discussed considering the mixed collections housed in the castle, some of which are described as being of high or very high vulnerability composite objects, such as paintings on canvas and veneered furniture with a yearly average of RH above 75 % RH. The decade old European standard for defining historical climate states:

> "climate conditions in a `microenvironment´ where cultural heritage object has always been kept, for a long period of time (at least one year) and to which it has been acclimatized…If the historical climate can be demonstrated to be safe then it is recommended that the same environmental conditions be maintained" (SIS/TK 479: 2010).

The statement by Padfield does sound more like the myths of the indoor climate of Skokloster Castle – the place in Sweden where the indoor climate is miraculously working against theoretical limits – a phenomenon described by David Lowenthal as our preference "…to treasure rather than conceal evidence of…domestic carelessness" (Lowenthal 1994, 44). Not even the Arrhenius law will work here in that simple function

it has promising a lowering of deterioration. Instead, the focus from environmental control should be shifted from implementation of ideal values to understanding and evaluating existing conditions. Studies with degradation process by a factor of two for every 10°C Peter Brimblecombe estimates the simple Arrhenius relationship is likely to break down in the case of rather complex materials making up cultural artifacts (Brimblecombe, 1994, 72). Adding freeze-thaw cycles would further complicate the damage functions present. In general studies with a more holistic scope in uncontrolled climate condition buildings housing collections with oil paintings are rare but one example exists by Kristina Holl. She studied the indoor climate of Linderhof Palace in Germany according to current climate guidelines combined with the conservational investigation of fixed furnishings also including oil paintings due to existing documentation on historical collection condition survey data (Holl 2013).

2.1.4 Condition reporting in documentation

Now how reliable is the surveyor, and who is to do condition checks, write reports and compile condition survey data? How do we define unacceptable change caused by damage functions, and how do we assess the rate of change? Jonathan Ashley-Smith asserted ironically “Conservators believe that they can make a holistic appraisal of a dynamic process by making a single observation. The methods of the scientist are in complete contrast.” (Ashley-Smith 1995). Without knowing which experiences Ashley-Smith wished to refer to he presented another view of the need for conservators as experts in his paper **Losing the edge: the risk of a decline in practical conservation skills** discussing conservators´ need of experience to carry out their task – a crucial practice with ethical dimensions. For conservators to achieve the level of proficiency necessary it is expected to have at least an 8-10 years of experience (Ashley-Smith 2016). Consistency and reliability studies on condition assessment using checkbox forms have recognized the effect of training in increasing reliability of assessment e.g., surveyors without conservation experience tended to look at superficial things as experienced surveyors reported on underlying features of perceived phenomena (Taylor and Stevenson 1999). As there is no `neutral´ C-R a sound documentation is elementary as evidence of the facts, knowledge, and decisions made with discernment as remedial conservation contains the inevitable irreversibility of alteration (Orna et al. 1994).

Conservators are expected to have the necessary skills, knowledge, and experience to recognize and operate within the disciplinary professional guidelines and ethics (Hutchings 2011, 15). The aim and objective of conservation documentation has historically been to create an anamnesis for the work of art, stating the findings, actions, and measures – providing proof. Remedial conservation i.e., direct action to arrest a current damaging process improving the state of conservation on tangible cultural heritage, as well as restoration aimed at facilitating its appreciation, function, and use are conditional. Actions are only carried out when the item has lost part of its significance or function due to unacceptable change. Hence, the fundamental principles for all conservation actions are that they are based on a thorough examination and documentation. The value of the documentary significance of the painting is of principal concern of the conservator respecting the integrity and the authenticity of the work of art – including the function – the accessibility and reading of the picture before conservation. For the examining conservator to arrive at a diagnosis, it is expected that the assessment of C-R needs, and actions is based on a system of knowledge including a systematical method of examination. The evaluation itself is dependent on collected empirical evidence and language-based descriptors of materials and phenomena. For paintings on canvas the objective is twofold: first, describing the structure of the painting which includes a description of the artist´s materials and technique, second, providing a description of the state of preservation, describing changes or the type and cause of damage.

Instability is considered an unacceptable change to the material structure. Phenomena affecting or threatening the material composite may also affect the use, function, and value, that is the intangible attributes, amongst those the aesthetics of a painting. The understanding of form, dimensions, depth, color, tones, and structures may have been compromised. The artist's intent and ultimately the significance of the work of art may have changed due to unacceptable damage. It is important to note that paintings are constantly in a process of change, a continuum directly or indirectly affected by Man, as creators and users, but also as re-interpreters of significance as Ian Hodkinson in an excellent way has explored in his article on *Man´s Effect on Paintings* (Hodkinson 1990).

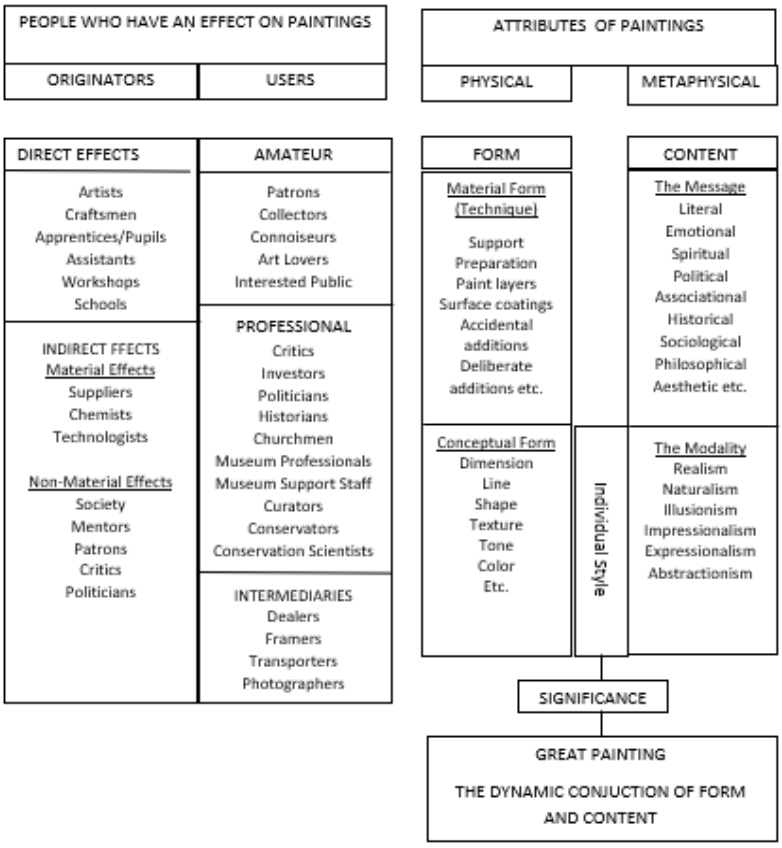


Figure 3 People who have an effect on paintings and the physical and metaphysical attributes of paintings. Redrawn from Hodkinson 1990.

In his article Ian Hodkinson presents the people who have an effect on the material (tangible) and metaphysical (intangible) characteristics to the significance of paintings (please see Figure 3. Chapter 2.1.4.). The people, the professionals, and intermediaries who besides conservators have an effect on the attributes of paintings are shown.

2.1.5 Documentation – an auxiliary discipline to C-R

During the conference on documentation in conservation **Dokumentation in der Restaurierung** in Germany in 1989 several papers on the theory and role of documentation in C-R were presented which I find to be in an interesting contrast to the view presented by Ashley-Smith (2016) above disregarding the role of documentation in the practice of conservation. Finding literature on the theory of documentation is sparse even if several modern and digitized technologies are in use today the field of

practitioners have an emphasis on how to do documentation. The obligation for the profession to document all work is communicated in normative texts. Internationally defined in the Athens Charter of Historic Monuments, and in Article 16 in the Venice Charter as imperative to be stored as archival material (ICOMOS 1931; ICOMOS 1965). Karl Faltermeier (1994) presents a beautiful metaphor in describing documentation by comparing the act to the practice recognized by many from their early school years – that of placing a flower in between the leaves of a book. This simple act of conservation delivers in time through drying under a light pressure a pressed flower. It will represent the resulting document containing both valid and invalid statements of what ones was. The inner structure and the composition are easily recognizable. The color has changed or disappeared. The scent of the flower as well as the location is no longer preserved. The existing document has only a part of its original information content (Faltermeier 1994, 3). In its archaic meaning the word *document* refers to evidence or proof, an original or official paper relied on as the basis, proof, or support of something. The word was used in this meaning for the first time in the 14th century. In writing, the word document is conveying information in the form of historical documents (Merriam Webster 2021). Manfred Koller has in his work aimed to clarify the definition and structure of the main forms of documentation defining it as the verifiable and logically comprehensible presentation of facts, those of the conditions encountered and those newly enacted measures taken to safeguard cultural heritage objects. According to Koller documentation including visual, art-historical, and other scientific processing, therefore is an auxiliary discipline of history, art, architecture, and the history of technology, but also of archaeology, and ethnology. Documentation is building preservation and museology, in short of all history and humanities, which depend on the preservation i.e., the unadulterated accessibility to the information of the research handed down from earlier times (Koller 1994, 7). This information of records needs to be acquired through systematic inquiry, standardized methods of description and language used, as well as consistent practices to be objective and reliable. The latter requirement can be enhanced by experience.

2.2 The structure of the study

In chapter 1, the Prologue, I introduce the reader to the historical house museum setting of Skokloster Castle in Uppland, Sweden with a short description of the history of the building proprietor, his social, political, and historical position during the Early Modern Swedish Era of Greatness, and the historical developments of the country house with its collections until the acquisition to the Swedish state in 1967.

In chapter 2, the main objective of the study is outlined and the theoretical considerations for the research are explained. I introduce the research question positioning it in the theoretical setting of the definition of conservation as a process of managing change, more exactly in the pivotal point of when change in cultural heritage objects become unacceptable by having a negative effect on its significance requiring decisions to be made by stakeholder representants of whom conservators represent one discipline amongst other disciplines. In this chapter I refer to the philosophical theories I have chosen to support my theoretical and methodological choices for the experimental research design. I explain the research design based on a historical case-study method combined with a qualitative discourse analysis method done in a conservation knowledge framework to study C-R decision-making processes in a retrospective of five decades in real-life management situations in a historic house museum setting. I clarify the science philosophical challenges of conservation as an interdisciplinary science through the theories of human perception and human language present in our interactions with the world of objects and argue for my choices of FDA and the conservation knowledge concept map used in combination as methods for assessing meaning and context in expert discourse language within the theoretical framework of conservation. The main concepts used in the research are explained after which I describe the methodological research design which combines qualitative and quantitative methods. I use qualitative methods for the analysis of interactions between professionals, and their interactions with objects. For the analysis of the state of preservation of objects numerical data based on quantified collection condition survey data. Before explaining the structure of the research, I explain the micro- and the macro study setting, and context and I examine the practices in the research process evaluating the validity and reliability of my role in this qualitative research.

In chapter 3 previous research is presented overlooking previous research considering decision-making in heritage conservation, and documentation in general and condition reporting in particular. In this chapter previous studies of the environmental conditions in situ at Skokloster Castle are presented.

In chapter 4 the management of change in paintings on canvas is discussed. Phenomena described as change are explained by first describing the physical structure of 17th and 18th century works of art. The different categories of change are explained differentiating the unconditional and conditional change considered unacceptable, hence requiring conservation measures and actions. Change – sometimes considered harmful caused by historical C-R interventions is discussed alongside with the role of mandatory documentation in collection management.
The results of the study are reported in chapter 5 as conservation decision-making examples analyzed through FDA in the C-R process narrative of the E.C.C.O. knowledge and skills framework. In chapter 6 Discussion I am discussing the experimental research design in relation to the research question from a theoretical and methodological viewpoint interpreting the results. In chapter 7 the conclusions from the analysis of the examples of the study are explicated considering the methods approaching the research question from the perspectives of sustainability and the role of C-R being firsthand informed of the state of preservation of the collection objects formulating recommendations for future research to enforce stewardship and interdisciplinary communication.

3 Managing change by defining change through documentation

In this chapter I will describe the characteristics of the typical 17th and 18th paintings on canvas as physical structures, their material construction, and the importance of understanding the mechanisms, and deterioration of the structure. The following chapters present the general structure of paintings on canvas, change by natural ageing – gracious deterioration, change by damage functions – unacceptable change, and change by a strange hand – C-R interventions. Understanding deterioration,

mechanisms, and their implications for the state of preservation and the resulting impact on their significance as pictures and works of art considered our cultural heritage is fundamental. The demanding task for a conservator is the synthesis - arriving at a diagnosis. This multivariate evaluation process may require interdisciplinary knowledge e.g., curatorial and/or scientific consultation. The examination process, assessing and defining change in paintings on canvas, is inevitably time dependent in terms of state-of-the-art knowledge in academia and practice, and the experience, tradition, facilities, and training of the conservator.

3.1 Paintings on canvas

The reason for my choosing to do research on preservation of paintings on canvas in a historic house museum setting was the acknowledgement of the very high or high vulnerability of paintings on canvas as `working´ hygroscopic composites to uncontrolled environmental conditions. In a building with mixed collections, and an uncontrolled indoor climate the complex real-life conditions require the recognition, knowledge and understanding of risk of allowing the presence of damage functions, which eventually in time will result in unacceptable change affecting object significance. The question was how change was perceived – had perceptions been modified in time – and if so, had this affected the way how the objects were represented and valued?

This exploratory study would interrogate the deviation of the overall condition of the collection compared with reference collections of paintings housed in historic buildings or churches. Following the Venice Charter, Katrin Janis (2006) sees the preservation of the authenticity and integrity of a conservation object as a holistic category, encompassing all its levels and dimensions – these should be made the secure basis of professional ethics and practice, including the principles derived from it. At the same time, this ethical principle forms the core of conservation discipline that is newly constituted depending on the object of research bringing together different sciences (Janis 2006, 45).

The relationship between the professional actors and objects in conservation of cultural heritage is a concern of conservation ethics, since C-R being by definition a public good it often operates in competing contexts of public interests with the conservator guided by

the level of change/intervention they are comfortable to carry out and prepared to justify balancing between advocating on behalf of the cultural heritage and acting on behalf of the client. It is here in this juncture where codes of ethics, theories, and professional guidelines on C-R meet (Belishki and Corr 2019, 93).

The preservation state of paintings on canvas may affect the accessibility and use. Many are the paintings expelled to the storage, in a historic sense to a `waiting room´ due to their fragility or illegibility. This is the fate of the main part of our cultural heritage. Paintings in museums evaluated not to endure being exposed may in historic house museums still hang in their original context. Some have the opportunity to be shown in exhibitions at the home institution or sent on loans to be exposed for a wider public if assessed to endure the ordeals of transit and handling. This calls for individual C-R assessment and decisions regarding the allowed magnitude of change on material and immaterial values of the object that have the potential to increase or add value – changes that in turn affect different kinds of values to different extent as categorized by Feilden (See Table 2 Feilden´s 8 degrees of intervention with possible repercussions for heritage value, chapter 3.1).

Table 2 Feilden´s (8) degrees of intervention with possible repercussions for heritage value (Feilden 1988) The thick black line and the grey filled text boxes annotate the line between C-R activities, societal building rehabilitation (light grey)

Seven degrees of intervention (8)	**Possible repercussion on value**
Prevention of deterioration	Intended to reduce change but certain kinds of value may be given priority, so values change at different rates
Preservation of existing state	Many values kept; utility and possibly aesthetic and information values slowly decrease
Consolidation of the fabric	Utility increases but information decreases. E.g., DNA information
Restoration	Utility and aesthetics may increase but information and material authenticity may decrease
Rehabilitation	Contextual value increases, potential uses may decrease
Reconstruction	Material authenticity decreases, information may increase
Reproduction	Reproduction is different, since the original object is not necessarily irreversibly affected by this intervention

The Feilden table of levels of intervention differentiates following the present practice in the United States between conservation and the act of preservation and managing change – according to Frank Matero conservation seeks to establish continuity through

controlled change, as preservation is the notion of retaining status quo or the means by which the existing form, integrity, and material of a work or place are maintained and deterioration is retarded – explaining by safeguarding – at least the illusion of no change (Matero 2000).

Do paintings have rights? Salvador Muñoz Viñas, unwilling to deal with the issue of objects having rights or not, more interested in acknowledging the subjective motifs of conservation underlining the importance of asking why, and for whom conservation is done – with an emphasis on the social aspects of conservation (Muños Viñas 2005, 189). In the above Feilden intervention degrees the answer to the question why may lie within the range of the white box areas in Table 2. (see Table 2. Chapter 3.1.), where the area of interest in this case-study aimed to focus on discourse phenomena related to conservation process decision-making in a historic house setting.

3.1.1 The structure of paintings on canvas

Documentation should always contain an analysis and description of the material buildup of a painting as a physical structure. The structure of a canvas painting follows mostly a similarly layered structure regardless of period and type. The textile support was the preferred painting support during the first half of the 17th century. Fibers used were flax or hemp, and at times silk can be found. Some geographical historical preferences have been found, e.g., the early paintings on canvas were Venetian from 1550 – 1650. In Venice and later in Italy and France coarse weaves of hemp were preferred, probably partly related to the availability of tweed weaves (twill) and often in very large sizes, some twill weaves (see Figure 4 e, f) were available in widths up to 220 cm (Koller 1984). For textile supports the most common type of weave was the plain weave pattern also called tabby weave (See a Figure 4 Below, chapter 3.1.1.).

In the 17th century Netherlands with the province of Holland, the manufacture of textiles was concentrated in the cities of Leiden and Haarlem. Here cloth for sails, windmills and the dyeing industry were produced on a large scale. Flax and hemp were mainly imported from the Baltic countries (North 1997).

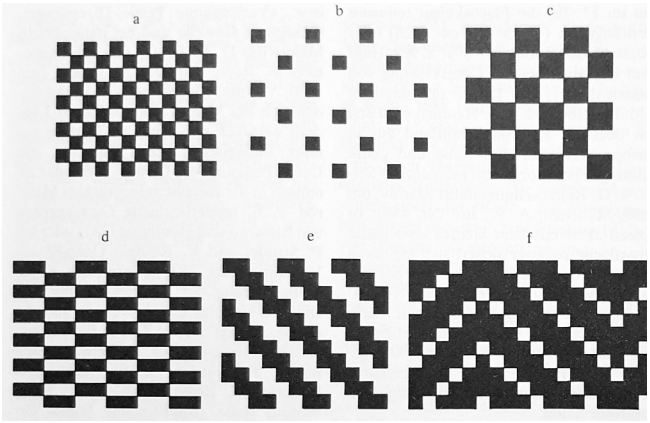


Figure 4 Weave types of textile supports for paintings: a) plain weave, b) “structure pavimenteuse” or open mesh plain weave, c) basket weave, d) rib weave. e) leftward twill f) herringbone. Picture from Koller 1984.

Working up through the composite structure of paintings on canvas, first a preparation layer was applied, sometimes containing a glue layer followed by application of a ground(s), underdrawing, paint layer(s), and finally on top, the varnish layer(s) (for the painting structure see Figure 5, chapter 3.1.1).

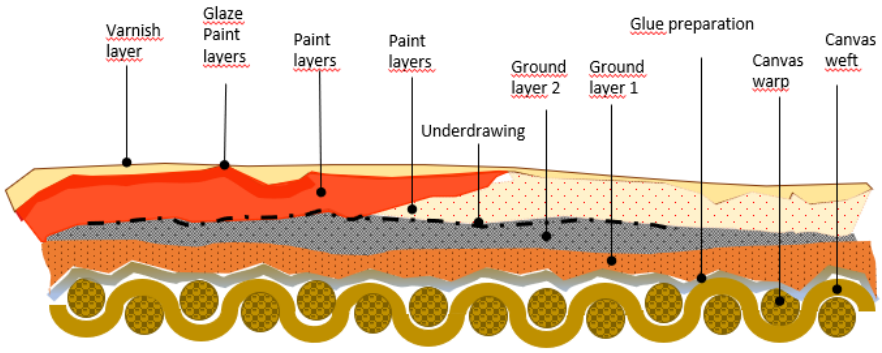


Figure 5 Schematic drawing of the layer structure of a painting on canvas. Variations in the structure occur depending on period and the artist’s technique. Drawing: Rothlind

The layer structure of the painting in Figure 5 represents a material build up typical for 17th century Old Master paintings, with a preparatory glue layer, and a double ground as described in the De Mayerne-treatise, organized, and classified by Gudrun Bishoff (Bishoff 2004). The canvas was usually stretched upon a wooden strainer, sometimes

after having been tensioned on a working frame with threads in a technique called lacing. When finished the painting was nailed onto a strainer with wooden pegs or nails.

Figure 6 . Strainer with fixed corners. (Sko1665) Photo: Rothlind/SHM/Skoklosters slott.

The strainer, an early type of auxiliary support, provided a structure with fixed corners joined with variations in mortise and tenon joint fixed with wooden dowels or pegs. From the mid- 18th century expandable wooden stretchers became more common allowing the support to be stretched with an even tension using wooden wedges or keys to expand the corners of the stretcher (see Figure 6. Strainer with fixed corners, 7. Stretcher with expandable corners, chapter 4.1.1.).

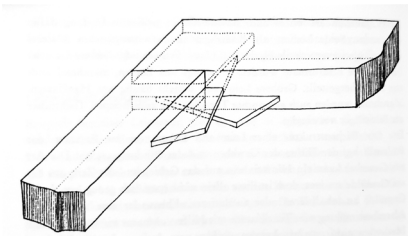


Figure 7 Stretcher with expandable butt joint corner with wedges. Drawing from Kühn 1974.

In some rare cases the paintings on canvas delivered from the artist on a roll to the commissioner were not stretched upon a strainer but nailed directly onto the back of the display frame as in the case of many works of art in the collection of paintings of

Skokloster Castle. The display frames had most likely been made to fit by the castle carpenter.

3.1.2 Change by natural ageing – graceful deterioration

The ageing process of painting materials is still until today not thoroughly studied. This applies especially for aged material in their real environment; therefore, uncertainties on the slow physical, chemical, and biological deterioration occurring in painting materials is broadly defined as change that may not be reversed. The following general description of graceful deterioration applies for oil paintings on canvas stored in favorable conditions, handled with care, and with no occurrence of vandalism or natural catastrophes in the environment to which the painting is exposed. In time all organic materials decompose. Early changes may occur related to the artist's technique playing a decisive role for the aging characteristics of the painting. The choice of strainer or stretcher, canvas weave structure, its preparation and paint layer application with composition of pigments and binders – all these together with a final layer of varnish, decide the structural aging properties of the painting.

Craquelure of the type called drying cracks, caused by the slow or faulty drying of the binding media, or use of certain pigments like asphalt, will result in areas with wide mesh cracks in the paint layer (Eibner 1928; Kühn 1984). The varnish layer is applied to protect the paint layer, but also to saturate the oil paint, preferably according to treatises applied one year after the oil paint has dried and the work is finished, hence it was usual for artists to apply egg white varnish as intermediate or retouching varnishes during the process of painting. During the Baroque period as reported by the Florentine Filippo Baldinucci in 1681 natural resins as mastic were used as varnish mixed with mineral or spiked oil with addition of Sandarac pulver or Venice Turpentine and Mastic in spirits to saturate colors (Koller 1984, 375). Varnishes have through history been known to yellow or discolor as they age – an effect that can be retarded by removing the varnish, a measure already mentioned by Albrecht Dürer in a letter to Heller dated 26th August 1509. In his letter Dürer warns Heller from allowing anyone to varnish his painting since all other varnishes will yellow by which Heller´s painting would be destroyed :

> *"…***besonders Fürneis** den man sonst nit kann machen, uf ein neues überfirneissen so wird sie aber 100 Jahr länger stehen dann vor. Lass sie aber sonsten Niemand mehr fürneissen dann **alle anderen Fürneis sind gelb**, und man wurde Euch die Tafel **verderben**" (Taubert 1956, 17).

Oil paintings tend to darken and yellow partly due to the aging properties of the materials themselves, possibly causing unwanted chemical reactions when materials incompatible with each other interact. Darkening has been known to be caused by dark iron oxide containing grounds, and by linen oil as pigment binding media. Hence nut oil, or even á tempera with glue with varnish was recommended for use with blue pigments like smalt or ash blue in the de Mayerne manuscript, not to have the blues lose its color as linen oil eventually yellowed (Berger 1975, 119). Pigments, like green copper resinate (verdigris), in the Netherlands known as Spanish green, was made by exposing copper plates to vapors of vinegar producing a beautiful green corrosive crust on the surface of the plates. If the plates were treated with salts before a deep green mixture of copper acetates and copper chlorides was produced (Wallert 1999). Later this green became known in time to oxidate and darken to brown or almost black in Old Master paintings (Van Eikema Hommes 2001; Koller 2013). Not until very recently research has shown light exposure to be the reason for the grade of darkening due to oxidation resulting in chemical decomposition of different compositions in the pigment: copper resinate to copper acetate; linseed oil to boiled linseed (Alter et.al. 2019). The popular organic yellow or red dyes were known to be fugitive, i.e., known to fade when exposed to light already in the 17th century, traditionally applied as transparent glazes mixed with oil or varnish in the finishing stages of painting (Berger 1975, 199). As Koller points out many are the Baroque paintings today that have lost their original depth of colors due to fading which we only may find proof of looking under the rabbets of the picture frame where the original color hue has been preserved (Koller 1984, 364). Lead white pigment in oil becomes translucent in time due to a chemical process called saponification, revealing underdrawings or changes to the composition (pentimenti) during creation by the artist. In time the light refractive index of the paint layers changed making them more transparent – a mechanism that has not been fully understood until today (Ludwig 1893, Chen-Wiegart et al. 2017). All the above changes in the varnish and paint layer together change the tonalities, color balances, and possibly even the reading of forms in the

picture. Many of the above changes may be referred to as `patina´, often adding value and esteem to the work of art.

An important basis for the analysis of subjectivity considering change defined as *patina* approximating gracious deterioration is provided by the same framework, described by Paul Philippot in 1966 as a `normal´ effect that time has on material:

> "Normality" does not negate patina; it merely reveals that the concept does not concern material but rises from the critical domain and always implies an aesthetic judgement – for Philippot conservation was a critical act (Philippot 2004, 392).

Age craquelure in the picture layer is visible in almost all aged paintings on canvas. The development of craquelure is related to the hygroscopicity of the cellulose fibers of the woven canvas and thereby to climate fluctuations in the environment of the painting.

In conclusion the natural aging of materials depends on the methods of preparation and the artist´s technique, as well as on the environmental conditions. The mechanical movements, as shear between the composite layers caused by environmental fluctuations will eventually result in networks of age cracks in the more due to aging brittle varnish, picture, and ground layer. On the verso of the cracks the threads of the canvas become visibly darker in the cracks on the picture side due to the unhindered oxidation, enhanced by light, as well as due to the transport of moisture with airborne impurities, like mildew and bacteria, through the canvas. Also metals present, like nails or iron oxide preparations, may weaken canvas supports. The above changes are slow but irreversible in stable conditions. Patina on objects that have reached an equilibrium with their environment show little signs of deterioration for some time, as the process of change is slow (Urzì and Krumbein 1994, 112).

3.1.3 Change by damage functions – unacceptable change

The magnitude of change, described in terms of structural deterioration (i.e., damage), affect the structural performance of the materials (e.g., cohesion, strength), but damage function can also negatively affect the aesthetic function and thereby the value of a paintings on canvas (See Figures 8. and 9. chapter 4.1.3.). The physical, chemical, and

biological agents of change may aggressively shorten the lifespan of paintings if allowed presence.

The chemical changes caused by oxidation in ageing materials may result in embrittlement of pigment binding media losing contact with the pigment in the paint layer, which may cause the color to look grey, a phenomenon called blanching, and found to be related to high relative humidity levels. With the movements of the support, cracking in the picture layer will occur. The cellulose in textile supports suffer from ageing through hydrolysis and oxidation, losing firmness and flexibility, and finally becoming brittle. According to Stephen Hackney, hydrolysis reactions, the contact with water, seems especially important, because hydrolysis leads directly to the loss of strength by breaking and shortening the polymer chains of cellulose (Hackney 2020, 118).

Historically, the use of albumen or egg white varnishes, as described by Cennino Cennini in his Craftsman´s Handbook, was used by artists and later by picture restorers has upon drying reportedly had the sufficient strength to cause the development of craquelure in the paint layer, on its own, or mixed with gum, sugar, or honey, to reduce tensions while drying (Cennini 1960; Nicolaus 1999, 314). As structures, paintings on canvas are known as extremely vulnerable, the material layers are `working´, behaving differently reacting to changes in environmental conditions. The mechanical behavior of the structure can be described as highly reactive (Mecklenburg 1982; Michalski, 1990).

Exposure to uncontrolled environmental conditions may cause change to the material or the geometric properties affecting the structural performance of the support. Unacceptable changes in paintings on canvas are for example a partly detached support from a strainer/stretcher, tears, holes, or severe 3D bulging creases or deformations in canvas. Originally taut and plane, the diminished capacity in the weave structure may result in deformations and sagging of the canvas. The deformations and the loss of tension in damaged parts may affect the picture layer negatively, the 3D surface structure may indicate loss of cohesion, visible as tenting of paint or delamination between the different layers of the composite structure resulting in flaking or powdering and finally loss of original ground, paint, or varnish. High humidity levels risk the survival of the work of art as a whole or may limit the damages to certain layers, like the varnish layer in the

composite structures affecting the reading and limit its use due to aesthetic damage or fragility (Herrschaft 2012). Failure due to other agents of change as biological deterioration of binding agents caused by microorganisms, mold, and fungi may result in co-association of damage functions.

On a molecular level – invisible for the eye to detect - deterioration in canvas may be a result of change, measurable as increased brittleness due to change in the degree of polymerization (DP) of cellulose (Oriola 2015).

Figure 8 Tenting, craquelure, and losses in paint layer. Still life with birds. Photos: Author

Figure 9 3D Bulging and crazed varnish. Portrait Seved Bååt.

With paintings on canvas, it is a challenge to be general. This is why the parameters to describe system performance will be twofold, according to the definition by IIC where functions of unacceptable change, dependent on agents of change, which implies a value-based decision needs to be applied to the analytically determinable change, i.e., empirically derived rate of deterioration. In this case-study these decisions are referred to as breakpoint values, signaling the point of discontinuity, when optimal transfer of significance embedded in the tangible or intangible values becomes endangered by unacceptable change.

Damage functions, also called agents of change, have historically been the focus of interest. Developments in the late 20th century study of change to heritage and museum collections in preventive conservation have also been towards a paradigm shift in preventive conservation from the individual object to the environmental conditions of object collections. The ABC-method was the first risk assessment management program, outlined in 1987, and published by conservation scientist Stefan Michalski (1990) (Michalski 1993). His nine agents of deterioration wall charts were the first systematic framework that outlined preventive conservation, disaster planning, and remedial conservation for museums. The list was appended by conservator Robert Waller in 1993, adding one factor to the previous nine, that of object dissociation. The now 10 agents of deterioration: physical forces, fire, water, thieves and vandals, pests, contaminants, light and UV/IR radiation, incorrect relative humidity, incorrect temperature, and dissociation are assessed to eliminate detrimental forces systematically and methodically on collection level, ticking the boxes of a chart comprised of recommended benchmarks and standards for a best practice collection management (Waller 1994). Lately, a quick risk scan and value assessment tool, evolved from resource management focusing on value management, named QuiskScan, was presented by conservation scientist Agnes Brokerhof et al. (Brokerhof & Bülow 2016, Brokerhof et al. 2017). The introduction of the concept of developing value of collections pushes collection management to become active – more progressive.

Management tools for risk assessment – some of them published as handbooks may work as useful “mind-setters" for resourceful museum organizations. They may provide a good overview of the preservation conditions and open up for interdisciplinary communication when drawing up conservation policies. Critique towards this paradigm shift in conservation has been presented by Jane Henderson (2019). Her wish is to rebalance collections care literature away from collecting figures back to developing thought processes. She points out that these rational decision-making methods may result in the collection of inaccurate or subjective data masked by over-confident interpretation and offer false insight into collection condition (Henderson 2019). Regardless of which risk assessment tool is chosen and implemented the methods give at hand relativities, at best a standardized estimate, an assessment of evaluated risk for damage functions (Strlič et al. 2013)

From benchmark thinking the step to assessing the factual state of preservation of the collection seems distant. Risk assessment processes approach the object from the outside. In assessing the condition of a work of art the approach is working from the inside out, based on a systematic examination and diagnosis, the primary evidence of the preservation state. Arriving at right decisions for safeguarding cultural heritage objects on collection or object level may be less data-greedy and laborious.

Ideally these two systems of assessment, risk-assessment and quantified condition survey data combined might provide informed empirical evidence, forming the base for C-R decision-making. Damage functions causing unacceptable change, requiring decision-making considering intervention that will somehow affect object significance, are discussed further in the research design chapter below and the following case study.

3.1.4 Changes by a foreign hand – C-R history

Old paintings are rarely untouched – they may have later additions, exhibition labels, inventory numbers, and inscriptions by owners. Interventions have mostly been made with the best of intentions, aiming at caring for the object to prevent deterioration. Unfortunately, some interventions have historically proven to cause irreversible change. The materials and methods used may in the worst case scenarios have accelerated material deterioration. A weakened support may have been lined (a historical conservation method where a second canvas is adhered to the back of the original), as a means in firsthand to strengthen the canvas, to mend holes and tears, and in the same procedure often aim to consolidate the adhesion of the picture layer. There may be fillings of old losses in the ground and/or paint layer, and finally retouches or overpaintings on the damaged parts, and finally original or added layer(s) of varnish on the picture layer.

Paintings have through history been enlarged or reduced in dimension or even separated from the original composition or connecting parts – either by the original artist or later by foreign hands. The original size of the work has also been changed due to C-R or reframing. Many are the paintings that have had their original tacking margins cut off due to lining or just because they had become frail. Strainers have been changed for sturdier stretchers, and sometimes the canvas support has been marouflaged, that is, glued upon

a stiff support, e.g., a wooden board. All the above physical interventions have affected the history and material integrity and authenticity of the original. Some interventions have altered the aesthetic appearance – the surface structure, the tonality, or the light refraction index of the painting. The earlier historical techniques of total transfers, e.g., oil paintings were removed from their original picture carrier either a panel or canvas and glued on a new canvas. The method, invented and developed by the French restorer Jean-Michel Picault (1750 – 1794), was very much dependent of the tacit skills and knowledge of the restorer. In 18th century Sweden the portrait painter Eric Hallblad (1720 – 1814) had learned the secrets of the trade of both transfer and lining of paintings in Paris. He kept the secrets of the trade and excelled in applying these methods, becoming famous enough to have paintings sent for conservation from abroad, mainly from Denmark and Germany. He was the first state contracted conservator, the `Garde du tableaux´ of the Royal Collections appointed by King Gustav III (1746 – 1792). Maude Bennel (1985) writes that Eric Hallblad on the 11th of April in 1783 was given a Royal Order to write a detailed account of his working methods and contract an apprentice to whom he was to reveal his working methods and the secrets of the trade of transferring paintings, restoring them, and preserving them from harm. The contract between Eric Hallblad and his pupil Johan Wångberg was drawn up in Stockholm in 1783 (Bennel 1985).

Until the 18th century painters restored works of other artists – a tradition already mentioned by Pliny in his Natural History (Plinius 77). Peter Paul Rubens is known to have restored works by other artists during his mission to Spain in 1603 as the works he was travelling with on behalf of the Duke of Mantua had been water damaged and started to mold in their wooden crates due to unfortunate rainstorms following their path from Italy to Valladolid (Jaffé 2004). Until the beginning of the 20th century it was the painters who specialized in conservation and restoration. The critical and ethical views on conservation were already acknowledged in the late 1820´s in Germany, where Christian Phillip Koester would write his three books published on the ethics in conservation and restoration. It is already with Koester that the early ideas of `minimum intervention´ are traceable. Facing the huge task together with Jacob Schlesinger, also painter and restorer, they would conserve the royal collections in Berlin and Potsdam considered to be in an alarming condition (Koester 1827; Skwirblies, 2012).

Some structural conservation strategies, such as lining or de-lining, have had its disadvantages documented, and by necessity, been questioned in favor of minimum intervention alternatives (Makes and Hallström 1972; Prescott-Percival 1975; Koller and Prandtstetten 1981). Uncritical use of ” methods in fashion” or any remedial conservation treatment, a material or method as a standard or as a prophylactic measure needs to be questioned (Schiessl 1987). Controversial debates and critics have been a positive driving force, not just for conservation science – but also for conservation practice. Dissemination and transfer of critical knowledge into the future may become a concern unless acknowledged by the present active generation of educators and practitioners.

3.2 Documentation – for managing change and significance

In this chapter I will discuss the elementary twofold role of documentation in heritage conservation managing change – a method for the continuous re-interpretation of the modifications of significance in paintings in a timely continuum (Hodkinson 1990, 60). Monitoring change becomes the critical act assessing need of conservation-restoration actions and measures following stewardship ethics and the normative texts expressed for the first time internationally in The Venice Charter demand for continual maintenance of cultural heritage.

3.2.1 The short history of documentation

Laying the foundation for the protection, identification, and condition-relevant information, with technical or scientific facts, later to be used as evidence of the preservation history, documentation informs considering the physical state of the objects. Documentation kept together with environmental condition data can act as a measure for the prevention of risks, which responsible specialists should keep a record of as recommended by UNESCO, and as defined in Article 16 in the Venice charter (ICOMOS 1965; UNESCO 1978).

The tradition of documentation in conservation is a surprisingly late development. Friedrich Rathgen, considered the father of conservation science, was according to Karl Faltermeier (1994) the first to notify documentation in 1898 in his book first published in German, titled **“Die Konservierung von Altertumsfunden”**, a work later translated to

English in 1905 and published internationally. In his book Rathgen besides explaining in detail his work on the archeological objects points out the importance of photographic documentation before conservation treatment in case some accident would happen during treatment. He also thoroughly explains the methods and materials he used in each sample case. Half a century later Harold Plenderleith wrote a few lines on documentation in his book **"The Conservation of Antiquities and Works of Art".** According to Faltenmeier handbooks in conservation were still missing a chapter on documentation until the 1980´s. A few lines in conservation journals might note on models for "multiple-choice" -charts to be used in documentation. Due to the short history of documentation practice today the lack of documentation is a fact especially in the management of historic house collections. In case some notes exist these often are shorthand and laconic readings regarding methods of treatment, and materials used. Photo documentation becoming available in the early 20th century provides at times important information filling out missing written information. All archival information to be found regarding notes on interventions, conservation reports make the task of the conservator less complicated. Faltenmeier compares the task of the conservator who has to work on objects without knowing how and with what they were treated may have:

> …a similar fate to Columbus, who sought the seaway to India and landed in America. Only great experience, knowledge, and a good portion of luck lead to success on the way to preserving cultural assets. (Faltermeier 1994).

The above applies to the paintings that have been restored, which in the western world of museum collections applies to a major part of collections. Still, paintings that have not had conservation treatment exist. These works are of major interest for the study of damage functions in "known" conditions. The nature of changes caused by physical factors and time, eventually result in decay due to the exposure to physical components that include vibration and shock, thermal energy transfer, electromagnetic radiation in visible, ultraviolet, and infrared region, the interactions with liquid and gaseous water, micro-organisms, and disasters.

Systematic examination of paintings and reporting on their condition is historically a rather late development, meaning many collections lack historical data. It is in old, major collections that we today may find systematically kept notes on C-R measures dating

back to the 18th century on great paintings, such as **The Tribute Money** by Tizian, painted in 1516. The C-R documentation for this painting has been meticulously kept since the artwork arrived at Dresden Gemäldegalerie Alte Meister in 1746 (Bachmann 1989). For easel paintings documentation follows a certain method. It was not until the Venice Charter, applicable for both buildings as well as art works as monuments, in its Article 16. the claim was made for: "…precise documentation in the form of analytical and critical reports, illustrated with drawings and photographs. Every stage of the work of cleaning, consolidation, re-arrangement, and integration, as well as technical and formal features identified during the course of the work, should be included" (ICOMOS 1965).

Early historical examples are for example the method of Primary documentation introduced by Heinz Althöfer in 1963, the same year as a systematic scheme for easel paintings was approved for legal sufficiency and published 1964 in the Murray Pease Report in the IIC American group standards for practice and professional relationships for conservators (Straub 1967; Pease 1964). In 1972 the International UNESCO Convention developed condition reporting further based on the Althöfer structure of primary, secondary, and tertiary documentation, and in 1982 the original documentation following Manfred Koller (Pease 1964; Straub 1967; UNESCO 1972; Nicolaus 1999). In Rolf E. Straub´s view works of art are to be treated as documents of the artist´s personality, their cultural and historical situation in time. This is why the conservator should not only preserve every particle of a painting but should also be able to give an account of the previous state of the work and the steps taken to preserve it for a long time to come. All this was to be done in respect of the `original´, the painting as primary documentation (Straub 1967).

Today in Europe, the documentation process, e.g., drawing up a condition report for movable cultural heritage objects, have been standardized. The standard is general, referring to established object specific methodological recommendations for drawing up the object description (SIS/TK 479: 2012). Documentation comprises all the facts, that is statements supported with evidence, collected, and systematically retrieved during examination and diagnosis, assessment of both internal and external conditions, the C-R process, combined with archival information, scientific material analyses, photographic

or other pictorial representation, and finally during monitoring use, movements, exhibition, and storage.

3.2.2 Documentation for maintenance of ethics and standards

In the introduction on condition reporting of easel paintings The Canadian Conservation Institute (CCI) points out that such a routine provides a backlog for any changes in the condition of the painting(s) (CCI 1993). How often the collection of paintings is surveyed is a question of personnel resources, but for a sustainable collection management regular condition audits are elementary. Assessing the condition of complicated structures as those of paintings on canvas require systematic information retrieval. A regular, and careful visual examination of paintings is the prior source for information for understanding causes of deterioration. The gathering of information being question-driven, regardless of scientific, social, or cultural, information retrieval is the basis of documentation upon which C-R decision-making is founded. Our ability to extract information from works of art is subjective and relative. It has to be emphasized that the information we gather is based upon our roles, timely training, experience, and knowledge (Orna et al. 1994).

The condition report is to contain information necessary for interdisciplinary communication. It is the foundation for sharing C-R decisions with others than conservation professionals. Collection of archival data on object history may assist in the assessment of deterioration rates which in turn may direct or defer the prioritization of C-R measures. Documentation and quantification of phenomena in real life conditions is fundamental as all remedial conservation actions and measures need to be considered in relation to the environmental conditions of the object. The ideal situation for collection management is that each painting belonging to a collection has been systematically documented, and condition reported on acquisition.

Weighing durability vs. fragility to maintain value and safeguard authenticity in a sustainable way is the objective for conservation. Retarding deterioration by lowering the amplitudes of cyclic stress and degradation caused by environmental factors, handling, and use can ideally be achieved by creating the ultimate environment where paintings

were exposed and accessed in a dynamic equilibrium with the physical environment. Consequently, when the physical structure begins to deteriorate, loss of use-value will eventually affect loss of context, social, cultural, symbolic, or environmental – deterioration in cultural heritage objects in the end remind us of our responsibilities to society. This is why change caused by deterioration needs to be defined to be understood.

If change is defined as damage or deterioration, the question of why and what may have caused the at times visible change need to be examined further to arrive at a differential diagnosis – the causal relationship. Therefore, documentation of objects in real life conditions is fundamental. Departing from state-of -the-art knowledge of conservation materials and methods, respecting the material, historical and conceptual authenticity of the object, the conservator needs to arrive at a diagnosis and a proposal for remedial treatment to prevent further loss of original material affecting object significance.

Historical and archival data consisting of condition or conservation reports may provide an important backlog source of information for estimating rate of change. The real-life conditions being complex questions regarding how agents of change co-associate, inhibit, accelerate, act individually, synergistically, or antagonistically on exposed aged artist´s materials continue to be answered (Koestler et al. 1994; Moroz 2011**).** For these phenomena we need a shared language, a glossary of terms we may perceive and understand regardless of our training. Where are the breaking points for disagreement regarding heritage values, which values do we agree upon, and are there really no value hierarchies giving guidance? Some writers have proposed there ought to be an option to construct or select a local or bespoke hierarchy of value attributes (Ashley-Smith 2018, 14). How would such a bespoke set of value hierarchies relate to conservation ethics? Or would this open up for an adapted local set of attributes or values where the representation and use of cultural heritage would be looked upon differently regarding state of preservation – allowing a higher level of risk and an ethical drift in how object function and use are perceived. Another option is using quantified documentary data:

> … the difficult condition of material authenticity, and onto documentary notation, as authenticity becomes a matter of the (play of) accuracy with which the present cultural apparatus plots an object and provides a full

> commentary on how its particular interpretation relates to that of its predecessors (Kemp 2009).

As the methodologies of material science have become the most authoritative means of object description then, concomitantly, they have also become the authority for legitimizing much of conservation practice. And in so doing they ensure their own transmission, and that of their essentialist epistemology, through the preservation of the material object (Kemp 2008, 61). It is well noted elsewhere how 'scientific analysis' can be successfully applied when concerned with **isolated phenomena**, but less able to respond when facing complexity and revealing its probabilistic nature in its specifications when matched with real world behaviors (Muñoz Viñas 2005, 121-129).

3.2.3 Documentation versus Risk assessment

Developments in the late 20th century study of change to heritage and museum collections in preventive conservation have also been towards a paradigm shift in preventive conservation from the individual object to the environmental conditions of object collections. The ABC-method was the first risk assessment management program, outlined in 1987, and published by conservation scientist Stefan Michalski in 1990 (Michalski 1993). His nine agents of deterioration wall charts were the first systematic framework that outlined preventive conservation, disaster planning, and remedial conservation for museums. The list was appended by conservator Robert Waller in 1993, adding one factor to the previous nine, that of object dissociation. The now 10 agents of deterioration: physical forces, fire, water, thieves and vandals, pests, contaminants, light and UV/IR radiation, incorrect relative humidity, incorrect temperature, and dissociation are assessed to eliminate detrimental forces systematically and methodically on collection level, ticking the boxes of a chart comprised of recommended benchmarks and standards for a best practice collection management (Waller 1994). Lately, a quick risk scan and value assessment tool, evolved from resource management focusing on value management, named QuiskScan, was presented by conservation scientist Agnes Brokerhof et al. (Brokerhof and Bülow 2016; Brokerhof et al. 2017). The introduction of the concept of developing value of collections pushes collection management to become active, and progressive.

Management tools for risk assessment – some of them published as handbooks may work as useful “mind-setters" for resourceful museum organizations. They may provide a good overview of the preservation conditions opening up for interdisciplinary communication when drawing up conservation policies. Critique towards this paradigm shift in conservation has been presented by Jane Henderson. Her wish is to rebalance collections care literature away from collecting figures back to developing thought processes. She points out that these rational decision-making methods may result in the collection of inaccurate or subjective data masked by over-confident interpretation and offer false insight into collection condition (Henderson 2019). Regardless of which risk assessment tool is chosen and implemented the methods give at hand relativities, at best a standardized estimate, an assessment of evaluated risk for damage functions (Strlič et al. 2013).

From benchmark thinking the step to assessing the factual state of preservation of the collection seems distant. Risk assessment processes approach the object from the outside, often being disconnected from object condition data. In assessing the condition of a work of art the approach is working from the inside out, based on a systematic examination and diagnosis, the primary evidence of the preservation state to establish causal relations for understanding mechanisms and reasons for deterioration. Arriving at decisions for safeguarding cultural heritage objects on collection or object level condition assessment may be less data-greedy and laborious – monitoring objects in their environment will in time provide valuable raw data for detecting causality and information considering rate of change. As heritage these connections are value-laden, originally created within a special context in time and space, therefore, when applying knowledge making conservation decisions, we need to have the insight in the signification stated in the New Orleans charter to “…consider and recognize being part of a continuum, we are neither the first nor the last to affect the preservation of historic structures and artifacts” (AIC/APTI 1992). This consideration is motivated, as pointed out by Mary Orna et. al, since our ability to convey the culturally significant information may be limited – that is why objects do re-emerge or disappear from social consciousness – at times due to conflicting views regarding their intrinsic qualities, or our lack of knowledge, resources, or suitable methods of research (Orna et al. 1994, 53). This is why the desirable levels

of intervention must take as principle: as little as possible – only as much as is necessary – the minimum intervention principle.

4 Results

In the following chapter examples of C-R decision-making processes picked along the longitudinal timeline of the historical case-study are deconstructed using the FDA for the analyses of sampled “corpus of statement” –passages from the multidisciplinary discourses expressed in written material. The conservation examples containing the FDA analysis in the conservation knowledge framework are presented decade vise. After each presentation, an analysis of the FDA discourse is made interrogating decision-making for conservation knowledge expressing theoretical, and ethical as well as social content.

Each decade following the acquisition of the building with the mixed collections is reviewed through examples which are analyzed using the experimental research design of FDA in the E.C.C.O. C-R knowledge framework as described by E.C.C.O. Competencies (E.C.C.O. 2011). The knowledge areas recognized in the analysis of the discourse of each time period are presented graphically by marking the concepts represented in the discourse in the E.C.C.O. concept map to visualize the decision-making narrative. The identified concepts from the C-R concept map are named in each heading of the analysis chapter. The concepts are noted in writing, signified by using text in **bold** for each concept.

4.1 Turning the Kaleidoscope 1967-1977

The process of becoming a museum had begun several years before the acquisition date. A thorough documentation of the quality of the collections and their state of preservation had been made in which the costs for conserving the paintings collection was estimated to 1, 2 million Swedish Krona (Edenman 1967, 6). Activities of the first decade were extensive after which state funded restorative campaigns would decline. Over the decades collection management activities have been documented in many different forms, and it is this material that has been the source material for my research. As an experimental both in a theoretical and empirical sense the aim of the retrospective

case-study is to investigate the kaleidoscopic (i.e., constantly changing, or fragmentized) and dichotomous nature of the knowledge base of C-R decisions in a historic house museum setting managing a collection of paintings on canvas. The first analysis was a test sample to look into the general focus of the partnering institutions and the stakeholder on the planned restorative actions for the collection of paintings when conservation and restoration work was begun in September 1967. Selected paintings were chosen by the institution representants and taken to the studios for C-R of ITAM and NM in Stockholm.

4.1.1 Example 1 Setting the scene: **stakeholder demands, norms, values, and assessment of needs**

In September 1967 ITAM declared their program approach for the Skokloster Castle restorative actions was to represent a new, experimental activity, aiming at developing methods of documentation of paintings, technical analysis, as well as conservation methods. Also, the objective was to differentiate natural ageing from damage caused by external factors. Deterioration caused by damp was not to be assessed as prioritized even if the paintings would look `horrid´, nor would tears or holes need prioritized treatment – unless direct water damage had been documented (Hallström 1967; 1973).

NM, in turn, represented a long line of European fine art museum tradition and experience in conservation practice, following the international conventions of the ICOM (International Council of Museums) and the IIC (International Institute of Conservation of Historic and Artistic Works) considering technical documentation and methods for conservation, as well as management of collections of paintings in the NM and the Royal Castle´s Collections (Wennberg 1972, Schiller 1972).

During fall 1968, 677 paintings located in the castle on acquisition were condition surveyed by ITAM conservation students and conservators. The condition categorized in three categories (I – III), considering damage and urgency of treatment would show that, ca. 30 % (219) needed remedial conservation (category I), of which 10 % called for urgent measures to prevent loss. Almost 40 % (267) needed preventive or remedial conservation in the near future (category II). The two categories (I and II) representing

70 % (486) of the surveyed artworks needed remedial conservation within five years. Nearly 30 % (194) were assessed to need aesthetic or restoration work (Hallström 1968).

4.1.2. Analysis Example 1 Setting the scene: **stakeholder demands, norms, values, and assessment of needs**

Initially, to use the C-R process term for the concept map, ITAM declared their institutional aims to be developmental and experimental considering **examination and analysis, documentation, visual examination, non-destructive/destructive analysis, type of direct action**. NM as initiators of the collection conservation project followed their traditional stakeholder demands for C-R – their mission was not planned to deviate from their main aim and objective of preservation of the collection of paintings through C-R as a national fine arts institution following the normative declaration of the international charters, Professional guidelines, and Codes of ethics.

The differing aims communicated by the partnering institutions on the onset. ITAM stating the institutional aims as an experimental activity towards method development was possible to define as **research** activity or R & D. Considering the concept map research is not included in the central spine of C-R process. The aim and objective of NM was planned to follow the C-R process central spine. This difference in how aims and objectives between the partnering institutions were looked upon might have been a source for conflict development for the planned project.

Both institutions had chosen paintings from the collections to be conserved. These had been brought to the studios for examination and diagnosis and for consulting the board of trustees on C-R during 1967. A major part of the collection of paintings on site were condition surveyed for setting up a C-R plan for the coming years. This initial condition collection survey provides a back log and secondary data for discussing the historical impact of C-R decisions made during the coming five decades of management

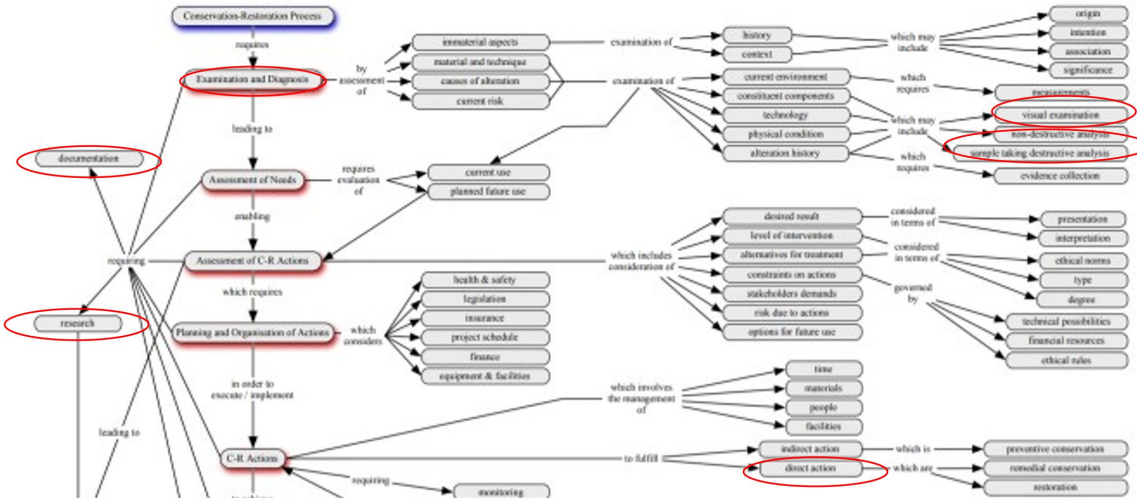


Figure 10 A visualization of the knowledge areas/concepts present in Example 1 discourse analysis Setting the scene for the coming C-R joint project.

The initial quantified collection condition survey showed two thirds in rough numbers of the collection was in need of remedial conservation measures within a period of five years. Accordingly, plans were made to treat ca 500 paintings during the state financed period (Hallström 1968, 2).

4.1.3 Example 2 –The Castle and The Wild Boar

Architect Ove Hidemark, assigned on acquisition of Skokloster Castle to the Swedish state to lead the building restoration managed by the National Board of Public Building. He explicated the objectives of the building restoration program five years after project start as:

1) To help a building, which in certain parts is in a rather poor shape, towards a new lease of life on its own terms.
2) To take care of the building as a whole and endeavor to preserve its identity, both as a physical structure and as living history. Here are included **all features**, from the 17th century and right up until our own day.
3) To interfere as little as possible, avoiding both additions and touching up, and erring on the side of omission rather than excessive action.

4) Where interference is unavoidable, to seek solutions which, as far as possible, resemble those which might have been adopted by the 17th century builders (Hidemark 1972).

Representing movable cultural heritage, **"The Wild Boar"**, by an unknown master, a larger than life size painting, depicting a wild boar, shot by General-Governor of Pommern, Count Carl Gustav Wrangel, in November 1664 in the woods of Eldenau, near Greifswald, Germany, was considered a hunting trophy on commission. The inscription, fragmentarily preserved today, is known only as notes taken down by visitors. Elias Brenner wrote the most complete transcription in 1709, the other attempts were notes made in 1734, and 1761, retelling the boars´ humble testimony, the glory of having been hit by a well fired shot by the Gothic Mars (Count Wrangel).

In 1967 assessed to be in a ruinous condition the painting was conserved. Meyerson, curator of weapons, writes in his article **`Two Hunting Trophies – A Wild Boar and a Wolf – at Skokloster´:**

> It has now been taken care of, the flaking paint has been fixed, but the losses have not been replaced; where the canvas is naked, it has been toned to diminish the contrasting effect to the parts undamaged. This is the correct conservation principle, giving the object the option of life, preserving its identity, bearing the traces of ordeals and adventures. A principle especially important for paintings preserved in their original environment (Meyerson 1970).

Having lost its original context on the Guest room floor in connection to the apartments, where the painting is recorded to have had its original location in 1728, the work probably due to its poor state of preservation was stored away into a privy in the mid-19th century. The conservation order dated 23 Nov 1967 states that the ruinous condition was decisive for choosing consolidation of the severe cupping and flaking of the picture layer by glue lining. Restoration was to be kept to minimum intervention. To lower the cost the work was to be performed by ITAM as student work (Malmborg & Hallström 1967, 1).

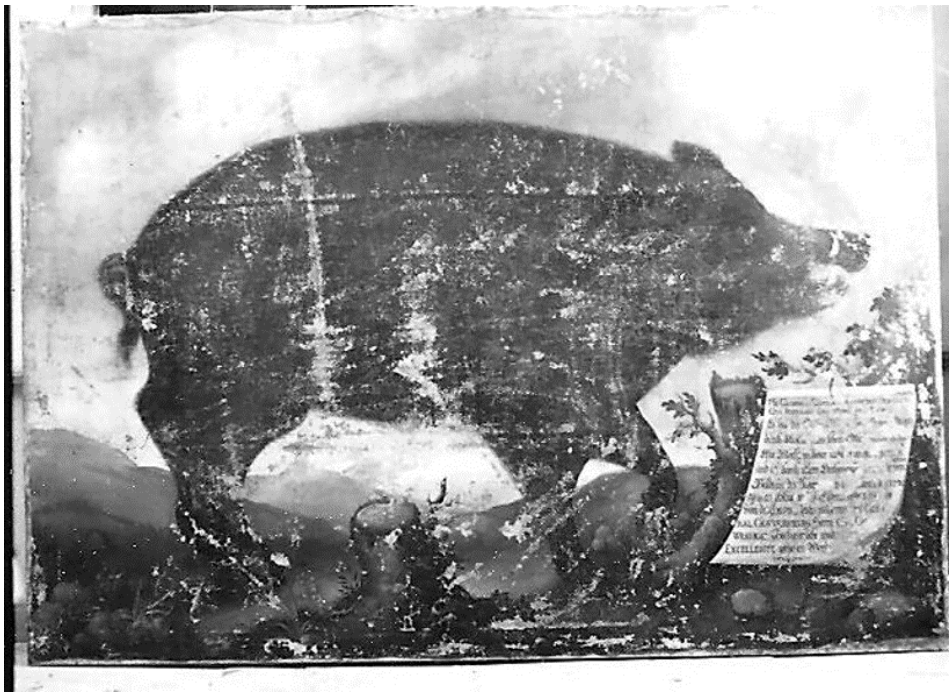


Figure 11 The Wild Boar, oil on canvas, by unknown artist 1664. Photo after conservation 1967. Skoklosters slott/SHM.PDM

After conservation, the painting was hung in room Rotterdam on the Guest room floor facing north without public access (see Figure 11 The Wild Boar, above chapter 4.1.3.).

4.1.4 Analysis of example 2 – **history, context, alternatives for treatment, minimum intervention**, and desired result

The building restoration program of Ove Hidemark followed by and large the normative texts of the articles of the 1964 Venice Charter for immovable and movable cultural heritage. Hidemark expressed the idea of preserving the different historic layers as well as the idea of `minimum intervention´ restricting restorative actions in his building restoration program five years in the working process.

The Venice Charter stated the aims and objectives considering conservation as an activity maintaining a heritage asset on a permanent basis and that this can be facilitated in the case of monuments if a socially useful purpose can be found (ICOMOS 1965). The

architectural interpretations would come to influence the views of paintings conservation as can be seen in the example of the movable object – The Wild Boar.

In his article on hunting trophies in the Skokloster collections Vice Chair of the Skokloster board Åke Meyerson expressed his view regarding a proper conservation considering the level *of* **intervention** having been made for a **desired result**. In the article object authenticity is explained through **history** and **context***,* the picture viewed upon as a historic document, accepting loss, wear, and tear (Malmborg and Hallström 1967, 1). The existing photograph after conservation in 1967 does not convey whether the bare canvas areas have been toned in as reported by Meyerson. The picture seems shattered by the old losses of original paint making the reading of the picture difficult – thereby impairing the recognition of form. Optically the perception of a pictorial image does not take place in isolation as the whole painting provides contextual clues for reading, assisting the viewer in his task.

Spike Bucklow (1994) studied the effects of craquelure in perception of images, finding the degree of ambiguity being partly dependent on the condition of the painting. He further asserted the ambiguity to be normal resulting from the painting´s intermediate spatiality and the need for the viewer to differentiate between "what belongs to the picture and what belongs to the intended reality" (Bucklow 1994). In the pictures below an effect of flattening the illusion of depth and perspective is demonstrated. (see Figure 12 chapter). For reading form the pair of pictures in Figure 14 and 15 (See Figure 13 below in chapter 4.1.4.) demonstrates the impaired reading of form vs. background caused by a contrasting network. The reading of The Wild Boar can after conservation exemplify both of these optical effects present compromising the reading of the artist´s intention. From an ethical point of view toning in losses was mentioned, but the photograph does not show the aimed effect of these being achieved.

The Venice Charter contained the more interventional ethos of managing change by controlling the agents of change, and regarding restoration the following is stated in the Article 9:

> …. Its (restoration) aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and

> authentic documents. It must stop at the point where conjecture begins… (ICOMOS, Venice Charter 1964).

In it works of art i.e., paintings are referred to as monuments besides buildings and sculptures. In this case the monumental size of the wild boar represented Man's interest and relation to nature – the artist's intent, and the use of the picture as a hunting trophy the aim seem to be lost – the huge boar has lost its power being shattered by the contrasting network of losses to the picture layer. The negative effects caused by of crackelure, or comparably in the case of the Wild Boar all losses for reading a painting are demonstrated in Figure 12 and 13. From a conservation point of view filling losses (lacunae) down to canvas in paintings on canvas have an important preventive function building a barrier for moisture transport which occurs up to 80 % through existing craquelures in the painting composite in a fluctuating humid climate (Moroz 2011).

Figure 12 Pair of images demonstrating the effect on a textural recession of a contrasting network impairing the illusion of depth and perspective. Pictures from Bucklow 1994.

The picture of the magnificent Wild Boar has due to unacceptable damage lost its function telling the original story – the hunting story once commissioned by Count Carl Gustav Wrangel – General-Governor of Pommern, instead, another tale takes turn, that of “ordeals and adventures” – caused by neglect, changing our way of perceiving the preserved elements, affecting representation and use, as well as affecting the value of

the object, all in accordance with the theory of cyclic relationship of conservation and object value presented above by Joel Taylor and May Cassar (Taylor and Cassar 2008).

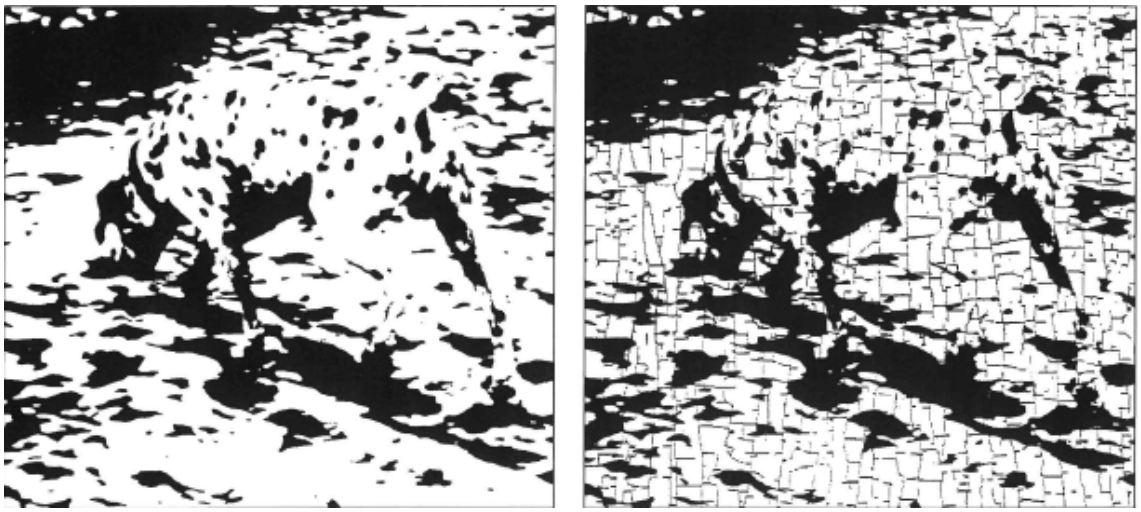


Figure 13 Pair of images demonstrating the effect on a textural recession of a contrasting network impairing the illusion of depth and perspective. Pictures from Bucklow 1994.

In the end the ethical question of restoration lies in respect of the artistic and unique character of the work and the person who created it. Regarding restoration, the Venice charter Article 12. statutes:

> Replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historic evidence. (ICOMOS 1964).

Restorations are reversible in their character, whereas cleaning or remedial conservation treatments are not. The condition surveys of 2000 and 2011 would find the glue lined painting infested by mold, with flaking and cupping of the picture layer, the thick varnish layer severely crazed, and blinded. The painting was assessed to need remedial treatment, the work located in a room without public access facing north with a highly fluctuating humid indoor climate location already in 1968 after conservation. The picture was due to a severely delaminated, blinded, and crazed varnish difficult to read in 2000/2011 (see Figure 14. Chapter 4.1.4.).

Figure 14 . The Wild Boar, oil on canvas, by unknown artist 1664. Photo: Rothlind 2011.

The example with The Wild Boar brings forth the choice of ‘doing nothing’ to an object rather than ‘doing something’ which according to Jonathan Ashley-Smith can sometimes challenge definitions of ‘respect’ He asks what is being respected if the damaged or unreadable object is left untreated and a real or virtual replica is created? Intangible aspects can take precedence legitimizing ethical approaches, but he asks what is being respected if objects are never allowed out of the risk-free waiting room?

> Leaving damaged or unstable objects in store shows indifference to the potential of objects to educate and inspire present and future generations. This lack of concern might be considered unethical, and the argument of insufficient finances does not lessen the ethical obligation (Ashley-Smith 2018, 10).

Following the C-R process of The Wild Boar through FDA combined with the C-R knowledge framework areas considered by the disseminator, the Chair of Skokloster board of trustees, the concepts marked with red rings indicate which aspects were considered by the stakeholder representative (See Figure 15 Chapter 4.1.4.). In the

conservation order other factors (black rings) were considered, those of financial restraints, time, and personal resources in consulting conservation decisions.

The dotted straight red lines indicate which areas were not discussed or argued during the C-R process. The public dissemination of the conservation contained value-laden statements regarding the decisions made having been proper – promoting a concept for coming conservation treatments of the paintings in the collection.

The decision for limiting actions and measures for safeguarding the cupping and weakly adhered picture layer by consolidating through structural conservation using glue lining was motivated through history and context.

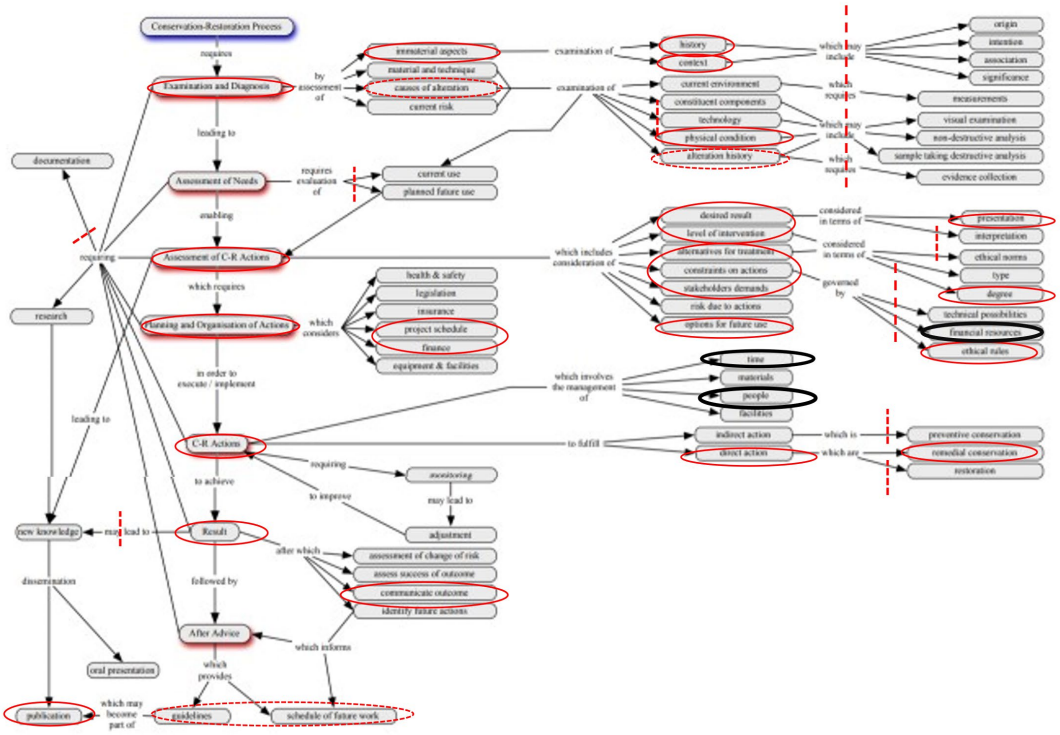


Figure 15 The FDA analysis of the C-R process of The Wild Boar depicted in the knowledge framework. The communicated concepts in a published article marked (red), conservation order (black), The dotted lines indicate which areas of C-R process were not considered.

The causes of damage looked upon as `historical´ – not as caused by neglect and poor conservation conditions related to high humidity levels. An undifferentiated view of decay as a value regardless of it being caused by damage function (unacceptable damage) claiming it to be patina i.e. – normal ageing is ethically problematic. Choosing not to restore the reading of a picture is a complex issue - which the analysis shows was an area of knowledge omitted in the discourse focusing on the structural conservation of the picture.

The immaterial and aesthetic aspects of enabling a reading of the maker´s intent was left out due to economic and time resources. After conservation, the painting was not hung on public display which is interesting in that aspect that the painting and the preceding process was explained and published in an article as an example of a method proper – for Skokloster Castle.

4.1.5 Example 3 Understanding deterioration **– indoor climate, desired results**

An indoor climate incident would be the onset of polemics between the two institutions; ITAM and NM on conservation methods. A letter to the board by the administrator reports on one painting showing fierce canvas deformations when put on display after conservation in November -69 (See Figure 16, chapter 4.1.5.). The indoor climate in the unheated castle, with low temperatures (T) and relative humidity (RH) levels above 90 % RH, had caused swelling resulting in deformation of the painting structure. The glue-paste lining method used would be criticized by the ITAM for causing conservation damage. Paintings on canvas are “working” in fluctuating climate lined or unlined and deformations in canvas occur in damp conditions with high RH (see Figure 16 and 17, chapter 4.1.5).

A special board meeting would recognize the need for further testing on adhesives used. The question of **current environment** adjusting T and RH in rooms where objects were stored was discussed by NM, as deformations had disappeared after moving the paintings to a room with a T of + 15 °C (Hedqvist 1972b, 1-2).

The partnering institutions were called to Skokloster for a conference in August 1972 . ITAM and NM, members of the board, the National Heritage Board, and the National

Board of Buildings would discuss the conflict regarding conservation. The administrator stated his commission was*:* "…to strive for a sound conservation technique, study of old paintings and the material degradation taking place". A task differing, according to the administrator, "…from that of Nationalmuseum, as a management organ, shall present a series of paintings representing public capital value", hereby expressing the differing institutional goals of conservation (Hedqvist 1972a, 30).

Board representant would state: "…all objects in the collections were valued equal. On acquisition, the castle with its object collection was one, not to be changed" (Hedqvist 1972a: 7). The board's view of the two different lines represented were described as:

> …the first line of approach would view the paintings as works of art, aiming at restoring them aesthetically, often requiring heavy restoration of the object. The other line of approach, would consider a cultural historical or historical principle, only doing what is necessary to set back the forthgoing decay, hereby accepting wear and tear (Hedqvist 1972a, 17).

Board trustee and NM Senior Curator and keeper of the Royal Castles´ Collections, was cited by Meyerson having stated the goal of conservation to be:

> Taking back the paintings to how they preferably looked when finished on the easel", and regards the indoor climate, "... if the paintings cannot withstand the climate of the castle, the climate at Skokloster had to be changed (Hedqvist 1972a, 17-18).

The view presented by the NM representative was experience based. NM had managed to stabilize the indoor climate of the National Portrait Gallery at Gripsholm Castle already in the late 1920´s Paintings, (some 340 of 1, 926 paintings), had suffered from low T resulting in high RH and mold growth. Head Engineer Fritz Jacobsson, thermo-electric specialist with the Royal Waterfall Board, found after five years of tests and study, a way to stabilize the indoor climate of Gripsholm castle. Electric heaters would be installed inside existing tile stoves, the latter installed in the castle in the 1770´s, as well as inside fireplaces. No negative effects would arise to the building construction, interior fixtures, or the collections (Almqvist 1927; Selling, 1937).

Figure 17 Deformation of canvas caused by large climate fluctuation on return after glue-paste lining from conservation studio to Skokloster Castle, Nov 1969 (Sko 3173). Photo: Björn Hallström.

Figure 16 Climate fluctuation induced deformation, Oct 2010 Läckö Castle, unlined painting Gripsholm Castle Collection (NMGrh 3432). Photo: Eric Cornelius/Nationalmuseum.

Jacobsson´s solution, still in use today, originally designed to utilize excess waterpower electricity produced for churches on Sundays, would through conservation heating create a stable indoor climate. Keeping temperatures during winter at the lowest at 6 – 7 degrees °C, previously observed condensation of water or even frost on objects could be avoided (Hahr 1924; Rothlind 2012). The 1993 collection condition survey of 509 paintings on canvas, mainly 17th and 18th century artworks displayed at Gripsholm at the latest, since 1866, 21 (4 %) needed remedial conservation in the near future, 25 (ca 5 %) needed minor remedial conservation or restoration, and 11 (0,2 %) of the paintings had minor preventive conservation needs (Dahlén, 1993).

The board acclaimed having commissioned conservation to fit the physical environment, emphasizing the uniqueness of Skokloster Castle. Consequently, deterioration was a value to preserve, the collections being almost untouched. ITAM asserted deterioration had ceased, or the process to be slow. Even if the condition of the paintings were

`horrendous´, many of them ruined by humidity and very fragile, the main objective would be to study the deterioration, preserving all, even dust, for study using new technical methods available (Hedqvist 1972a: 30; Makes and Hallström 1972, 29). As members of the ICOM and the IIC, NM would not accept the idea of bespoke ethics of locally adjusted conservation principles. There were no differing standards for **presentation** for NM nor the likewise unique Royal Castles – all collections were well-kept (Hedqvist 1972a, 44). Easel paintings were not to be reduced to mere material structures or parts of interior fixtures. They ought to be respected as objects with an individual function and significance,

> …the leading museums find it important to promote restoration techniques aiming a presentation of the artistic heir as far as possible for the viewer to have a similar optic-aesthetic experience as the timely viewers once had" (Hedqvist 1972a, 20).

NM conservators´ critics were forwarded with a request for clear instructions for *desired results*. Having received comments regards paintings having become **"too fine"** after conservation-restoration it was stated:

> … it would be a mission impossible to show all layers of history in an easel painting dividing it into different fields…all forms of temporary measures would tear and finally be destructive for the objects. No conservation measures ought to be done before loss of original material is at hand. The choice of technique and material must be proven traceable, stable, and sustainable. Clinginess and experiments on original, invaluable objects of art was not acceptable, with all chemical and physical damage caused" (Hedqvist 1972a, 44).

Here, discourse contained conflicting views considering the idea of applying building restoration principles in paintings conservation pointing out only unacceptable change would justify remedial conservation.

4.1.6 Analysis of Example 3

To conclude the discourse content in Example 3, the extracted passages expressed during the Skokloster conference held in 1972, and the preceding board meeting would bring forth several conflicting views between the partnering institutions regarding their

mission, the damage functions present in the current environment, the methods of conservation as well as the desired results – the aims and objective of the C-R process. The yellow circles in the expanded conceptual model map express the areas of concern and conflict with ITAM presented by NM, the red circles indicate the views of ITAM. The dotted red line at the bottom of the C-R process spine marks the unresolved interdisciplinary decision problem. The concept map visualizes several more areas having been referred to in the discourse considering wide principal issues – environmental conditions, methods of conservation, the desired result regarding presentation of easel paintings in a historic house museum compared to that of a museum environment

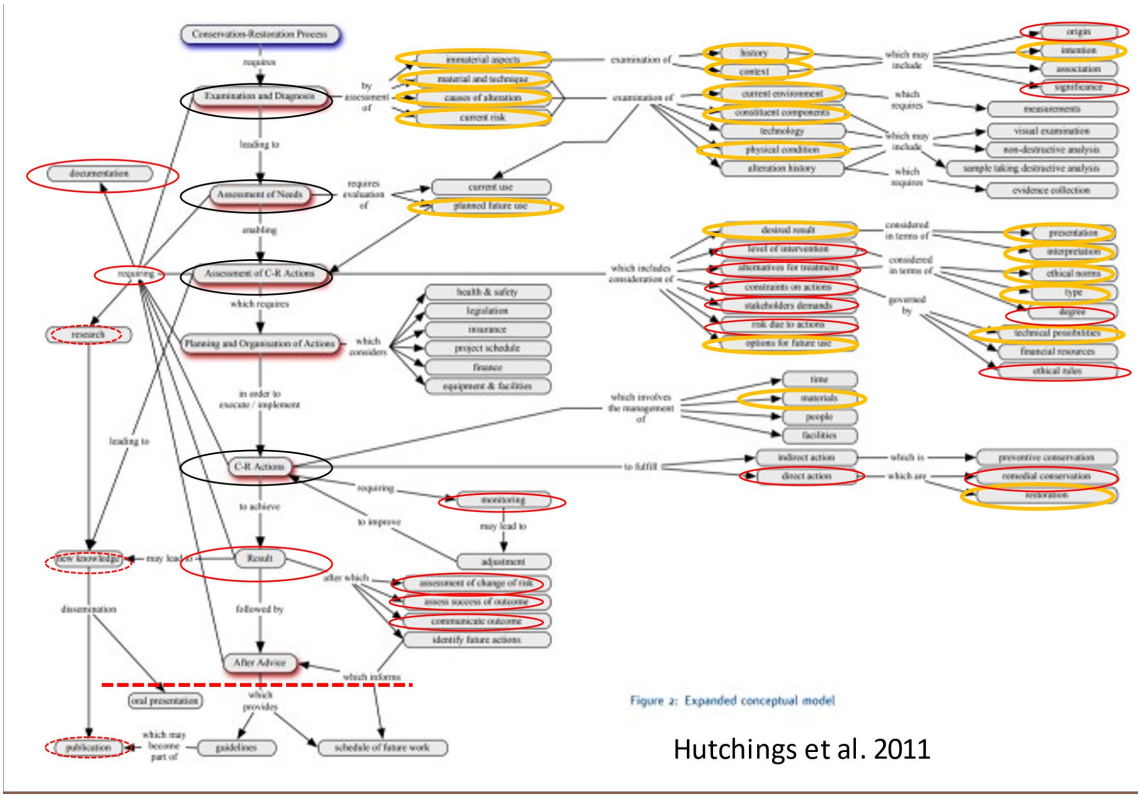


Figure 18 FDA analysis Example 3 The conflicting institutional views on current environment, type and level of intervention and desired result.

To depict the areas of knowledge where conflicting views were expressed yellow and red circles have been drawn within the C-R process concept map (See Figure 18., chapter 4.1.6.).

. The Skokloster board of trustees would disregard the fact that NM also managed the Royal Castle´s Collections housing mixed collections from the same time period as Skokloster Castle. Those participating in consulting represented different professional knowledge backgrounds: painter, curator (politician, art historian), architect, and conservator.

The discourse reflects the difficulties in reaching a consensus considering the views of intangible characteristics of paintings as artistic expressions and the idea that conservation aims to stabilize the structure – restorative means aim to retain the patina and reading of the aged painting as is eminently expressed by Hans Brammer. Commenting on the expressed will of C-R to attempt to restore a painting to its original quality Brammer emphasizes the imperative of leaving works of art as unadulterated as possible to remain historically and aesthetically credible - they ought to show all typical properties for its age which we consciously and unconsciously expect through experience:

> …restoring a painting to its original condition comes at the expense of historical originality. This natural ageing is not just an element of a painting's beauty, but also an element of a painting's authenticity. This is a historical fact we must respect. When we look at a 300-year-old Rembrandt, we must view it with the same perspective as we view a seventy-year-old person." (Brammer 1983).

The task of the conservator and the curator is that of having a sensitivity, experience, and knowledge to do the balancing act of respecting the aged material and immaterial integrity to preserve the historical authenticity and the forward significance of the work of art. One challenge is to express these qualities that very much lie in the domains of human perceptions – difficult to express and mediate in words.

4.1.7 Example 4 The Officer Portrait ensemble

Unacceptable damage, caused by incorrect RH **(current environment),** in 20 officers´ portraits painted by Georg Günther Kräill (1584 – 1641) during 1623 he painted 18 portraits, and two more 1624-1625, displayed in the 1st floor galleries connected to the open inner courtyard stairwells, were diagnosed with `Skokloster- disease´. A phenomenon described as moisture-transport of `proteinous materials´ through the

painting substrate to the picture surface. Irrespective of damage acknowledged being related to the indoor climate the adverse conditions would be described as:

> Practical experiments have shown this – by museum standards – extreme indoor climate to have been beneficial for the collections, and there are no plans for the installation of central heating. The actual museum environment, however, calls for special attention to the choice of methods and materials of conservation (Meyerson et al. 1972, 239-299; Makes and Hallström 1972, 3-44; Hallström 1973; Hallström and Göransson 1974, 3-19).

The above concluding remarks for the conservation project of the ensemble of the officer´s portraits do not specify which collections were found to prove the climate beneficial. The report in question discusses in detail the damages caused on one of the 20 paintings by glue-lining in the 1930´s. One portrait in the series had been lost and replaced by a copy painted in the early 20th century, probably due to degradation of the original painting. A reason for lining might have been that the condition of the painting was worse than the other paintings in the series. However, the damages of the lined painting were compared with another painting in the series on the basis of being painted by the same artist. The comparison in technique being only one variable considering the historic climate conditions in the corridors.

The ensemble of portraits located probably since 1667 in the courtyard wall niches on the 1st floor were moved from their original location, the old castle named the Stonehouse at Skokloster estate. The ensemble pictured in the 19th century lithography by Carl Johan Billmark depicting Count and Field marshal Herman Wrangel`s Officer comrades in arms from the Thirty Year´s war. The conservation project of the ensemble was referred to by ITAM lead as experimental, avoiding using the standard method for conservation at the time: glue lining. Instead, new synthetic adhesives for consolidation in combination with beeswax dissolved in balsamic turpentine was used on the canvas backs for impregnation to enhance the hydrophobicity of the painting materials. The mountings in the wall niches were made without stretchers allowing the canvases to hang free fastened by the architectural wooden framing. Old restorations and overpaintings were removed and old losses and damages were retouched. The harsh environmental conditions for the portraits positioned in a corridor with open stairwells directly connected to the inner courtyard fitted into inner courtyard wall niches was interpreted and promoted

by the castle architect, as what could, be described as `pseudoscientific ultimatum´, for paintings conservation at Skokloster Castle. ITAM Björn Hallström in his conclusion for the project characterized the conservation measures as:

> …relative treatment rather than absolute conservation. A special material or universal method of conservation can hardly be recommended, before a complete analysis is made of the item, its technical structure and condition (Makes and Hallström 1972).

The solution prescribed issued caution in choosing conservation methods. Methods used were to be compatible with the extreme climate for paintings on canvas, hence, the architectural premises would define the preservation conditions for the collections.

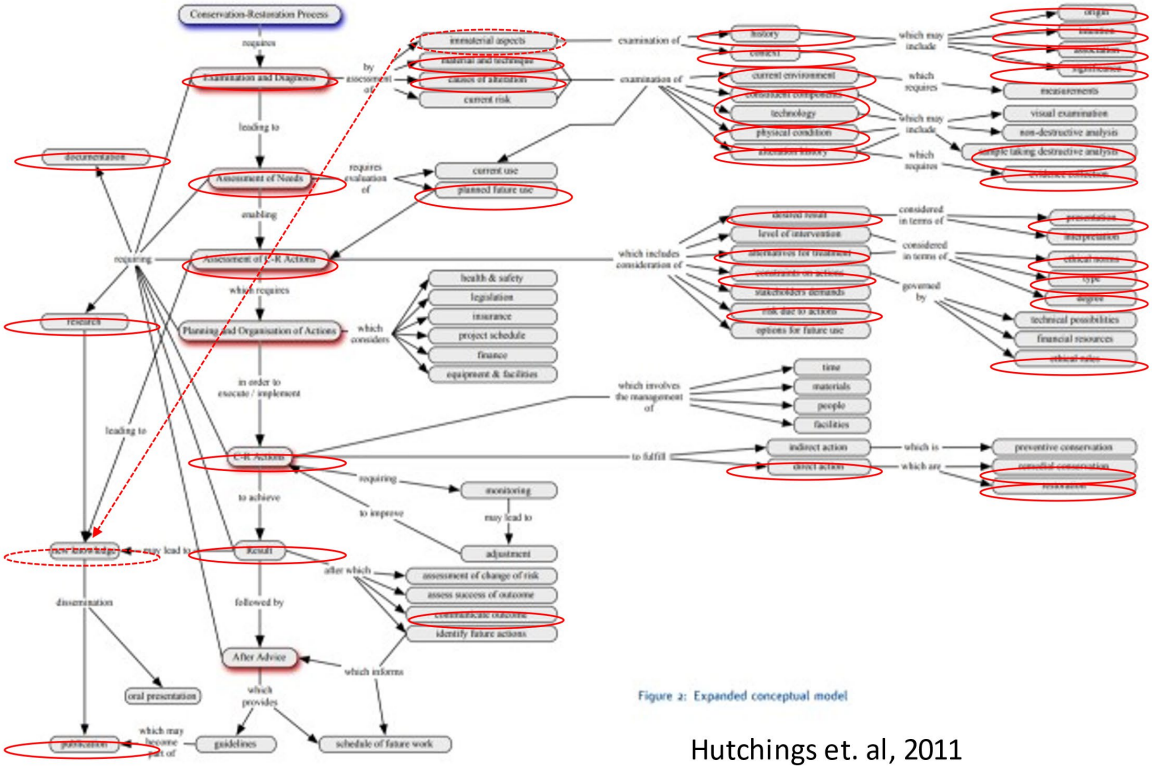
4.1.8 Analysis of example 4 - **causes of alteration, context, current environment, alternatives for treatment,** and **desired result**

In this analysis the views of ITAM would reflect upon the constraints to actions caused by the uncontrolled indoor climate. Acknowledging the problems caused by adding glue paste into the structure of a canvas painting would enforce the climatic reaction glue being strongly hygroscopic - likewise an addition of a linen fabric would cause these to react violently in unfavorable circumstances.

The conservation project was from the beginning labelled experimental enhancing the aim of the ITAM to do research. Therefore, the alternative materials and techniques used for consolidation were named **relative treatments** rather than **absolute conservation** – terms that remain somewhat obscure may address materials and techniques used on objects that were unknown at the time of work considering their compatibility, ageing characteristics, and reversibility in the environmental conditions present.

The approach had an insight in the need of critical insight in using conservation methods by routine but remains uncritical for the scientific demands on implementing new materials on original authentic works. The C-R process concept map shows a wide range of areas of knowledge activated during the multidisciplinary conservation project of the Officers Portrait ensemble. In conclusion the Officers Portrait ensemble conservation project aimed to prevent damage to the paintings through conservation, acknowledging

but not acting regarding the constraints caused by the unfavorable climatic circumstances in the castle corridors.



Hutchings et. al, 2011

Figure 19 FDA analysis in C-R process knowledge framework for Example 4. The red circles indicate activated concepts during the ITAM – led conservation project.

To prevent a set of **risks due to actions** causing alteration in original materials the choice was to choose other untested technical possibilities and materials on original objects to make them less hydrophobic and climate resistant. For the graphical presentation of the results see Figure 19 In chapter 4.1.8. .

4.2 Turning of the Kaleidoscope 1978 – 1990 **– risk due to actions, technical possibilities, technology, current environment**

The 1978 merge of The Royal Armoury, Skokloster Castle, and the Hallwyl Museum recommended a shared conservation resource for the three collections according to an

earlier governmental investigation (Holm 1973; Reuterswärd 1979). The stately restorative conservation campaign of 1967 – 1978 for Skokloster Castle was finished the same year - originally planned to comprise 500 paintings, had given remedy to 128 paintings. In a letter regarding conservation work at Skokloster Castle to the State Cultural Council it is stated that **causes of alteration** and:

> …conservation work done by other institutions has due to the humid climate of the castle during autumn, winter and spring caused damage to the objects, and therefore the care of the (paintings) collections makes special demands (Skeri et al. 1980).

Conservator Dr Frantisek Makes, assigned 1976, also a microbiologist, developed a unique method named enzymatic consolidation, for removal of e.g., excess animal glue in lined paintings using enzymes derived from Antarctic krill *(Euphausia superba)* in protein hydrolysis processes. Working now with three collections, and the new experimental method considered laborious, slow, and expensive, conservation of Skokloster paintings would decline before **research**, prioritizing collection highlights and exhibitions (**stakeholder demands**). Studies published discussed the new method, artist´s materials and technique aiming at respecting artist's intention (Makes 1979).

The 1980 exhibition **`Vård och Konservering´** (eng. **Care and Conservation**) at Skokloster Castle would inform the public in retrospect of conservation work done since the state acquisition. Expressed in the curatorial introduction are the bespoke definitions of:

> Care – managing and preventive measures considering storage, surface cleaning, inhibitive treatment against insect or rust, transport protection…,
> Conservation – treatment, which by active intervention in the object´s structure gives these the possibility to live forth in its once given setting. The methods vary, but the approach is the same. We have not strived for giving the objects back their original appearance, but value as highly the wear, and that is what has changed during the centuries.
> Restoration – …where the object, in case possible or even desirable is returned to its original appearance. One wishes to reconstruct a bit not visible for the eye. In restoration the pedagogic aspect is added to the objective of the work which is not present in care and conservation. The pedagogic focus may vary over time (Rangström et al. 1980).

Reflecting the views of the architect, curators´, and conservators' **desired results** and **level of intervention** were defined as a negation valuing the wear and tear **(presentation, interpretation).** Giving back an original appearance is a state theoretically impossible to assess, nor achieve by any means. Even cleaning is irreversible. Still, the goal of conservation has always been to achieve a state better than before (Lipp 2019). The definition of restoration expressed **ethical rules**, a puristic view, finding restoration neither possible nor desirable, only justified if considered pedagogic. The visitor would learn the method of conservation of paintings to be the only guarantee for future preservation **(risk due to actions**) at the same time acknowledging **current environment** - the `special´ climate (Rangström et al. 1980).

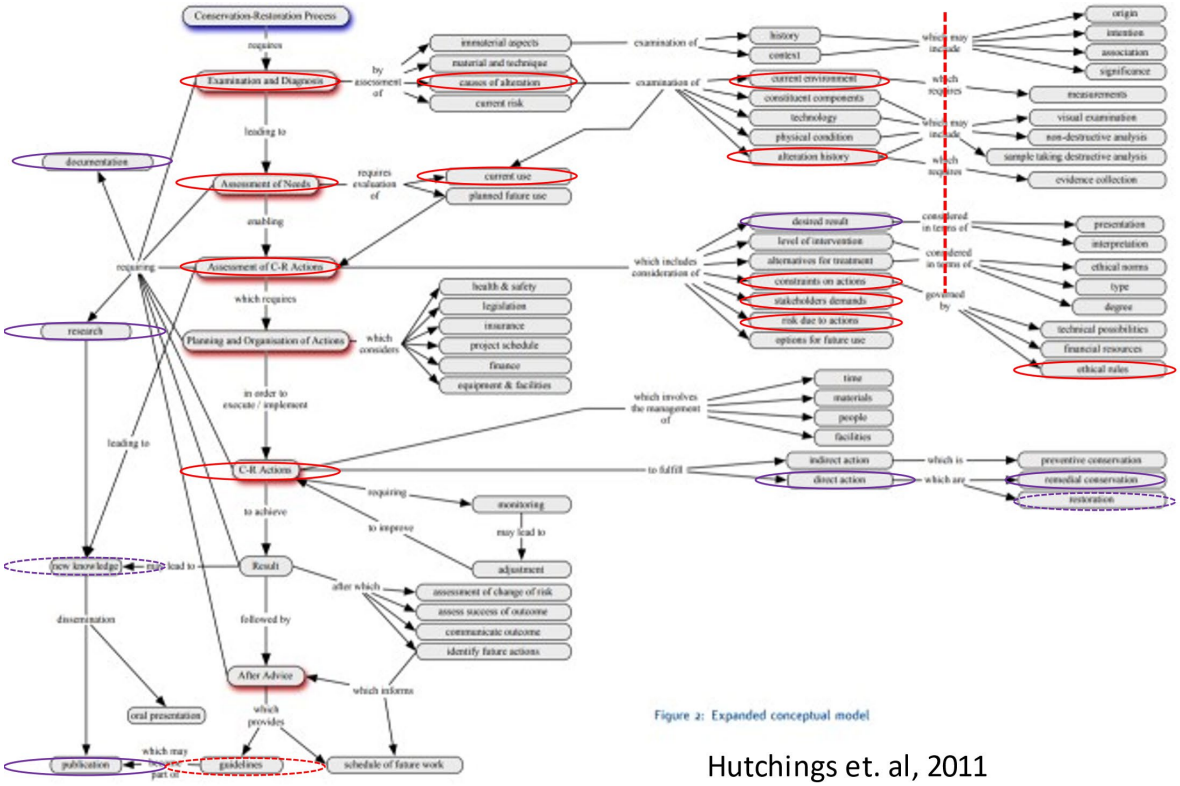


Figure 2: Expanded conceptual model

Hutchings et. al, 2011

Figure 20 FDA analysis of the period of 1978 – 1990 in the C-R process knowledge framework.

In Figure 21 in chapter 5.2. the FDA analysis of the discourses during the period of 1978-1990 in the C-R process knowledge framework marked in red indicates management

related concepts present in sampled discourse material reflecting the development and establishing of bespoke ethics within the new museum organization. The red dotted vertical line indicates the areas of discourse omitted in consulting by using the bespoke set of ethics regarding the views of remedial conservation and restoration. The violet circles indicate the concept activities of the conservator responsible for the conservation of the collection of paintings.

The discourse reflects the cyclic relationship between values, conservation and representation presented by Taylor and Cassar where the valued views of change and damage come to affect presentation and conservation decisions (Taylor and Cassar 2008).

The views established during the first decade following acquisition of the Skokloster collections had established themselves in the management discourse as an interdisciplinary decision problem embodied in the in-house conservator´s research efforts to find a conservation method that would withstand damage functions related to incorrect humidity and mold growth, acknowledging the rate of change being accelerated when compared to controlled museum climate conditions (Rangström et. al 1980). Several knowledge areas were hereby left without consideration indicated by the vertical red dotted line in Figure 20 (See Figure 20., chapter 4.2.).

4.3 Turning of the Kaleidoscope 1991-2001 – **research, current environment, preventive conservation, measurements**

During the 1990´s **research** on mold inhibition and **examination and analysis** of paintings would continue. Research on indoor climate effects to the collections through measurements on a dummy was published from an engineering disciplinary and curatorial assistance point of view with a preventive conservation objective. External conservation consultancy was included for the assessment of the condition of the dummy. The narrow sampling regarding objects of study faces problems when extrapolating findings according to scientific method (Holmberg and Kylsberg 1999, 1-63; Holmberg 2001, 57-99). The 1999 condition survey, initiated by a digitization project, would have reliability and validity issues, as the assessments of the paintings were

performed by conservation students, completed by the curator of paintings. Condition surveying requires expert knowledge, unless fulfilled, interpretation of the results is compromised. Consequently, the technical condition of paintings cannot be assessed by non-conservators (E.C.C.O. 2011).

Three categories in the survey of 575 paintings would indicate assessed need for conservation. Marked by numbers 0 – 3, category 3 indicated urgent need of conservation. According to the survey 2,3 % (11) paintings were considered to be in urgent need of conservation (category 3), 4, 2 % (20) works were categorized as less urgent (category 2), respectively 20 % (96) works needed minor treatment (category 1), and 362 (62 %) paintings were categorized as null (category 0), no treatment necessary. In 2000, using the same condition survey form 243 paintings were assessed by a trained, consultant paintings conservator. Accordingly, 21 % (51) paintings were in urgent need of conservation (category 3), 22 % (54) classed as category 2, 19 % (47) falling in category 1, and finally 34,5 % (84) paintings scored 0, no treatment necessary (Florman 2000). In the concluding curatorial remarks regarding the portraits it is said**, "…it is once again imperative to note that the choice of conservation methods have to be examined thoroughly for the special milieu where Skokloster objects are to be stored"** (Skeri, 2000). In 2001 an article titled **Skokloster Castle – one of the world's foremost Baroque museums** was published in the UNESCO journal **Museum International** reporting on several aspects of the technical and practical decisions requisite for historic house museum management of the building structure, book collections, metal objects and textiles. The collection of paintings was passed with one word – the museum organization did not have an in-house paintings conservator at the time of writing. General preventive conservation routines and the continued problems with fungal growth and corrosion on metal objects are reported promoting the role of the architect Ove Hidemark`s architectural ideas for discreet restorations (Bergström 2001).

4.4. Turning of the Kaleidoscope 2002 – 2016 – **current environment, measurements, research,** and **risk due to actions**

In 2003 a newspaper article would reflect on cultural heritage treasures decaying due to mold at Skokloster Castle. The explanation given by the management would be failing

treatments in the 1960´s. The `special´ climate was recognized as being detrimental **(current risk)**, but remedial conservation was considered a bigger threat **(risk due to actions*).*** Therefore, to avoid using `wrong´ conservation methods, a new policy for painting conservation was adopted, that of `doing nothing´(See Figure 23 chapter 5.4.1.). Only those in a critical condition were planned to be conserved by external consultant conservators, since the museum no longer had a painting conservator (Boldemann and Olevik 2003).

4.4.1 Example 5 The question of rate of change – understanding deterioration and significance

A decade of indoor climate studies aiming to prevent mold growth would begin in 2008, initiated within the program **Spara och Bevara,** funded by the **Swedish Energy Agency´s** research program for energy efficiency in cultural heritage buildings. Within the program a paper would report:

> …The results show that the selected object [sic] overall were in good condition, as they were selected to represent the whole collection this would indicate a major part of the collection has been relatively well preserved and that the strategy of “doing nothing” has been favorable (Holmberg et al. 2011).

The 2011 condition survey of the painting collection conducted by the present author would find 1 % (4) of 745 paintings inaccessible due to severe loss, 66 % (478) needed urgent or substantial remedial conservation, 30 % (220) having minor conservation-restoration needs, and 3% (20) needed preventive conservation. Comparing the result with the condition survey conducted in 1967, the assessed preservation state on collection level was found to be *status quo*, regarding assessed needs for conservation.

4.4.2 Analysis Example 5

To conclude the series of examples a conservation commission of a 17th century portrait on canvas in 2010 illustrates in a picturesque way the process of a detrimental deterioration – change occurring in a timely continuum – even if slow, proceeding in a sneaky fashion unless observed and mitigated – ultimately affecting object significance and value (Ashley-Smith 1999; Staniforth 2000; Brokerhof 2016; Brokerhof et al. 2017).

The cyclic, diurnal, and fast fluctuations of T and RH play one part, the freeze-thaw cycles and airborne pollution forming fungal growth another, and the painters technique and materials together with historical interventions will respond to the rest of the damage functions. Looking at the portrait before conservation we see a painting with a yellow, partly crazed, and blinded varnish, with discolored old retouches and overpaintings.

The pictures taken before and during conservation in 2010 after filling the losses down to canvas would reveal another truth – that of a continuous micro-flaking over the whole picture surface (except in lead white containing carnation parts and picture surface protected by the stretcher bars forming a climate barrier (See Figures 21 and 22 , chapter 4.4.2.).

Figure 21 and 22. Portrait Leonard Johannes Wittenberg before and during conservation after filling losses before retouching the damaged picture layer. Photo: Rothlind

When examined before and during conservation the picture layer had the same amount of earlier losses filled with an ochre colored filler restored with retouches and overpaintings during a conservation dating back to the 1830´s. The glue-paste lining, dating back to this early conservation, had been made using a very thin open linen mesh weave. The historical lining adhering well to the original canvas was left untouched when consolidating the picture layer, filling the lacunas, and finishing by retouching the picture. Several portraits by the same artist are preserved in the collections both unlined and lined. In some cases, the paintings show the same type of damage function of unacceptable change – that of multiple micro-flaking, losses to the picture layer – the original historical, material of contextual authentic character – the artistic deed of Carl Gustav Wrangel´s court painter or his studio, David Klöker later raised to nobility and named Ehrenstrahl (1629 – 1698).

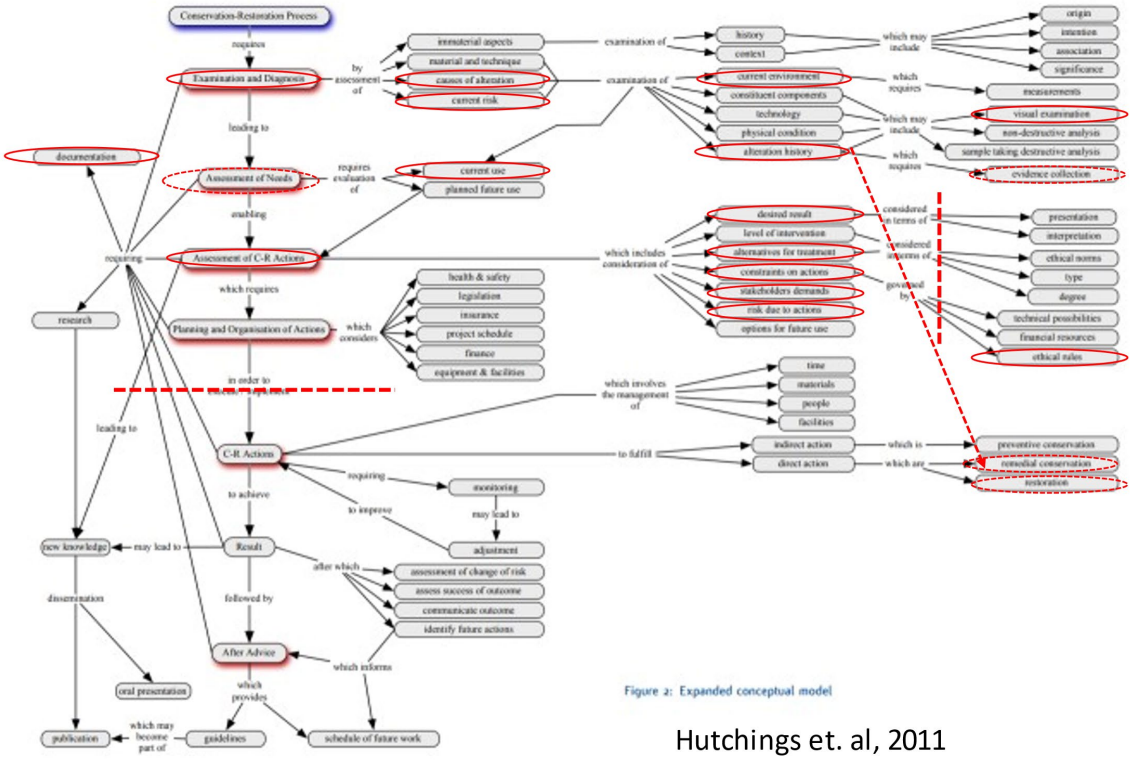


Figure 22 FDA in a C-R knowledge framework during 2002-2016. The red circles indicate concepts present in the `doing nothing´ discourse reflecting the unresolved interdisciplinary decision problem of consulting state-of-the-art conservation knowledge.

For C-R the objective is preventing loss of original material through unacceptable damage – preserving the artist´s deed, the significance of the work of art manifested in the structure's material characteristics and the motif of the picture learning us of the histories of the past. In a timely continuum continuous losses of the picture layer will bring us to the point when the preserved original paint surface will represent a minor part of the picture area – the picture losing its artistic qualities, its use-value and function , fragmentized to contain only pieces of its original information.

To prevent this from happening we need to monitor objects in their real environment on a regular basis to minimize loss at an unknown rate of change. The process may seem slow but on the generational or time of office timescale the process will get other proportions. Hanging in a dark corner, visible in torchlight high above the heads of the visitors in the Countess´ Bedroom the agents of change had found their way to loosen flakes of paint amounting to ca 5 – 10 % of the original picture layer. Sneaky and slow deterioration processes in a historic house setting calls for systematic collection care plans based on regular collections condition surveys to mitigate damage functions.

Together with continuous monitoring to study to gather knowledge of the rate of change in aged paintings on canvas new knowledge will be created. The most reliable path to knowledge is examination and monitoring the primary documents –it is only by knowing the paintings in their environmental conditions unacceptable change will be possible to mitigate. Damage functions are rarely making a fuzz in climate monitoring data or risk analysis forms – for the trained eye unacceptable change is visible in the work of art – not for the sake of the surveyor but for the stakeholders of our shared past – the future world enriched by human history.

4.4.3 Analysis of secondary data – collection condition surveys

The Skokloster collection of paintings collection condition survey indicated a stronger correlation than chance to the uncontrolled indoor climate. Damage likely related to incorrect RH levels, large range of T variations, and cyclic fluctuations due to a high rate of external air infiltration in t (time). When making a comparison with a reference collection one needs to consider the historical climate, object type, as well as

preservation and conservation history. Also, factors related to conducting a survey need to be considered. The questions asked conducting a collection condition survey are relevant for assessing the validity of the surveys to be compared.
For the case-study visible unacceptable damage were compared and quantified as secondary data overlooking the presence of indoor climate related damage on a general level in condition survey data. The data was grouped according to damage visible by ocular examination in the different layers of the material composite: the picture carrier (canvas), the picture layer, and the varnish layer. The presence of air borne pollution or signs of biodeterioration such as visible mold on the picture surface or in the structure was examined. A general overview of conservation history was compiled from the collection database system and the collection condition surveys.

Comparing the results of the condition surveys conducted 1967, 1999/2000 and 2011 show the overall condition of the painting collection, since acquisition, has not improved. The collection condition survey compiled in 1999 suffered from consistency and reliability issues – but the following assessment in 2000, by an experienced paintings conservator of the remaining paintings in the collection surveyed, follows the trend being consistent with both the 1967 and 2011 collection condition surveys. In rough numbers close to 70 % of the collection of paintings need remedial conservation due to unacceptable change. For reference, the 1993 condition survey of the National Portrait Gallery collection of paintings at Gripsholm Castle showed significantly differing numbers considering state of preservation (see Appendix 1, Table 3. and 4. Compilation data Collections Conditions Surveys Skokloster Castle 2011 and Gripsholm Castle 1993). The 509 paintings in the Portrait Gallery are mainly paintings on canvas from the same era, in many cases by the same artists as the ones presented in the Skokloster Collection of paintings. A major part of the portraits has been housed in Gripsholm Castle since 1866, many since finished by the artist in the 17th or 18th century. The reference paintings in the study would have major structural conservation dating before 1936, conservation work done during the decades around the turn century due to damage caused by dam and mildew. In the 1993 survey only 10 % needed minor remedial conservation treatment (Dahlén 1993). The more stable seasonal indoor climate in Gripsholm Castle seems to have provided a more stable annual climate cycle for a major part of the exhibited collection of portraits by not allowing T levels below 6 -7 degrees Celsius since nearly one century (Rothlind 2020).

The collected data provides more detailed information for further studies. For the present study data was sampled to describe and compare the occurrence of unacceptable damage present at the time of examination as secondary data for C-R decision-making. The types of unacceptable damage related to indoor climate were assessed by the author during a collection condition survey conducted in 2011 for the Skokloster Castle , by NM paintings conservator Lena Dahlén in 1993 for the Royal Portrait Collection, Gripsholm Castle, respectively. The quantified results are compiled in Appendix 1. Table 3. and 4. The data is presented for the three different decades for Skokloster as well as for Gripsholm in the previous examples in chapter 7. Results and discussed in the following discussion and conclusion chapters.

5 Discussion

This historical case-study focused on interrogating C-R decision-making processes managing a collection of paintings in a historic house museum from the acquisition of the site, and the building with the mixed collections housed within a time period of half-century. The narratives in decision-making were analyzed for their conservation disciplinary knowledge content to de-construct breakpoint values for directing, deferring, or deterring C-R decisions. Decision-making historically acknowledged as a challenge or a source of conflicts often resulting in failure is an area of interest for study for all professionals involved sharing responsibility for sustaining and safeguarding cultural heritage assets as stewards. Not only is our obligation to keep collections accessible for the present generation, but also to manage its values to the future with an optimal amount of significance.

As a background for the study the premises for managing paintings on canvas in their context in a historic house setting was explained chapter 2. In chapter 4. the structure of paintings on canvas and the mechanisms of deterioration causing change through damage functions, and specifically unacceptable change was explained, being the conditional for remedial conservation. The role of perception and professional experience considering assessing breakpoint values conditional for remedial conservation was assessed with regard to the multidisciplinary actors involved, their

roles defined by educational background, professional experience, and conservation knowledge, regulated by normative texts, guidelines and ethics presented in chapter 2.

Conservation, a discipline of applied sciences, is as all disciplines a field of different social understandings of the world, hence leading to different social actions. Therefore, theoretically, conservation knowledge was expected to form the foundation for a shared common understanding of the world of sustaining cultural heritage, by forming a shared source of reference for the representants involved in consulting C-R decisions. It is important to note that one profession, the conservators, historically have had a more defined obligation towards cultural heritage objects and the world community controlled by professional and ethical codes. The Athens Charter described conservation principles addressing the architect, technician, and archaeologist. Conservation was mentioned as an independent discipline for the first time in the Venice Charter thirty years later in 1964. Both normative texts were acknowledged by the international cultural heritage field, including state museums fifty years ago. Whether these documents were acknowledged by an educational institution of artists is unconfirmed. No such mention has been found in the written material read for the historical case-study. For paintings conservators the history of reflecting on best practice has a long oral history – some literary sources dating centuries back referred to e.g., in section 4.2.1. and 4.2.3. the main source of knowledge historically based on tradition, but also influenced by its contemporary concerns passed down from one generation to the next.

In my choice of method for the experimental research design, I found relevance to the questions to be asked considering historical management, and C-R decisions made in the work of Michel Foucault. The FDA was not referred to by Foucault himself as a method *per se*, but in psychological research FDA has offered tools for theoretical assessment of the rules, divisions, and systems of a particular body of knowledge. FDA seemed the type of qualitative discourse analysis to have the best fit for analyses of discourses with a deductive approach, allowing for theoretical interpretation, and deconstruction of meanings based on a knowledge framework (Arribas-Ayllon and Walkerdine 2017). The historical case-study, interrogating decision-making in a line of knowledge, a line of ethics as well as in a historical perspective found FDA to answer all these aspects by approximating the procedures and consequences of the construction

of objects and social constructions of knowledge and truth. Not only given the historical dimension in Michel Foucault's theory performing an FDA using the E.C.C.O. concept map as a knowledge framework, (representing the contemporary field of disciplinary knowledge today), but also the general ethical normative framework of the 20th century, enabled an analysis of interaction between the multidisciplinary professionals, as well as their interactions with the objects of study. The encoded **concepts** in the discourse were studied in the contextual setting of conservation knowledge framework. The analysis was used to map areas of knowledge used in consulting and sharing knowledge. Possibly more importantly it was also used for mapping and detecting missing links – knowledge areas unaddressed – presumably hindering interdisciplinary decision-making. The unaddressed areas might also be interpreted as knowledge gaps in interdisciplinary communication. Except from applying FDA for the analysis of theoretical knowledge I have considered theories in science philosophy, presented by the German philosopher Hans Georg Gadamer in his **Truth and Method** on hermeneutics, and in recent research on interdisciplinary decision problem presented by Johannes Persson et al., as well as the theories of the Austrian-British science philosopher Karl Popper (1902 – 1994). Popper's views on objectivity and knowledge harmonizes with the work of Gadamer both being cited in this study on **Object Knowledge** and **The Three Worlds** Ontology**,** the latter theory also referred to in a dissertation on the relation of preservation of cultural heritage and the professionalization of conservation in Finland by Tuula Auer. Auer asserted in her study that it was imperative for the conservator to gain knowledge of the physical aspects of the object as well as the ability to analyze its significance value (Auer 2000, 14). A view that conforms with how conservation is defined today.

I have in my selection of discourse samples aimed to choose `corpus of statements´ representing decision-making phenomena relevant for the study. Samples describing theoretical, ethical, and social aspects related to the C-R process as such, the nature of paintings on canvas, their tangible and intangible characteristics, the role of understanding deterioration and the mechanisms of damage functions present from conservation knowledge framework. Preventive, remedial and restoration aspects present in C-R decision-making have been included. The samples were chosen from many different types of documents and discussion transcripts, and the material sampled was analyzed chronologically to create a historical timeline for the analysis of the

historical development of the views and perceptions managing change in the collection of paintings in an attempt to test the hypothesis of the symbiotic relationship between value, conservation, and representation as proposed by Joel Taylor and May Cassar (Taylor and Cassar 2008).

Overlooking the results in a historical perspective conservators were not firsthand involved in the decision-making discourse when discussing conservation-restoration aims, actions and measures. No documentation has been found of how commissioned conservation work was communicated or discussed interdisciplinarily, except for the information found in the conservation order documents where the proposed actions are written and stated in shorthand. The question is was it the conservators, and conservation students who through documentation would administrate initial quantified condition data listing proposed C-R needs as each condition report contained tick box fields for C-R needs. These were later assessed and discussed by the conservation board represented by the respective institution curators, and the stakeholder representative of the Skokloster Board. *Presentation* would during the first decade of remedial conservation be a source for conflicting views after completed C-R. The discourse would reflect differing aims, institutional traditions, and disciplinary knowledge backgrounds. Differences in how aims and objectives between the partnering institutions were looked upon would in time become an infected source of conflict.

In general, views on the objectives and aims managing change differed from the onset. For the operative conservation project lead, at the same time ITAM representative, the rate of change and breakpoint values for unacceptable change was of interest mainly from a material research point of view. There was also an interest in developing new technical methods for documentation. ITAM, as a newly established educational institution, would operate through the administrator reflecting the Foucauldian power/knowledge relation, which may have been influenced by the experiences of historical developments in conservation, as that of the Florence Floods (Alexander 1980). ITAM lead had been assigned as Head of the Nordic group of conservators in Florence in the midst of the Skokloster restorative actions project planning, participating in the recovery operations during June-September 1969. An experience offering many young voluntary participating Swedish conservators a rare opportunity to study

preventive conservation, damage functions, conservation methods and techniques. Hallström described the technical resources present in Italy as inspiring in a letter to the executive head of the Skokloster board Åke Meyerson asking whether the paintings conservation project had received funding (Hallström 1969).

ITAM, aiming to prove the causal evidence of unsuitable conservation methods being practiced by NM, practiced the same C-R methods, using recipes of glue-paste in use in Italy, and visiting Italian conservators would use glue-lining combined with bees wax impregnation as methods. Alternative methods for increasing the hydrophobic character of painting structure would result in other types of irreversible change e.g., impregnation of canvas and picture layer with mixture of beeswax and Venice turpentine. Unacceptable change when described as occurring slowly even if the damages were `horrendous´ were perceived as a value as a phenomenon or object for study deferring C-R decisions before material research. Only damage caused by accidental water leakage or flood would need immediate action (Hallström 1967, 2). The views regarding restoration were restricted reflecting a viewpoint dismissing the aesthetic characteristics of paintings. The intangible aspects of paintings were not considered by ITAM unless they were caused conditionally by a foreign hand through C-R treatment. Critics towards museal representation traditions were presented arguing the museal tradition for being young, and the idea of paintings as museal objects therefore was to be considered narrow – reflecting an interest only in the picture surface not the structure as a whole. This view of ITAM dismissing the intangible aspects and values of works of art would cause commotion and opposition not being consistent with the international views IIC and ICOM referred to by NM institution curators nor conservators. This infectious conflict line positioned between the ITAM view of collection objects as study specimen of structural or material deterioration, and the museal tradition view of managing fine art collections respecting the artist´s deed alongside with the structural cohesion was one that would prevail but become slightly re-tuned in the discourses over the coming decades.

Technology, material and technique, ethical norms, and **risk due to action** and **desired result** would be the authority domain for NM conservators´ discourse considering the goal of conservation. These are the areas traditionally identified as those

representing the disciplinary expertise, in the 1984 Definition of the profession the `technical examination, preservation, and C-R of cultural property´ is contained in these concepts of the knowledge framework, but also those often left out in consulting C-R decisions according to recent studies by Henderson and Nakamoto (Henderson & Nakamoto 2016). In the beginning NM conservators would tutor ITAM students. Regardless of NM´s institutional experience in solving environmental condition related problems for example the risk of incorrect (high) RH and mold to collections housed in historic buildings, for which example the problems solved at Gripsholm Castle and Drottningholm Castle in the early 20th century, the **current environment** in the castle remained the architect´s authority, reflecting Foucauldian "technologies of power" as the sole representant for another state authority, the National Board of Buildings, setting not only the standard for the `special´ climate, but also forming the future explanatory discourse establishing the prevailing view of conservation methods, a view also promoted by ITAM, as damage functions. **Risk due to actions** - the polemics´ theme between the institutions assuming in time the character of `the hands-off-blame´ discussed by Michalski (Michalski 2018, 199 – 200). This view would prevail and lead to drift of ethics, communication breakdown, finally ending in stasis - the **constraint to actions** being the unresolved preventive conservation problem of the incorrect RH and T would eventually lead to utilitarian decision described as the odd indifference to `collateral damage´ a phenomena described in moral psychology related to the development of moral tribal thinking as an reaction to unresolved moral conflicts with the moral commonsense of another tribe (Greene 2013). The **current environment** was not to be questioned – by being labelled `special´ it had been proven beneficial. This indoor climate discourse specifies and represents a kind of institutional partitioning of knowledge. Disregarding a causal relationship by playing a "truth game" problems were recommended to be solved by other methods of conservation, which would direct the in-house conservator to put all efforts in search of **new knowledge** by doing **research**.

The interdisciplinary decision problem positioned within the conflicting views regarding the indoor climate being unsuitable for paintings on canvas represents Popperian optimism and Kuhnian pessimism as discussed by Johannes Persson et al. (2019). This example demonstrates how Type I and Type II mistakes distort the outcome, as in the case of incorrect relative humidity, for a decision-maker it would have been important not

to overlook a causal link when there was one (Type II error). Also, it would have been important to avoid implying that there is a causal link where there is none (Type I error) when all damaged paintings in the discourse were blamed having been treated using ethically questionable methods by the partnering institution. Hermansson and Hansson (2007) suggest that in managing decisions that involve risk we need to address important ethical considerations: who is the decision-maker, who is exposed to the risk, and who stands to benefit from taking the risk? In certain constellations this becomes especially clear, e.g., when the decision maker and the beneficiary is one and the same individual, but the person or group exposed to the risk is someone else. In the case of indoor climate, the architecture of the building being decisive for the preservation or risk for the collection of paintings, the interdisciplinary conflicting ethical goals of actions and measures necessary between partnering institutions became personalized by the National Board of Buildings representative as the beneficiary and decision-maker.

The unwillingness of the decision-maker responsible for the building restoration to make changes to the building to stabilize the indoor climate to mitigate risk to climate sensitive collections – created a conservation dilemma –the exposed group for the risk, the conservators and the objects were faced with the dilemma addressed by the principle five New Orleans charter – between the historical building and the collections housed within (AIC/APTI 1992). Disregarding the equal consideration and the highest quality of care would come to modify the view of the collection of paintings, their interpretation and need of care. Sven Olof Hansson, in another study represents a theory of seven questions to be asked making a risk analysis for decision making, states that decisions on risk should be taken by experts rather than by laymen (Hansson 2005).

The new millennia in management would not have an in-house paintings conservator. For the collection of paintings, the curatorial management policy of “doing nothing” was claimed a success. The former promoted conservation method being isolated to one actor and thereby inaccessible and not practiced by the professional field, had developed a view of external remedial conservation as detrimental. The unresolved conflict between preventive and remedial conservation, the historic structure and the artifacts caused stasis.

The reader who expected to find climate charts in this thesis will leave empty handed. The choice of omitting climate data for the uncontrolled indoor climate of Skokloster Castle was intentional to underline the interdisciplinary decision problem in conservation. The German inventor and electrician Werner von Siemens (1816 – 1892) is said to have stated “Messen is Wissen” – a popular citation amongst Swedish engineers translated – “To measure is to know” respectively in English, serves well to describe the dilemma of knowledge left disconnected to the questions asked. Regardless of how many measurements have been made of the RH and T fluctuations – this knowledge remains useless unless it is coupled with knowledge of the assessed change in the cultural heritage objects – in this study the collection of paintings on canvas. It is only when the interdisciplinary sciences of the applied science we know as conservation manages to bridge existing gaps of knowledge gaps to build future transdisciplinary knowledge.

6 Conclusion

Back in 1967, the assigned stakeholders and conservators were faced with paintings that, beautifully expressed by Stefan Michalski had met:

> those that we picturesquely blame on Time: light, humidity, warmth, and pollution…and the agents in turn will have access only if some custodian permits it (Michalski 1990, 39).

Many of the 17th century paintings at Skokloster Castle had in 1967 endured an estimate of 128, 000 diurnal cycles in the unheated castle. Since the state acquisition date 20, 000 cycles have occurred with open access to those subtle agents.

6.1 General observations – the question of expertise understanding damage functions

Looking back to the historical pivotal point – the time of acquisition of the collection, the then quantified survey data indicated the significance of paintings was at risk. A major part of the collection of paintings was assessed to be in need of remedial conservation. The 1968 collection condition survey data would initially serve as a document describing the assessed C-R needs and used for making plans for conservation actions. During the

past half-century three condition surveys have been conducted. Systematically compiled Collection Condition surveys, contain valuable primary documentation of the condition of each object forming a valuable quantified data base for decision-making in collection management (UNESCO 1972; CCI 1993; SIS/TK 479: 2012). These are preferably used in collection management. If the condition of the collection is monitored the stakeholder may become alerted on changes, identifying risks, and trends but most importantly providing data for analysis and synthesis.

Before reaching the point of unacceptable change should conservators faced with endangered collections ask as Lily Koltun:

> …is the conservation policy in a historic house museum to live after the maximum acceptable level of threat to be balanced with minimum acceptable use (Koltun 1990, 130)?

Such a policy would demand grounded knowledge and calculations of the magnitude of risk and rate of change in time but: "… conservators do not set standards for the preservation of objects; it is the physical properties of the …work of art which determine how it will endure" (Michalski 1994). In his recent article on decision-making Stefan Michalski completes the circle by interconnecting the aesthetic value in asking: "Is it really facts and reasoning that leads some of us to value original material over original intent in a painting, or deeply buried beliefs? "(Michalski 2018). On disciplinary level Hummelen, Saatze and Verstegh proposes a concept of symmetry for conservation: "…as one practice of knowledge and value production in the relation (chains) to objects and people and to focus research, education, and organizational structures more on enrichment, disclosure, discourse, critique, and mediation of these processes" (Hummelen et al. 2008).

All the presented views above contain the phenomena of the interdisciplinary decision problem, Staniforth arriving to the point where the C-R decision has to be made through negotiation, Koltun remaining in it – tolerating and calculating risk, Michalski addressing the decision-maker with the question: "is it really facts and reasoning that leads us to value original material over original intent in a painting, or is it deeply buried beliefs? Symmetry proposed by Hummelen et al. seems to address the interdisciplinary problem of conservation by referring to knowledge and value production. But when formulating

the characteristic decision problem in interdisciplinary settings we come to terms with the normative side of the interdisciplinary decision problem as Persson et al. asserts:

> It ought to be taken seriously, and if sustainable scientific progress is to be made, it needs to be considered even though, or perhaps precisely because it is generally overshadowed by the more obvious political, social, and cultural barriers to interdisciplinary science (Persson et al. 2018).

In discussing the interdisciplinary decision problem Persson et al. concludes citing Popper, solving it requires a certain openness (reflexivity) – a politics of science – if long-term progress in interdisciplinary science is to be a genuine possibility, we may need to avoid being too disciplined by disciplines: interdisciplinary science may not “flourish if science becomes the exclusive possession of a closed set of specialists" (Persson et al. 2018). Digging into the role of the specialist, in case of internalized acknowledgement by the specialist may gain answers to the interdisciplinary decision problem through dialogue learning from Hans-Georg Gadamer explaining hermeneutic consciousness not culminating in methodological sureness but in that readiness for experience distinguishing the experienced man from the one captivated in dogma. For Gadamer in terms of the concept of experience this readiness is dialogue – historically, effected consciousness. Asking questions will seem easier than answering them for someone who engages in dialogue only to prove himself and not gain insight. According to Gadamer there is no risk that he will be unable to answer a question. However, in fact, the continual failure of the part in the dialogue shows that people who think they know better cannot even ask the right questions. He continues: to be able to ask, one must want to know, and that means knowing that one does not know.

> In the comic confusion between question and answer, knowledge, and ignorance that Plato describes, there is a profound recognition of the priority of the question in all knowledge and discourse that really reveals something of an object. Discourse that is intended to reveal something requires that that thing be broken open by the question (Gadamer 1989, 355).

Overlooking the five decades of management of the Skokloster Collection of paintings I have been asking questions, breaking open discourses finding the partnering institutions, stakeholder representants and multidisciplinary experts, each representing their fields of knowledge on acquisition of the new site with its collections started off with an urge to

conserve, restore, and preserve, but theoretically from different institutionally partitioned discourses. Within two years interdisciplinary conflicting views had developed. The major conflict residing in the realms of environmental damage functions on site, but also due to the differing objectives considering the aims and objectives of the restorative actions dependent on differing views of the indoor climate in the building, and the paintings as objects, and their value function in the contextual setting. For one institution the paintings in the collection would represent structures, valuable objects of research to study material deterioration, and rate of change as part of the building architecture. Interventive treatment would be deterred by casuistic argumentation using varying explanatory variables. The other institution would work as all major European art museums at the time of intervention in their assessment of C-R needs. Relating to the objects condition working one-special-object-at-the-time underlining international ethical rules and norms, respect for artist's intent, and the subject´s (conservator´s) responsibility to act on unacceptable change to maintain the integrity of the object, not excluding its context, having the responsibility and experience in managing large collections housed in historic buildings. The stakeholder view would at times represent a utilitarian view.

For the restorative actions funded by the state, led by a temporary conservation board there were many complicating factors at play that looking back suffered from missing information. Restoration of the building, as well as of the different parts of the collections were worked on simultaneously during the first decade. A chosen lot of the paintings collection were removed from the castle and taken to the studios in Stockholm for conservation. The environmental conditions with the seasonal fluctuations were not acknowledged by the partnering institutions until after conservation as paintings were returned to the castle. Understanding of the rate of change in considering damage functions, and the types of unacceptable change in the paintings chosen for conservation was also difficult to assess, since the C-R interventions were to be made on a collection mainly unknown, historically almost untouched, based on one initial examination, and a collection condition survey compiled one year in the project for the main part of the collection. Condition assessments would also lack information on conservation history.

6.2 Theoretical, ethical, and social factors in C-R decision-making

Skokloster Castle, on acquisition transformed from domesticity to an institution, a public state museum brought up new rules, principles, and norms e.g., national legislation and an international codex as a framework to be considered and applied in the management of the documentary historic house, the site and the collections of artifacts housed within.

The temporary conservation board and the assigned partnering institutions had not been collaboration partners before. Professionally they represented different disciplinary backgrounds. The Vice Head of the board had worked as a state investigator for museum institutions. The established relations were historical in that the Royal Institute of Art, a training institute of painters had occasionally in its earlier history also trained future restorers. From the late 19th century until the 1930´s, a few painters would have received a grant for studies in Berlin or later in Munich with the German court painter and conservator-restorer Alois Hauser (1831-1905), later to be appointed paintings conservators with NM. In 1967, the experimental training program of conservators, founded in 1965, with the ITAM, a recently established department of the Royal Institute of Art was progressive, probably aiming to become a conservation science laboratory, as those established in Rome, Berlin, and London in the 1930´s. NM would represent centuries of traditions and expertise in fine art C-R and collection management through Director General, curators, conservators, bench conservators, as well as `liners´ treating mainly the support (Rothlind 2020).

In positioning this group of multidisciplinary professionals into the E.C.C.O.´s knowledge framework for conservation faces theoretical issues. To make conservation decisions conservation education is expected, a certain level of expertise is built in the knowledge framework. The C-R process spine represents the theoretically general line of decision-making narrative in any C-R process – regardless of type of cultural heritage object or material. Ethically C-R decisions are expected to be made by conservation specialists in consultation with a wide representation of stakeholders (Venice Charter 1965). Areas privileged for conservators only are the remedial C-R actions governed by ethical norms and rules (ICOM 1984). Other specialists representing the interdisciplinary fields over the five decades were the architects, engineers, conservation scientists, building antiquarians and the technicians.

My results indicate that in a timely continuum C-R decision-making would not follow the theoretical C-R process spine. Instead, theoretical, ethical, and social factors would have an impact through interdisciplinary decision problems deferring or deterring preservation of the collection of paintings. Initially, rushing into decision, one institution aimed to do R & D in conservation, the other one set up work as planned to deliver commissioned C-R of the paintings in the collection. The partnering institutions and the commissioning board of trustees did not consult on the condition of the collection before project start, consultations on object level rarely involved the conservator during the first decade considering the assessed conservation needs and actions. A shared opinion of what was considered necessary actions and measures was taken for granted. The examples analyzed through discourse content analysis reveal necessary theoretical knowledge areas that would miss out consulting decision-making. The practice of conservation work followed the principle of one-special-work-at-the-time, the traditional mode of work for so-called bench conservators of the time. Interestingly this would cause controversy due to the differing institutional traditions, and competing organizational, as well as institutional positions and views on paintings as objects of art in general.

The conflicting views regarding C-R aims and objectives during the first decade were indicated by the following factors in the interdisciplinary discourse: 1) institutional differing and partly contradictory views of aims and objectives considering C-R needs and actions for the collection, 2) omitted consulting on environmental conditions necessary for a high vulnerability/vulnerable object collection as paintings on canvas, and 3) commissioner would miss out consulting C-R aims and objectives on tangible and intangible values with conservators before C-R, 4) conservators would not participate in consulting regarding preservation state, rate of change and causal relationship of environmental conditions.

Risk analysis and theoretical content became evident in the interdisciplinary discourse on C-R needs and actions and was initiated only after conservation. After the first `lot´ of conserved paintings had been returned to Skokloster Castle a conflict problematizing practiced C-R methods would appear. The incidence of one painting reacting with deformations to the incorrect RH in the humid castle, would cause reactions and raise critics of C-R methods in general but regards glue-paste lining in particular. The response

of the partnering institution reminds me of the opening of London National Gallery after WWII with the onset of the row considering the supposedly disreputable cleaning campaign done by the restorers during the years of war.

Due to the environmental conditions of damp at Skokloster Castle, in this case a deformation reaction of a recently glue-paste lined painting, would throw into relief the practice of using traditional glue-paste lining for consolidating the picture layer and supporting an old structurally weakened or damaged canvas by lining. The method has been used widely in Europe, in Italy since the 17th century, France, Netherlands and Sweden since the 18th century, and in all Europe during the 19th century until 1974. Lining and re-lining is still today widely in use in the world, like in the U.S, Great Britain, Belgium, and Russia. Countries where lining/re-lining has been practiced sparsely during the 20th century are Germany, Austria, Switzerland, and Sweden representing a non-interventive approach. NM has not lined a single painting since 1982 (Rothlind 2020). Historically, the lining and re-lining polemics at Skokloster in 1972 was to precede the critical international discussion initiated by Westby Percival-Prescott on the Greenwich Conference on Comparative Lining Techniques in 1974 and following an international moratorium of three years on traditional conservation methods – lining paintings on canvas, and its adverse effects on the integrity and significance of the works of art (Koller and Prandtstetten 1981). During the Skokloster conference, a consulting process where theoretical and ethical issues and phenomena were discussed, the FDA clarified the differing standpoints of the partnering institutions. In time the environmental damage function of incorrect RH and T would become an interdisciplinary decision problem, and an institutional power conflict bound up with knowledge including ethical and moral dimensions, reflecting in psychological research on types of thinking, In experimental moral philosophy the examples would represent thinking in lines of “the elephants in the room”, “the sanctity/degradation foundation” and “the “hands-on” blame module” as presented by Stefan Michalski (Michalski 2018).

The results of the study show that in time the managemental position of the Skokloster board and the ITAM lead caused a decline in C-R activity – areas of knowledge referred to in the discourse narrowing down in the C-R decision-making narrative. A bespoke ethic would emerge `doing nothing´ creating generational impact by deferring

conservation needs empirically present in the collection of paintings. Efforts were made to produce “truth effects” in engineering based technical studies arguing doing nothing was better than providing the requisite levels of care and continuous maintenance as proposed in the Venice Charter.

Due to the unresolved interdisciplinary decision problem residing in the minds of the management, C-R activities went into stasis, and the discourse contained the `truth´ of conservation as risk and damage function. This position would pose an ethical problem. First, continual maintenance is expected for safeguarding cultural heritage. Second, preventive conservation with risk management offers protection for entire collections. If none of these are focused on, cultural heritage will be at risk.

The role of tradition and expertise in C-R today is questioned by voices from within the discipline. Stefan Michalski along with many others thinks we need to acknowledge expert knowledge exists, not just in conservation, but within many professions and sciences. Experience, based on heuristic thinking is not always wrong, but based on evolutionary human knowledge judging gains from losses, and where tacit knowledge is expert knowledge. An individual with at least a decade of experience may be able to ask if a phenomenon has an observable pattern if this person has at least one decade of immersion in that phenomenon (Michalski 2018). In risk management expertise is crucial for an efficient protection of an entire collection. Working in a mode of singularities will not lead to conclusions considering causal relationships nor applications of big data. Stewardship ethics require working sharing C-R decisions in an interdisciplinary discourse with respect to expert roles, allowing for reflective thinking – and openness for focusing on long-term advantage – transferring optimal significance to future generations.

6.3 Methodological considerations

The study shows the experimental combination of a qualitative and contextual discourse analysis method in a knowledge framework, in this case designed as a visual concept map of the C-R decision-making narrative, provided an interesting, and promising method of analysis for describing the challenge of the **interdisciplinary decision problem** residing in the ontological and epistemological roots of conservation practice

expressed in the professional discourse. Experimentally applied in this historical case-study it has provided a means to analyze and gain an understanding in historical processes of decision-making using the condition of the collection of paintings as empirical data for backlogging the impact of decisions made over the time period of study. The reliability and validity of the method used is considered documented for the reader and methodologically possible to repeat using the same written documentary sources due to the systematization and documentation of the analysis process of the data available for study. Deviations in interpretations are unavoidable due to surveyor bias related to knowledge background and/or being part of the culture of study.

The conclusions regarding the validity of the collection condition survey data used in this study are esteemed valid, as the assessments were made for the main part of the surveys by experienced (minimum 10 years) conservators. Also, congruence in data on damages present documented in condition reports on paintings in 1967, 2000 and 2011 argue for validity and reliability of assessments made.

6.4 Directions of further research

Today condition data is generally used for safeguarding collections on object level. in museum collection management. The reason for why data is not systematically used in decision-making for best practice preservation of collections may relate to the lack of systemized backlog condition data in the same data format and the historical prevailing tendency of attending to conservation one-special-work-in-the-time basis. The scientific principle being the study of singular phenomena in isolation to reduce bias, the study of singularities, one phenomenon in isolation, in laboratory conditions, on artificially aged dummies leaves us with the problem of extrapolating scientific evidence into real environmental conditions and consequently with big gaps in knowledge. More empirical observations on what is known regarding rate of change and knowledge regarding how preserved elements impact on how objects are represented, and how new forms of representation will affect future conservation is needed. One future line of study of interest is to relate collection condition survey data with data from reference collections using epidemiological study methods. Still, for the management of a single collection, evidence provided through studies combining qualitative methods combined with

quantitative methods may prove fruitful. The real world, the complexities created by co-association, the synergistic or antagonistic phenomena may not be seen partly due to lack of time, or missing resources necessary for analysis and synthesis of data on collection level or our inability to ask the relevant questions. The present emphasis on preventive conservation, exhibition production and loans take time from developing an understanding of management processes in a longitudinal perspective. This unfortunate kaleidoscopic use of collected data might in the long run have contributed to a development directing conservation research away from studying deterioration mechanisms on collection level.

One of the aims of the study was to study the use of knowledge gathered through primary documentation, to emphasize the role of collection condition survey data as a powerful method for the analysis of existing co-associations of physical, chemical, and biological agents of change aiming at historical asset monitoring. The attempt to combine the analysis of real objects, mainly 17th century paintings on canvas housed in their real environment for more than three centuries, broadening the views to conservation practice, communicating the responsibilities, as well as working methods, guided by conservation ethics in the interdisciplinary field of cultural heritage has been a methodological challenge. The cause was foresight – learning from the past how to include a more holistic transdisciplinary communication in sharing views and perspectives. Acknowledging breakpoint values affecting C-R decisions negatively may prevent communication failures regarding conservation needs for future sustainable management of collections of paintings in historic house settings.

With a development of broadening views and ideas of social-inclusiveness, an increased engagement with communities in cultural heritage it is important to define the intersection of areas in C-R decision-making that have been privileged in conservation theory and practice – to cite Robyn Sloggett to be “a distinctive discipline with a highly developed discourse” to enable conservation practice grow and become sustainable and pluralist (Sloggett 2014). To do this a recognition of being interdisciplinary is fundamental since interdisciplinary science differences in ontology and epistemology constitute one of the main obstacles to the integration of knowledge across scientific disciplines (Jerneck et al. 2011). For conservation, the differences are in the division into natural sciences and

the humanities, and thereby a division between positivism and constructivism/subjectivism

To retain significance and value of the collections and sites we need to adopt stewardship ethics, the careful and responsible management providing the highest levels of care for both the structures and the objects trusted in our care during time of office. This includes a holistic view of the multivariable values of cultural heritage objects in their context encompassing our own role as stewards in a timely continuum – for a sustainable C-R for present and future generations of users - their right to construct their view of the world through language and perception. For conservators it is important to develop a critical awareness in our role managing cultural heritage in time of office. We need to learn from the primary documents, the objects as sources of information, using their "anamnesis" for adopting the best range of approaches for the care of the collections. Learning from management decisions of the past may prevent ethical drift or even "stasis" making conservation decisions that in a worst case scenario may lead to ignorance and neglect – a development of great concern noted lately by many leading conservators around the world – let us develop our ability asking the right questions – understanding one does not know all.

> Catch only what you've thrown yourself, all is
> mere skill and little gain;
> but when you're suddenly the catcher of a ball
> thrown by an eternal partner
> with accurate and measured swing
> towards you, to your center, in an arch
> from the great bridge building of God:
> why catching then becomes a power—
> not yours, a world' s.
> —Rainer Maria Rilke

7 Epilogue

The past decade of jointly performing indoor climate studies a fruitful dialogue would emerge between the managing organizations, the then state museum authority Royal Armoury, Skokloster Castle with the Hallwyl Museum Foundation, since 2018 part of National Historical Museums, the National Property Board Sweden and academia. The discourse containing the shared responsibility managing both the historical structure with its interiors and collections has become more defined. The building envelope structure of the castle has received major maintenance work. The historic roof structures covered by the glazed, black Amsterdam roof tiles have been restored. Also, about 40 % of the single glazed windows of the building have until this date been restored, a work that will continue on a yearly basis. Permanent glass door gates were installed in the stairwells of the building 1st January 2018 to stabilize the indoor climate in the corridors, stairwells, and the state apartments. In four rooms with mold growth problems, facing north or northeast, dehumidifiers have been installed. Continuous indoor climate monitoring and plans for creating a more stable climate in the state apartments continue in collection management as well as in collaboration with the partnering building management organization. Plans for preventive, remedial conservation and restoration of the collection of paintings are made up, and discussed jointly in-house, as well as internationally through workshops and research contacts, as for example in 2019 during Skokloster Summer Institute, made possible by a generous grant from The Getty Foundation in their Conserving Canvas Initiative in search of more knowledge understanding deterioration, mechanisms to find sustainable, minimum intervention, and compatible methods for conservation respecting the significance and authenticity of the works of art. The work for the preservation of the collection housed in the country house of the first proprietor, Count Carl Gustav Wrangel and his ancestors – then, as well as today, part of European and global history on the shore of Lake Mälaren in Sweden, continues its existence in time in our minds into the future – hopefully, enabled transferring optimal significance to coming generations embodied in the tangible assets – the building structure with its collections.

8 Acknowledgements

In Finland, I wish to thank my institutional supervisors Paula Niskanen and Dr. Nina Robbins, and Heikki Häyhä at Helsinki Metropolia University of Applied Sciences for their thoughtful comments, support, and constructive criticism through the process of writing.

In Sweden I wish to thank all my colleagues at National Historical Museums, former and present, no one mentioned no one forgotten for support, and for generously sharing their knowledge and expertise managing the collections of Skokloster Castle over the years – the castle containing a universe of its own – a source of endless knowledge of being human in time and in the world. A warm thank you goes to conservator Lena Dahlén with the Nationalmuseum, for her kind support and assistance in providing access to the collection condition survey data for the National Portrait Gallery at Gripsholm Castle.

For the constructive collaboration and dialogue through the years I wish to thank Skokloster Castle site manager Cecilia Wretling and castle architect Dick Sandberg with the National Property Board Sweden sharing responsibility in consulting measures and solutions striving towards creating a more stable indoor climate for the collections housed in the castle. I am very grateful for being given the opportunity to follow the EU Climate for Culture research project from the balcony, and for all meetings and conferences with participating partnering institutions´ researchers willingly sharing their knowledge of indoor climate findings over the years – many are the discussions that have provided me with new knowledge.

The compilation of this thesis could not have been completed without the countless, important, and inspiring discussions with my ever patient mentor and major source of knowledge, inspiration and experience in paintings conservation, my dear husband John Rothlind – without you nothing. To my parents - thank you for your ever loving support and to my son Axel for your wise counsel and sympathetic ear – ever indebted.

References

ORIGINAL SOURCES

Unpublished documents

DAHLÉN, L., 1993. *Inventering av porträttsamlingen på Gripsholm 26 - 30 augusti 1993, Nationalmuseum, working material.*

FLORMAN, Y., 2000. *Konditionsbedömning av måleri Skoklosters slott. Report Collection Condition Survey, National Historical Museums, working material.*

HALLSTRÖM, B., 1973. *PM Konservering av målningar från Skoklosters slott 1967-69 m.m.* 5 March, 1973, Sammanträdesprotokoll rörande konserveringsärenden 1967 - 2012, Skoklosters slotts Ämbetsarkiv SE/2:1, Serie A 3, Box A 3: 1, Dnr 67/73, Skoklosters slott.

HALLSTRÖM, B., 1972. *PM Fotografering och teknisk undersökning av målerisamlingen på Skoklosters slott m.m.* 20 Jun 1972. Undersökningar och diskussionsunderlag rörande konservering, Skoklosters slotts Ämbetsarkiv 1967 – 2012, SE/2:1, Serie F 2, Box F 2a: 1, Skoklosters slott.

HALLSTRÖM, B., 1968. *Inventeringen av tavelsamlingen på Skokloster som underlag för konservering.* 18 Dec,1968, Handlingar rörande konservering, Skoklosters slotts Ämbetsarkiv 1967 – 2012, SE/2:1Serie F 2, Box F 2 a:1, 1967, Skoklosters slotts ämbetsarkiv, Skoklosters slott.

HALLSTRÖM, B., 1967. *PM Konservering av tavelsamlingen på Skokloster.* 23 Oct 1967, Undersökningar och diskussionsunderlag rörande konservering, Serie F, Box F 2 a:1, Skoklosters slotts Ämbetsarkiv, 1967 - 2012, Skoklosters slott.

HEDQVIST, E., 1972a. *Problem rörande bindemedels verkan vid konservering av föremål av organiskt material.* § 63, 27 januari, 1972, Sammanträdesprotokoll rörande konserveringsärenden 1967 - 2012, Skoklosters slotts ämbetsarkiv, Serie A, Box A 3: 1, Skoklosters slott.

HEDQVIST, E., 1972b. *Protokoll från konferens angående konserveringarna vid Skoklosters slott den 16 augusti 1972.* Undersökningar och diskussionsunderlag rörande konservering, Box F2, F 2 a, Skoklosters slotts Ämbetsarkiv 1967 - 2012, Skoklosters slott.

MALMBORG, B, HALLSTRÖM, B, 1967. *Restaureringsbesked SK 13.* Nov 23, 1967. Undersökningar och diskussionsunderlag rörande konservering, Skoklosters slotts ämbetsarkiv, 1967 - 2012, SE//2:1, Serie F2, Box F 2 a, Skoklosters slott

ROTHLIND, J., 2012. *Att förvalta ett kyrkligt kulturarv - bevarande och energieffektiviseringsarbete inom Västerås kyrkliga samfällighet.*

SCHILLER, G., 1972. *Några synpunkter på vården av slottssamlingarna.* Bilaga Protokoll Från konferens angående konserveringarna vid Skoklosters slott den 16 augusti 1972. Undersökningar och diskussionsunderlag rörande konservering, Box F2, F 2 a, Skoklosters

slotts Ämbetsarkiv 1967 - 2012, Skoklosters slott.

SKERI, K., 2000. *Digitalisering av 575 porträtt i Skoklosters slotts samlingar.* 18 januari, 2000. Undersökningar och diskussionsunderlag rörande konservering, Serie F, Box F 2 a:1, Skoklosters slott Ämbetsarkiv, 1967 - 2012, Skoklosters slott.

SKERI, K., MAKES, F., LEIJON, U, 1980. *Synpunkter med anledning av skrivelse Statens kulturråd 1979-12-17 beträffande Museernas konserveringsverksamhet.* 7 januari, 1980. Handlingar rörande konservering, Serie F 2, Box F 2 a:1, 1967, Skoklosters slotts ämbetsarkiv, 1967 - 2012, Skoklosters slott.

WENNBERG, B., 1972. *Brev till styrelsen för Skoklosters slott, Bilaga Protokoll från konferens angående, konserveringarna vid Skoklosters slott Aug 16, 1972.* Undersökningar och diskussionsunderlag rörande konservering, Box F2, F 2 a, Skoklosters slotts Ämbetsarkiv 1967 - 2012, Skoklosters slott.

Oral sources

ROTHLIND, J., 2020. *Conservation Principles and Practices at Nationalmuseum 1986 - 2004. Interview by Ann-Cathrin Rothlind, Collegial discussions on methods and ethical principles in paintings conservation over the years.*

RESEARCH LITERATURE

Publications

ASHLEY-SMITH, J., 1999. *Risk Assessment of Object Conservation.* 1 edn. London: Routledge.

ASHLEY-SMITH, J., 2010. The Ethics of Conservation. *The Conservator,* **6**(1), pp. 1-5.

AUER, T., 2000. The Professionalization of Conservation Trade, University of Tampere.

AULMANN, H., 1948. Die Ausstellung "Cleaned Pictures" in der National Gallery in London. *Kunstchronik: Nachrichten aus Kunstwissenschaft Museumswesen und Denkmalpflege,* **1**(9), pp. 1-7.

BENNEL, M., 1985. 1700-talet: Om konservator Eric Hallblad (1720 - 1814) och hans verksamhet i Stockholm samt hans egenhändiga redogörelse för sina arbetsmetoder, Nordiska Konservatorförbundets X Kongress Finland, Jun 10 - 15, 1985 1985, NKF-Finland, pp. 45-68.

BERGEON LANGLE, S., 2001. Polemics Surrounding the Restoration Painting and Sculpture. *Zeitschrift für Kunsttechnologie und Konservierung,* **15**(1), pp. 7-24.

BERGER, E., 1975. *Quellen Für Mahltechnik während der Renaissance und deren Folgezeit.* 2 edn. München: Sändig -Reprint.

BISHOFF, G., 2004. Das De Mayerne-Manuskript Die Rezepte der Werkstoffe, Mahltekniken und Gemälderestaurierung [dissertation]. Institut für Museumskunde an der Staatlichen Akademie der Bildenden Künste Stuttgart.

BÖTTIGER ET AL., 1980. *Vårda! Bevara! Museerna och föremålsvården. Rapport från kulturrådet 1980:2.* Uddevalla: Statens kulturråd.

BRAMMER, H., 1983. Die Wiederherstellung des Originalzustandes an Gemälden als Restaurierungsziel? *Mitteilungen Deutscher Restauratoren Verband,* **5**, pp. 6-9.

BRIMBLECOMBE, P., 1994. The Balance of Environmental Factors Attacking Artifacts, KRUMBEIN, WOLFGANG, BRIMBLECOMBE, PETER, COSGROVE, DAVID, STANIFORTH, SARAH, ed. In: *Dahlem Workshop, Durability and Change: The Science, Responsibility, and Cost of Sustaining Cultural Heritage, Berlin*, Dec 6-11, 1992 1994, John Wiley and Sons Ltd., pp. 67-79.

BROKERHOF, A., BÜLOW, A. and KEMP, J., 2017. Developing value: A story about sleeping beauties and ugly ducklings, MENEZES, M., RODRIGUES COSTA, D., DELGADO RODRIGUES, J, ed. In: *Intangibility matters: International conference on the values of tangible heritage*, May 29-30, 2017, LNEC - IPERION CH, pp. 11-21.

BUTCHER-YOUNGHANS, S., 1993. *Historic House Museums: A Practical Handbook for their Care, Preservation & Management.* New York: Oxford University Press.

CAMUFFO, D., 2010. The Role of Temperature and Moisture. In: CAMUFFO, DARIO, FASSINA, VASCO, HAVERMANS, JOHN, ed, *Basic Environmental Mechanisms Affecting Cultural Heritage, Understanding deterioration mechanisms for conservation purposes.* Florence: COST Action D 42: CHEMICAL INTERACTIONS BETWEEN CULTURAL ARTEFACTS AND INDOOR ENVIRONMENT (ENVIART)., pp. 9-30.

CENNINI, C., 1960. *The Craftsman handbook "Il Libro dell 'Arte".* 2 edn. New York: Dover Publications.

EIBNER, A., 1928. *Entwicklung und Werkstoffe der Tafelmalerei.* München: Verlag B. Heller.

FALTERMEIER, K., 1994. Sinn und Zweck der Dokumentation, *Dokumentation in der Restaurierung*, 23 - 25 November 1989, Österreichischer Restauratorenverband ÖRV, Schweizericher Verband für Konservierung und Restaurierung SKR /SCR, Deutscher Restauratorenverband DRV, pp. 3-6.

GOMBRICH, E., 2004. Dark Varnishes: Variations on a Theme from Pliny. In: BOMFORD, D., LEONARD, M, ed, *Readings in Conservation: Issues in the Conservation of Paintings.* Los Angeles: The Getty Conservation Institute, pp. 507-518.

GRANBERG, O., 1910. *Skoklosters slott och dess samlingar. Kortfattad beskrivning af Olof Granberg.* 2 edn. Stockholm: Aktiebolaget Ljus, Isaac Marcus´ Boktr.-Aktiebolag.

GREENE, J., 2013. *Moral Tribes: Emotion, Reason, and the Gap between Us and Them*. New York: Penguin Press.

HACKNEY, S., 2020. *On Canvas: Preserving the Structure of Paintings.* Los Angeles: The Getty Conservation Institute.

HAHR, A., 1924, Oct 19. Fuktigheten kring Gripsholms slott hotar samlingarna. *Stockholms-Tidningen*.

HALLSTRÖM, A., ARVIDSSON, J, 2001. Mould Infested Books in the Library at Skokloster Castle - Treatment Strategy and the Use of Menadione as Inhibitor, RAUCH, ANGELICA, MIKLIN-KNIEFACZ, SILVIA, HARMSSEN, ANNE, ed. In: *Schimmel - Gefahr für Mensch*

und Kulturgut durch Microorganismen, 21 -23., Juni, 2001 2001, Verband der Restauratoren e.V. (VDR), pp. 179-183.

HALLSTRÖM, B., GÖRANSSON, B, 1974. *Microbial Environment.* Stockholm: Dokumenta.

HEDLEY, G., ed, 1993. *Measured opinions.* London: United Kingdom Institute of Conservation.

HEKKERT, P., 1995. *Artful Judgements. A Psychological Inquiry into aesthetic preferences for visual pattern.*, Delft University.

HERRSCHAFT, J., 2012. Firniskrepierung - Ansätze zur Behandlung des Schadensbilddes mit dem niedermolekularen Kohlenwasserstoffharz Regalrez. *Zeitschrift für Kunsttechnologie und Konservierung,* **26** (2), pp. 367-386.

HIDEMARK, O., 1972. Skoklosters slott - en restaurering. *Arkitektur (Offprint Skokloster Studier 6),* **4** (4), pp. 3-25.

HIDEMARK, O., NELANDER, P, 2001. *Vårdprogram för Skoklosters slott.* Stockholm: Statens Fastighetsverk, National Property Board.

HODKINSON, I., 1990. Man´s Effect on Paintings, RAMSAY-JOLICOUEUR, BARBARA, A., WAINWRIGHT, IAN, N., M., ed. In: *Shared Responsibility: A Seminar for Curators and Conservators*, 26-28 October 1989, 1990, National Gallery of Canada, pp. 54-68.

HOLM, L., 1973. *SOU: 1973:5 Museerna: Betänkande av 1965 års musei- och utställningssakkunniga.* Stockholm: Utbildningsdepartementet.

HOLMBERG, J., 2001. *Environment Control in Historical Buildings*, Royal Institute of Technology.

HOLMBERG, J, STYMNE, H, BOMAN, C ET. AL, 1999. *Measurement of ventilation, air distribution and interzonal air flows in a 4-storey historic building, using a passive tracer gas technique.* Haftcourt Ltd. Care of Cultural Property.

HOLMBERG, J, KYLSBERG, B, 1999. *Report no 10 from Swedish partners. Final report on results from measurements at Skokloster palace of: Indoor climate, Time dependant moisture sorption in old wood, surface deterioration and cupping of old wood, presence of mould, outdoor air infiltration.* Stockholm: Projektburo EUREKA EU 1383.

HUTCHINGS, J., 2011. Developing a competence map for the Conservation Restoration Profession. *Zeitschrift für Kunsttechnologie und Konservierung,* **25** (1), pp. 5-19.

JAFFÉ, M., 2004. Rubens´s Mission to Spain in 1603. In: BOMFORD, DAVID, LEONARD, MARK, ed, *Issues in the Conservation of Paintings.* Los Angeles: The Getty Conservation Institute, pp. 7-8.

JANIS, K., 2010. Was darf ich, was darf ich nicht, was soll ich tun? In: R. ZIMMER, ed, *Die Kunst zu Bewahren.* Berlin: Generaldirektion der Stiftung Preussischer Schlösser und Gärten Berlin-Brandenburg, pp. 35-47.

KOESTLER, R., et.al, 1994. Group Report: How Do External Environmental Factors Accelerate Change? KRUMBEIN, WOLFGANG, E., BRIMBLECOMBE, PETER, COSGROVE, DAVID, E., STANIFORTH, SARAH, ed. In: *Dahlem Workshop on Durability and Change: The Science, Responsibility, and Cost of Sustaining Cultural Heritage, Berlin*, December 6-11, 1992 1994, John Wiley and Sons Ltd., pp. 149-163.

KOLLER, M., PRANDTSTETTEN, R, 1981. Informationen 14: Gemälderestaurierung: Ölbilder auf Leinwand. **5**, pp. 187-188.

KOLLER, M., 2013. Reinheit und Kunst. *Restauro,* (2), pp. 27-34.

KOLTUN, L., 1990. Conservation policies: Three tests for their usefulness. RAMSAY-JOLICOEUR, B., WAINWRIGHT, I, ed. In: *Shared Responsibility: A Seminar for Curators and Conservators*, 26-28 Oct 1989, 1990, National Gallery of Canada, pp. 128-135.

KÜHN, H., 1984. Farbmaterialen, Pigmente und Bindemittel. In: H. KÜHN, ed, *Reclams Handbuch der künstlerischen Techniken.* Stuttgart: Phillipp Reclam jun., pp. 11-52.

LEDER, H., 2002. *Explorationen in der Bildästhetik. Vertrautheit, künstlerischer Stil und der Einfluss von Wissen als Determinanten von Präferenzen bei der Kunstbetrachtung.* Lengerich: Pabst Science Publishers.

LEGNÉR, M, GEIJER, M, 2015. *Kulturarvet och komforten. Inomhusklimatet och förvaltningen av kulturhistoriska byggnader och samlingar 1850-1985.* Klintehamn: Krilon förlag.

LOWENTHAL; D., 1994. The Value of Age and Decay. W. KRUMBEIN E and BRIMBLECOMBE, P, COSGROVE, C, E, STANIFORTH, S, eds. In: *Dahlem Workshop on Durability and Change: The Science, Responsibility and Cost of Sustaining Cultural Heritage*, Dec 6-11, 1992 1994, John Wiley and Sons Ltd., pp. 39–49.

LUDWIG, H., 1893. *Die Technik der Oelmalerei - Zweiter Teil: Die Materielle Dauerhaftigkeit der Oelmalereien.* Leipzig: Verlag von Wilhelm Engelmann.

MAKES, F., 1996. Investigation, Restoration and Conservation of Mattheus Merian Portraits. *Göteborg Studies in Conservation,* **3**, pp. 2-73.

MAKES, F., 1988. Enzymatic consolidation of the portrait of Rudolf II as "Vertumnus" by Giuseppe Arcimboldo. *Göteborg Studies in Conservation,* **1**, pp. 7-49.

MAKES, F., 1979. *Enzymatic Consolidation of Paintings*, University of Göteborg.

MAKES, F., HALLSTRÖM, B., 1972. *Remarks on relining.* Stockholm: Royal Academy Art School.

MECKLENBURG, M., 1982. *Some aspects of the mechanical behavior of fabric supported paintings.* Unpublished report for the Smithsonian Institution

MEYERSON, Å., 1970. Wranglars Ära: Två jakttroféer - vildsvin och varg - på Skokloster. *Skokloster Studies,* (2), pp. 34.

MEYERSON, Å., HALLSTRÖM, B., HIDEMARK, O. ET. AL, 1972. Herman Wrangel och hans krigskamrater - En porträttserie på Skoklosters slott. *Skokloster Studies,* (5), pp. 239-299.

MICHALSKI, S., 1994. Sharing Responsibility for Conservation Decisions. In: W. KRUMBEIN et al., ed, *Durability and Change: The Science, Responsibility, and Cost of Sustaining Cultural Heritage.* Chichester: John Wiley & Sons, pp. 241-258.

MICHALSKI, S., 1990. Times effects on paintings, *Shared Responsibility: A Seminar for Curators and Conservators*, 26-28 Oct 1989, Canadian Conservation Institute, pp. 39-52.

MUÑOZ VIÑAS, S., 2005. *Contemporary Theory of Conservation.* Amsterdam: Elsevier Butterworth-Heinemann.

NICOLAUS, K., 1999. *The Restoration of Paintings.* Cologne: Könemann Verlagsgesellschaft mbH.

NORTH, M., 1997. *Art and Commerce in the Dutch Golden Age.* New Haven and London: Yale University Press.

ORNA, M., V and ANDERSON, R, BENDER, B, CRAMER, F, DE WITTE, E, DREVER, J, I, EHLING, A, HECKL, W, M, LOWENTHAL, D, MADSEN, H, B, MELNICK, D, SAMULE, F, H, WESTHEIMER, F, H, 1994. Group Report: What Is Durability in Artifacts and What are the Inherent Factors Determine It? W. KRUMBEIN E and BRIMBLECOMBE, P, COSGROVE, C, E, STANIFORTH, S, eds. In: *Dahlem Workshop on Durability and Change: The Science, Responsibility and Cost of Sustaining Cultural Heritage*, Dec 6-11, 1992 1994, John Wiley and Sons Ltd., pp. 51-66.

PADFIELD, T., 1994. The Role of Standards and Guidelines: Are they a Substitute for Understanding a Problem or Protection against the Consequences of Ignorance, KRUMBEIN, WOLFGANG, E., BRIMBLECOMBE, PETER, COSGROVE, DENIS, E., STANIFORTH, SARAH, ed. In: *Dahlem Workshop Reports: Environmental Sciences Research, Berlin*, December 6-11, 1992 1994, John Wiley and Sons Ltd., pp. 191-199.

PHILIPPOT, P., 2004. [1964] The Idea of Patina and the Cleaning of Paintings. In: BOMFORD, D, LEONARD, M, ed, *Issues in the Conservation of Paintings.* Los Angeles: Getty Publications, pp. 391-395.

PLESTERS, J., 2004. Dark Varnishes - Some Further Comments. In: BOMFORD, D., LEONARD, M, ed, *Issues in the Conservation of Paintings.* Los Angeles: The Getty Conservation Institute, pp. 519-530.

POPPER, K., 1979. *The Two Fundamental Problems of the Theory of Knowledge.* London: Routledge.

POPPER, K., 1963. *Conjectures and Refutations: The Growth of Scientific Knowledge.* London: Routledge.

PRESCOTT-PERCIVAL, W., 1975. The Lining Cycle, *Greenwich Conference on Comparative Lining Techniques*, Apr 23-24, 1974 1975, Dokumenta, pp. 4-36.

RANACHER, M., 2001. Ursachen und die erfolgreiche Prävention von Schimmelbefall an Kulturgut und Architektur, *Schimmel - Gefahr für Mensch und Kulturgut durch Mikroorganismen*, 21 -23., Juni, 2001 2001, Verband der Restauratoren, pp. 70-83.

RANGSTRÖM, L., HIDEMARK, O., LEIJON U. ET.AL, 1980. *Vård och konservering - Skoklosters slott 1980.* Skokloster Castle.

REUTERSWÄRD, E., 1979. *Livrustkammaren Skoklosters slott Hallwylska museet: Förslag till organisation avgivet av styrelsen för livrustkammaren, Skoklosters slott och Hallwylska museet.*

SELLING, G., 1937. *Svenska herrgårdshem under 1700-talet: Arkitektur och inredning under 1700 - 1780.* Stockholm: Albert Bonniers Förlag.

SCHIESSL, U., 1994. Die Fachterminologie in der Dokumentation, *Dokumentation in der Restaurierung*, 23 - 25 November 1989 1994, Österreichischer Restauratorenverband

ÖRV, Schweizerischer Verband für Konservierung und Restaurierung SKR /SCR, Deutscher Restauratorenverband DRV, pp. 27-40.

SCHIESSL, U., 1987. "Apage Satanas! Apage Copaiva !" Über Materialmoden in der Restaurierungsgeschichte". *Zeitschrift für Kunsttechnologie und Konservierung,* **1**(1), pp. 165-175.

TAUBERT, J., 1956. *Zur Kunstwissenschaftlichen Auswertung von Naturwissenschaftlichen Gemäldeuntersuchungen*, Phillips-Univeristät zu Marburg.

TAYLOR, J., 2015. Embodiment unbound. *Studies in Conservation,* **60**(1), pp. 65-77.

THOMSON, G., 1986. *The Museum Environment.* 2 edn. London: Butterworth-Heinemann in Association with IIC.

URZI, C, KRUMBEIN, W, 1994. Microbiological Impact on the Cultural Heritage, *Dahlem Workshop: & nbsp; Durability and Change: The Science, Responsibility, and Cost of Sustaining Cultural Heritage, Berlin*, December 6-11, 1992 1994, John Wiley and Sons Ltd., pp. 107-133.

VAN EIKEMA HOMMES, M., 2001. Verdigris Glazes in Historical Oil Paintings: Recipes and Techniques. *Zeitschrift für Kunsttechnologie und Konservierung,* **15**, pp. 163-195.

VON REDEN, A., 2013. Uncertainties in the interaction between canvas painting support and moisture, *Climate for Collections: Standards and Uncertainties*, Nov 7 - 9, 2013 2013, Archetype Publications Ltd in association with Doerner Institut, pp. 247-256.

WALLERT, A., 1999. Methods and Materials of Still-Life Painting in the Seventeenth Century. *Still Lifes: Techniques and Style. The examination of paintings from the Rijksmuseum,* pp. 7-24.

WIDSTRÖM, T., 2019. *Simulation of historic buildings for enhancement of preservation and energy performance - issues and methods*, KTH Royal Institute of Technology.

Internet sources

AIC/APTI, 1992. *New Orleans charter for the Joint Preservation of Historic Structures and Artifacts.* Washington DC. Available: New Orleans Charter (culturalheritage.org) [-10-27, 2020].

ALEXANDER, D., 1980. The Florence Floods - What The Papers Said. *Environmental Management,* **4** (1), pp. 27-34. Available: https://link.springer.com/article/10.1007/BF01866218 [-08-09, 2020].

ALMQVIST, J., 1927. *Arbetskrafterna vid Nationalmusei avdelning för depositioner och slottssamlingar; given Stockholms slott den 28 januari 1927.* Stockholm. Available: https://data.riksdagen.se/dokument/DO3092. [-09-13, 2020].

ALTER, M.E.A., 2019. Photochemical Origin of the Darkening of Copper Acetate and Resinate Pigments in Historical Paintings. *Inorganic chemistry,* **58** (19), pp. 13115-13128. Available: Photochemical Origin of the Darkening of Copper Acetate and Resinate Pigments in Historical Paintings | Inorganic Chemistry (acs.org) [-01-17, 2021]

ANTOMARCHI, C.E.A., ET. AL, 2008. *Commentary on the ICOM-CC Resolution on Terminology for Conservation: A reminder of the scope of this document.* Rome. Available:

ICOM-CC Resolution on Terminology Commentary - ICOM-CC (icom-cc.org) [-09-13, 2020].

ANTOMARCHI, C. and ABEND, K., 2018. Emergence and Evolution of the ICCROM Sharing Conservation Decisions Course, HERITAGE, A., COPITHORNE, J, ed. In: Sharing Conservation Decisions Current Issues and Future Strategies, Rome, 4–8 July 2011, ICCROM, pp. 253-263. Available: www.iccrom.org [-01-09, 2021].

ARRIBAS-AYLLON, M. and WALKERDINE, V., 2017. Foucauldian Discourse Analysis. *The Sage Handbook of Qualitative Research in Psychology.* 2 edn. Cardiff University, pp. 110-123. Available: https://www.researchgate.net/publication/281237040_Foucauldian_Discourse_Analysis [-09-13, 2020]

ASHLEY-SMITH, J., 1995. Definitions of Damage, Apr 7, 1995. Available: Definitions of Damage (culturalheritage.org) [-08-06-2020].

ASHLEY-SMITH, J., 2016. Losing the edge: the risk of a decline in practical conservation skills. *Journal of the Institute of Conservation,* **39** (2), pp. 119-132. Available: https://www.tandfonline.com/doi/full/10.1080/19455224.2016.1210015 [-09-13, 2020].

ASHLEY-SMITH, J., 2018. The ethics of doing nothing. *Journal of the Institute of Conservation: A Festschrift for Jonathan Ashley-Smith,* **41**(1), pp. 6-15. http://www.tandfonline.com/doi/abs/10.1080/19455224.2017.1416650. [-08-06-2020]

BELISHKI, S. and CORR, S., 2019. Reflection on conservation-restoration practice today. A European Perspective. *Protection of Cultural Heritage,* (8), pp. 15-28. Available: https://ph.pollub.pl/index.php/odk/article/view/1024. [-09-13, 2020].

BERGSTRÖM, C., M, 2001. Skokloster Castle - one of the world´s foremost Baroque museums. *Museum International,* **53**(2), pp. 36-40. Available: https://unesdoc.unesco.org/ark:/48223/pf0000122979 [-10-26, 2020].

BOHMAN, G., 1967. *Utlåtande i anledning av Kungl. Maj:ts proposition angående förvärv av Skoklosters slott och samlingar.* Available: https://www.riksdagen.se/sv/dokument-lagar/dokument/proposition/kungl-majts-proposition-nr-63-ar-1967_ES3063/html [-09-13, 2020].

BOLDEMANN, M., OLEVIK, J, 2003, Nov 19. Möglet växer på Skokloster. *Dagens Nyheter*. Available: https://www.dn.se/kultur-noje/moglet-vaxer-pa-skokloster/ [-10-26, 2020].

BROKERHOF, A. and BÜLOW, A., 2016. The QuiskScan-a quick risk scan to identify value and hazards in a collection. *Journal of the Institute of Conservation,* **39**(1), pp. 18-28. Available: https://www.researchgate.net/publication/299419828_The_QuiskScan_-_A_quick_risk_scan_to_identify_value_and_hazards_in_a_collection [-12-22, 2020].

BROSTRÖM, T., LEIJONHUFVUD, G, 2010. The Indoor Climate in Skokloster Castle, D. DEL CURTO, ed. In: *Historical Buildings as Museums, Milano*, Apr 2010, Nardini Editore, pp. 84-93. Available: (4) (PDF) The Indoor Climate in Skokloster Castle | Gustaf Leijonhufvud - Academia.edu [-09-17, 2020].

CCI, 1993. *CCI Notes 10/6 Condition Reporting - Paintings. Part I: Introduction.* Ottawa: Government of Canada. Available: Condition Reporting – Paintings. Part I: Introduction – Canadian Conservation Institute (CCI) Notes 10/6 - Canada.ca [-09-13, 2020].

CHEN-WIEGART, Y.E.A., 2017. Elemental and Molecular Segregation in Oil Paintings due to Lead Soap Degradation. *Scientific Reports,* **7**(1), pp. 11656. Available: Elemental and Molecular Segregation in Oil Paintings due to Lead Soap Degradation | Scientific Reports (nature.com) [03-30-2021]

CORR, S., HUTCHINGS, J., VAN DEN BURG, J., ET AL., 2011. *Competences for Access to the Conservation - Restoration Profession.* Available: Competences for Access to the Conservation-Restoration Profession (ecco-eu.org) [-09-13, 2020].

DARDES, K, AVRAMI, E, DE LA TORRE, M, 1999-last update, The conservation assessment: a proposed model for evaluating museum environmental management needs. [Homepage of [Getty Conservation Institute]], [Online]. Available: http://hdl.handle.net/10020/gci_pubs/evaluating_museum_environmental_mngmnt_english. [-10-26-2020].

DE SILVA, M. and HENDERSON, J., 2011. Sustainability in conservation practice. *Journal of the Institute of Conservation,* **34**(1), pp. 5-15. Available: Full article: Sustainability in conservation practice (tandfonline.com) [-12-28, 2020].

DRUZIK, J, BOERSMA, F, 2017. *Epidemiology: Basic Ideas Applied to Museum Collections: A Report from an Experts Meeting.* Los Angeles: J. Paul Getty Trust. Available: Epidemiology: Basic Ideas Applied to Museum Collections (getty.edu) [-10-26, 2020].

E.C.C.O., 2002. *E.C.C.O. Professional Guidelines (I).* Available: http://www.ecco-eu.org/fileadmin/user_upload /ECCO_professional_guidelines_I.pdf [-09-13, 2020].

E.C.C.O., 2003. *E.C.C.O. Professional Guidelines (II) Code of Ethics.* European Confederation of Conservator-Restorers´ Organizations. Available: http://www.ecco-eu.org/fileadmin/user_upload /ECCO_professional_guidelines_II.pdf [-09-13, 2020].

E.C.C.O., 2004 *E.C.C.O. Professional Guidelines (III).* Available: http://www.ecco-eu.org/fileadmin/user_upload /ECCO_professional_guidelines_III.pdf [-09-13, 2020].

E.C.C.O.., 2011. E.C.C.O. Competences for Access to the Conservation-Restoration Profession. http://www.ecco-eu.org/fileadmin/assets/documents/publications/ECCO_Competences_EN.pdf [-09-13, 2020].

EDENMAN, R., 1967. *Kungl. Maj:ts proposition nr 63 år 1967.* Available: Kungl. Maj:ts proposition nr 62 år 1967 Proposition 1967:62 - Riksdagen [-08-13, 2020].

FOUCAULT, M., 1972. *Archaeology of Knowledge.* New York: Pantheon Books. Available: Archaeology of Knowledge and the Discourse on Language (monoskop.org) [09-27, 2020].

GADAMER, H., 1989. *Truth and Method.* 2 edn. London, New York: Continuum. https://mvlindsey.files.wordpress.com/2015/08/truth-and-method-gadamer-2004.pdf Accessed Jan 8, 2021.

GRAF ADELMANN, G., S, 1965. Restaurator und Denkmalpflege. *Nachrichtenblatt der Denkmalpflege in Baden-Württemberg – Organ der Staatlichen Ämter für Denkmalpflege,* **8**(3), pp. 1-2. Available: Bd. 8 Nr. 3 (1965): Nachrichtenblatt der Denkmalpflege in Baden-Württemberg – Organ der Staatlichen Ämter für Denkmalpflege | Denkmalpflege in Baden-Württemberg – Nachrichtenblatt der Landesdenkmalpflege (uni-heidelberg.de) [01-26, 2021].

GRAHAM, L., J, 2005. Discourse analysis and the critical use of Foucault, *Australian Association for Research in Education 2005 Annual Conference, Sydney*, Nov 27 - Dec 1, 2005 2005, AARE, pp. 1-15. Available as author pre-press e-paper: 10916129.pdf (core.ac.uk) [09-13, 2020].

HANSSON, S.O., 2005. Seven Myths of Risk. *Risk Management,* **7**(2), pp. 7-17. Available: Seven Myths of Risk | SpringerLink [-01-28, 2021].

HAUGEN, A., BERTOLIN, C. and LEIJONHUFVUD, G.E.A., 2018. A Methodology for Long-Term Monitoring of Climate Change Impacts on Historic Buildings. *Geosciences,* **8**(10), pp. n/a. Available: Geosciences | Free Full-Text | A Methodology for Long-Term Monitoring of Climate Change Impacts on Historic Buildings (mdpi.com) [10-23. 2020].

HENDERSON, J., Mar 20, 2019. Reflections on Decision-Making in Conservation, *ICOM-CC Preventive Conservation*, 19-23 September 2011 Mar 20, 2019, Publicações do Cidehus, pp. 1-8. Available: 1511_559_HENDERSON_paper_EN reflections on Decsion.pdf (cf.ac.uk) [-08-09. 2020].

HENDERSON, J., 2000. *Collection Condition Surveys.* orca.cf.ac.uk: ORCA Online research Cardiff University. Available: Collection Condition Surveys.pdf (cf.ac.uk) [-11-26, 2020].

HENDERSON, J. and NAKAMOTO, T., 2016. Dialogue in conservation decision-making. *null,* **61**, pp. 67-78. Available: Full article: Dialogue in conservation decision-making (tandfonline.com) [-09-13, 2020].

HENDERSON, J. and WALLER, R., 2016. Effective preservation decision strategies. *null,* **61**(6), pp. 308-323.Available: Effective preservation decision strategies: Studies in Conservation: Vol 61, No 6 (tandfonline.com) [-09-13, 2021].

HENDERSON, J., WALLER, R. and HOPES, D., 2020. Begin with Benefits: Reducing Bias in Conservation Decision-Making. *null,* **65**, pp. P142-P147. Available: Begin with Benefits: Reducing Bias in Conservation Decision-Making: Studies in Conservation: Vol 65, No sup1 (tandfonline.com) [-10-26, 2020].

HERMANSSON, H. and HANSSON, S.O., 2007. A Three-Party Model Tool for Ethical Risk Analysis. *Risk Management,* **9**(3), pp. 129-144. Available: A Three-Party Model Tool for Ethical Risk Analysis | SpringerLink [01-13, 2021].

HOLL, K., 2013. *Comparison of indoor climate analysis according to current climate guidelines with the conservational investigation using the example of Linderhof Palace.* Available: Comparison of indoor climate analysis according to current climate guidelines with the conservational investigation using the example of Linderhof Palace (openaire.eu) [-09-13, 2020].

HOLMBERG, J., KYLSBERG, B., SKERI, K., 2011. Damage assessment of objects of art correlated to local outdoor climate during 300 years, KILIAN, R., VYHLÍDAL, T. &

BROSTRÖM, T., ed. In: *Developments in climate control of historic buildings, Linderhof Palace*, Dec 2, 2010 2011, Fraunhofer IRB Verlag, pp. 77-85. Available: Report on publications and PR activities. Climate Modeling. Building Simulation. Mitigation and Adaptation Strategies. - PDF Free Download (docplayer.net) [08-13, 2020].

HUMMELEN, I., VAN SAAZE, V., VERSTEEGH, M, 2008. Towards a symmetrical approach in conservation? *ICOM Committee for Conservation*, Jun 2008, 2008, ICOM, pp. 1041-1047. Available: (1) (PDF) Towards a symmetrical approach in conservation? (researchgate.net) [-10-15, 2020].

ICOM-CC, 1984. *Definition of Conservator-Restorer´s Profession.* Available: Definition of profession 1984 - ICOM-CC (icom-cc.org) [-09-13, 2020].

ICOMOS, 1965. *International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter 1964).* Venice. Available: Microsoft Word - Engl. Venice Charter.doc (icomos.org) [-09-13, 2020].

ICOMOS, 1931. *The Athens Charter for the Restoration of Historic Monuments - 1931.* Available: The Athens Charter for the Restoration of Historic Monuments - 1931 - International Council on Monuments and Sites (icomos.org) [-09-13, 2020].

POULIOS, I., 2014. Existing approaches to conservation. In: *The Past in the Present.* Ubiquity Press, pp. 19-24. Available: https://www.jstor.org/ [-03-03, 2021].

KLING, H., 1964. *Lag (1963:583) om avveckling av fideikommiss.* Department of Justice. Available: Lag (1963:583) om avveckling av fideikommiss Svensk författningssamling 1963:1963:583 t.o.m. SFS 1999:1042 - Riksdagen [-08-13, 2020].

KLING, H., 1960. *Lag (1960:690) om byggnadsminnen.* Ministry of Education. Available: https://www.riksdagen.se/sv/dokument-lagar/dokument/proposition/kungl-majts-proposition-nr-161-ar-1960_EL30161/html [-08-10, 2020].

KOESTER, C., 1827. *Über Restauration alter Oelgemälde - Erster heft.* Heidelberg: Internet Archive with funding from Getty Research Institute. Available: Ueber Restauration alter Oelgemälde : Koester, Christian Philipp, 1784-1851 : Free Download, Borrow, and Streaming : Internet Archive [-11-12, 2020].

LEIJONHUFVUD, G., BROSTRÖM, T, Mar 2020. A call for systematic monitoring: exploring the link between monitoring and management of cultural heritage in times of climate change, *Integrated Pest Management (IPM) for Cultural Heritage 4th International Conference in Stockholm, Sweden*, May 21 - 23, 2019 Mar 2020, Available: www.researchgate, pp. 213-221. [-12-26, 2020].

LEIJONHUFVUD, G. and HENNING, A., 2014. Rethinking indoor climate control in historic buildings: The importance of negotiated priorities and discursive hegemony at a Swedish museum. *Energy Research & Social Science,* **4**, pp. 117-123. Available: Rethinking indoor climate control in historic buildings: The importance of negotiated priorities and discursive hegemony at a Swedish museum - ScienceDirect [-09-30, 2020].

LIPP, W., 2019. The Future of Restoration? Some fancy thoughts, SCHÄDLER-SAUB, U., SZMYGIN, B., ed. In: *Conservation Ethics Today - Are our Conservation-Restoration Theories and Parctice ready for the 21st Century?* Mar 1- 3, 2018 2019, International Scientific Committee on Theory and Philosophy of Conservation and Restoration ICOMOS Lublin University of Technology, Faculty of Civil Engineering and Architecture, pp. 21-32.

Available: Publication: Conservation Ethics today: are our Conservation-Restoration Theories and Practice ready for the 21st Century? - TODOPATRIMONIO [-08-10-2020].

LUCIANI, A., WESSBERG, M., BROSTRÖM, T, 2012. The influence of air exchange on the stability of the indoor climate in Skokloster Castle, *Indoor Air Quality 2012 10th International Conference Indoor Air Quality in Heritage and Historic Environments "Standards and Guidelines", London, UK.*, Jun 17 - 20 2012 2012, UCL Centre for Sustainable Heritage, UK, pp. 33. Available: https://www.academia.edu/4518016/ [-09-13, 2020].

MARÇAL, H, DUARTE, A, MACEDO, R, 2014. The Inevitable Subjective Nature of Conservation: Psychological Insights on the Process of Decision Making, *ICOM-CC 17th Triennal Conference: Theory and History of Conservation*, 17-19 September 2014, 2014, The International Council of Museums, 2014. Available: https://www.researchgate.net/publication/277983973_The_inevitable_subjective_nature_of_conservation_Psychological_insights_on_the_process_of_decision_making [-08-10, 2020].

MATERO, F., 2000. Ethics and policy in conservation. *The Getty Conservation Institute Newsletter,* **15**(1). Available: Newsletter 15.1 Spring 2000 (getty.edu) [-03-26, 2021].ÖS

MERRIAM WEBSTER DICTIONARY, 2021. Documentation. Available: https://www.merriam-webster.com/dictionary/documentation#h1 [-01-31, 2021].

MERRIAM-WEBSTER DICTIONARY, 2021. Document. Available: https://www.merriam-webster.com/dictionary/document [-05-15, 2021].

MERRIAM-WEBSTER DICTIONARY, 2021. Stewardship. Available: https://www.merriam-webster.com/dictionary/stewardship [-08-09, 2020].

MICHALSKI, S., 2018. Sharing Conservation Decisions: Tools, Tactics, and Ideas, *Current Issues and Future Strategies in Sharing Conservation Decisions. Findings of the ICCROM Seminar*, 4-8 June 2011, 2018, ICCROM, pp. 178. Available: https://www.iccrom.org/sites/default/files/2018-05/sharing_conservation_decisions_2018_web.pdf [-08-10, 2020].

MICHALSKI, S., 1998. Climate Control Priorities and Solutions for Collections in Historic Buildings. *Historic Preservation Forum,* **12**(4), pp. 8-14. Available: https://www.academia.edu/741961/1998_Climate_Control_Priorities_and_Solutions_for_Collections_in_Historic_Buildings [-10-26, 2020].

MICHALSKI, S., 1993. An overall framework for preventive conservation and remedial conservation, J. BRIDGLAND, ed. In: *Lighting and Climate Control. Working Group 17*. Available: https://www.icom-cc-publications-online.org/2673/An-Overall-Framework-for-Preventive-Conservation-and-Remedial-Conservation [-08-10, 2020].

MOON, K. and BLACKMAN, D., 2014. A Guide to Understanding Social Science Research for Natural Scientists. Conservation Biology, 28(5), pp. Pages 1167-1177. Available: The Society for Conservation Biology (wiley.com) [-03–14, 2021].

MOORE, M., 2001. Conservation Documentation and the Implications of Digitisation. *Journal of conservation & museum studies,* **7**, pp. 6-10. Available: (1) Conservation Documentation and the Implications of Digitisation (researchgate.net) [-12-20-2020].

MOROZ, R., 2011. Das Craquelé – ein „entspanntes “Abbild der Lebensgeschichte eines Gemäldes., pp. 1-15. Available: d_65.pdf (museumaktuell.de) [-03-08-2020].

MUÑOS VIÑAS, S., 2017. The Transactional Nature of Heritage Conservation. Available: Rwa_memorial_lecture_2017_munoz_web.pdf (ahk.nl) [-01-29, 2021].

ORIOLA, M., CAMPO, G., RUIZ-RECASENS, C., PEDRAGOSA, N. and STRLIČ, M., 2015. Collections care scenario appraisal for painting canvases at Museu Nacional d'Art de Catalunya, Barcelona, Spain. *null,* **60**, pp. S193-S199. Available: Full article: Collections care scenario appraisal for painting canvases at Museu Nacional d'Art de Catalunya, Barcelona, Spain (tandfonline.com) [-11-13, 2020].

PEASE, M., 1964. *The Murray Pease Report.* Routledge. Available: https://www.culturalheritage.org/docs/default-source/governance/murray-pease-report.pdf?sfvrsn=7 [-08-10, 2020].

PERSSON, J., THORÉN H., OLSSON, L, 2018. The interdisciplinary decision problem: Popperian optimism and Kuhnian pessimism in forestry. *Ecology and Society,* **23 (3)**(3).Available: https://doi.org/10.5751/ES-10401-230340 [-12-28, 2020].

PINNA, G., 2001. Introduction to Historic House Museums. *Museum International,* **53**(2), pp. 4-9. Available: Introduction to historic house museums - UNESCO Digital Library [-01-05, 2021].

PLINIUS, G., 00, 77-last update, Natural History, Book XXXV. Available: https://en.wikisource.org/wiki/Natural_History_(Rackham,_Jones,_%26_Eichholz)/Book_35 [Oct 10, 2020].

POPPER, K., 1978. Three Worlds by Karl Popper (PDF). The Tanner Lecture on Human Values. Talk delivered at The University of Michigan on April 7, 1978. Available: popper80.pdf (utah.edu) [01-28, 2021].

ROLLENHAGEN, G., 1615. *Emblemata volsinnighe uytbeelsels by Gabrielem Rollenhagium uyt andere versamelt, en vermeerdert met syn eygene sinrijcke vindingen, gestelt in Nederduytsche Rijme door Zacharias Heyns. [1-2]. Tot Arnhem, by Ian Ianszen, Boeckvercooper, 1615 [-1617].* Arnhem: Ian Ianszen. Available: https://books.google.be/books?vid=GENT900000099501&printsec=frontcover&hl=sv#v=onepage&q&f=false [-08-10, 2020].

ROTHLIND, J., 2012. Att förvalta ett kyrkligt kulturarv: bevarande- och energieffektiviseringsarbete inom Svenska kyrkan Västerås. Available: LIBRIS - Att förvalta ett kyrkligt kul... (kb.se) [-09-28, 2020].

SELLING, G., Jan 17, 2012. [1964] Legal and administrative Organization in Sweden for the protection of Archaelogical sites and Historical Buildings, *The Monument for the Man Records of the II International Congress of Restoration*, May 25-31, 1964 Jan 17, 2012, ICOMOS, pp. 978. Available: terza10.pdf (icomos.org) [-08-09, 2020].

SIS/TK 479, 2010. *SS-EN 15757 Conservation of Cultural Property - Specifications for temperature and relative humidity to limit climate-induced mechanical damage in organic hygroscopic materials.* Stockholm: Swedish Standards Institute. Available: https://www.sis.se/api/document/preview/75439/ [-09-13, 2020].

SIS/TK 479, 2012. *SS-EN 16095 Conservation of Cultural Property - Condition recording for movable cultural heritage.* Stockholm: Swedish Standards Institute. Available: https://www.sis.se/api/document/preview/86885/ [-09-13, 2020].

SKWIRBLIES, R., 2012. Restoration of artworks in the Berlin royal picture collection between 1797 and 1830, *CeROArt* [Online], HS | 2012, Online since 10 April 2012, Available: http://journals.openedition.org/ceroart/2356 [-05-16, 2021].

STANIFORTH, S., 2000. The Forbes Prize Lecture: Conservation: Significance, Relevance and Sustainability, *IIC Congress Melbourne & nbsp;* Sep 10, 2000 2000, IIC International Institute of Conservation, pp. 3-7. Available: https://www.iiconservation.org/congress/sites/iiconservation.org.congress/files/IIC%202000%20Melbourne%20Congress/1013-491.pdf [-09-13, 2020].

STERFLINGER, K. and PIÑAR, G., 2013a. Microbial deterioration of cultural heritage and works of art — tilting at windmills? *Applied microbiology and biotechnology,* **97**(22), pp. 9637-9646. Available: Microbial deterioration of cultural heritage and works of art--tilting at windmills? - PubMed (nih.gov) [-02-22, 2021]

STRAUB, R., E, 1965. Charakteristische Verfallserscheinungen am Leinwandbild. *Nachrichtenblatt der Denkmalpflege in Baden-Württemberg – Organ der Staatlichen Ämter für Denkmalpflege,* **8**(3), pp. 66-69. Available: heiJOURNALS – Heidelberger OJS-Journals (uni-heidelberg.de) [-01-22, 2021].

STRAUB, R., 1967. Bildbelege und Dokumentation in situ im Bereich der Gemäldepflege. *heiJournals Heidelberger E-Journals,* **8**(3), pp. 58-63. heiJOURNALS – Heidelberger OJS-Journals (uni-heidelberg.de) [-04-13, 2021].

STRLIČ, M., THICKETT, D., TAYLOR, J. and CASSAR, M., 2013. Damage functions in heritage science. *null,* **58**(2), pp. 80-87. Available: https://www.tandfonline.com/doi/full/10.1179/2047058412Y.0000000073 [-09-13, 2020].

TAYLOR, J., STEVENSON, S, 1999. Investigating Subjectivity within Collection Condition Surveys. *Museum Management and Curatorship,* **18**(1), pp. 19-42. Available: https://www.semanticscholar.org/paper/Investigating-subjectivity-within-collection-Taylor-Stevenson/17348794d4e4bdcdc3840bfd3f2ca441838014ec [-08-10, 2020].

TAYLOR, J. and CASSAR, M., 2008. Representation and Intervention: The Symbiotic Relationship of Conservation and Value. *Studies in Conservation: Contributions to the London Congress, 15-19 September 2008: Conservation and Access,* **53**(sup1), pp. 7-11. Available: http://www.tandfonline.com/doi/abs/10.1179/sic.2008.53. Supplement-1.7 [-09-22, 2020].

TIANO, P., Jan 1, 2002. Biodegradation of Cultural Heritage: Decay Mechanisms and Control Methods, Jan 1, 2002, Citeseer, pp. 1-37. Available: https://www.academia.edu/599911/Biodegradation_of_cultural_heritage_decay_mechanisms_and_control_methods [-09-13, 2020].

TOOMEY, A., et al., 2015. *Inter- and Trans-disciplinary Research: A Critical Perspective.* Google Scholars: Secretariat of the United Nations. Available: https://sustainabledevelopment.un.org/content/documents/612558-Inter-%20and%20Trans-disciplinary%20Research%20-%20A%20Critical%20Perspective.pdf [-12-17, 2020].

TURNER-WALKER, G., Nov 2012. The Nature of Cleaning: Physical and Chemical Aspects of Removing Dirt, Stains and Corrosion, *International Symposium on Cultural*

Heritage Conservation Nov 2012, pp. 1-19. Available: (1) (PDF) The nature of cleaning: physical and chemical aspects of removing dirt, stains and corrosion (researchgate.net) [-08-09, 2020].

TURNER, 1972. *Convention Concerning the Protection of the World Cultural and Natural Heritage.* Paris. Available: https://whc.unesco.org/archive/convention-en.pdf [-10-10, 2020].

UNESCO GENERAL CONFERENCE, 1979. *Recommendation for the Protection of Movable Cultural Property.* Paris. Available: https://unesdoc.unesco.org/ark:/48223/pf0000114032.page=176 [-09-13-2020].

VALIULLIN, R. and FURÓ, I., 2002. The morphology of coexisting liquid and frozen phases in porous materials as revealed by exchange of nuclear spin magnetization followed by 1H nuclear magnetic resonance. *The Journal of Chemical Physics,* **117**(5), pp. 2307-2316. Available: https://aip.scitation.org/doi/10.1063/1.1488585 [-10-22, 2020].

WESSBERG, M., LEIJONHUFVUD, G., BROSTRÖM, T, 2016. An evaluation of three different methods for energy efficient indoor climate control in Skokloster Castle, 2016. Available: An evaluation of three different methods for energy efficient indoor climate control in Skokloster Castle (diva-portal.org) [-11-16, 2020].

ZHANG, C. and LIU, Z., 2018. Freezing of water confined in porous materials: role of adsorption and unfreezable threshold. *Acta Geotechnica,* **13**(5), pp. 1203-1213. Available: Freezing of water confined in porous materials: - ProQuest [-09-13, 2020].

Table 3 and 4. Compilation of Collection condition surveys Skokloster Castle 2011 and Gripsholm Castle 1993

Skokloster Castle Collection of paintings on canvas - Condition survey 2011														
	Picture carrier			Picture layer					Varnish layer			Particle deposition		
Period	N= Canvas	Deform	Def lining	Cupping	Microflaking	Flaking	Losses 1	Losses 2	Yellowed	Blinded	Crazed	Surface dirt	Dust	Mold
16th c	6	3	0	5	5	6	6	0	5	5	5	5	6	1
17th c	390	251	35	296	104	229	216	87	315	319	278	245	329	134
18th c	21	12	2	14	7	15	14	1	21	18	14	17	17	3
Sum	**417**	**266**	**37**	**315**	**116**	**250**	**236**	**88**	**341**	**342**	**297**	**267**	**352**	**138**
16th c	1,4%	50,0%	0,0%	83,3%	83,3%	100%	100%	0%	83%	83%	83%	83%	100%	2%
17th c	80,9%	64,3%	0,9%	75,9%	26,6%	58,7%	66,6%	22,3%	97,8%	81,8%	71,2%	95,0%	84,3%	34,3%
18th c	7,0%	57,1%	0,9%	66,6%	33,3%	71,4%	66,6%	0,5%	100,0%	85,7%	66,7%	91,6%	80,9%	14,3%
All periods	**100,0%**	**57,1%**	**19,0%**	**75,3%**	**8,6%**	**76,7%**	**77,7%**	**7,6%**	**93,7%**	**83,5%**	**73,6%**	**89,9%**	**88,4%**	**16,8%**

National Portrait Gallery, Gripsholm Castle, paintings on canvas - Condition survey 1993														
	Picture carrier			Picture layer					Varnish layer			Particle deposition		
Period	N= Canvas	Deform	Def lining	Cupping	Microflaking	Flaking 2	Losses 1	Losses 2	Yellowed	Blinded	Crazed	Surface dirt	Dust	Mold
16th c	157	7	5			9	15	3	0	5	3	24		
17th c	239	6	11			4	5	2	1	1	5	25		
18th c	57	2	0			0	5	0	0	0	0	3		
Sum	**453**	**15**	**16**			**13**	**25**	**5**	**1**	**6**	**8**	**52**		
16th c	34,7%	0,4%	0,3%			1%	9,50%	2%	0%	3%	0,2%	15%		
17th c	52,8%	0,2%	0,4%			1,7%	2,1%	0,1%	0,0%	0,0%	0,2%	10,4%		
18th c	12,5%	0,4%	0,0%			0,0%	0,9%	0,0%	0,0%	0,0%	0,0%	5,3%		
All periods	**100,0%**	**0,3%**	**0,2%**			**1%**	**4,16%**	**0,046**	**0,00%**	**1%**	**0,1%**	**10%**		

List of Figures

Figure 19 FDA analysis in C-R process knowledge framework for Example 4. The red circles indicate activated concepts during the ITAM – led conservation project, chapter 4.1.8.

Figure 20. FDA analysis of the period of 1978 – 1990 in the C-R process knowledge framework. chapter 4.2.

Figure 21 och Figure 22. Portrait Leonard Johannes Wittenberg before and during conservation before retouching filled losses in the picture layer. Photo: Rothlind, chapter 4.4.2. .

Figure 23. FDA in a C-R knowledge framework during 2002-2016. The red circles indicate concepts present in the `doing nothing´ discourse reflecting the unresolved interdisciplinary decision problem of consulting state-of-the-art conservation knowledge, chapter .4.4. 2.

List of Tables

List of Abbreviations

FDA	Foucauldian discourse analysis
QDA	Qualitative discourse analysis
E.C.C.O.	European Confederation of Conservator-Restorers Organisations
ICOM-CC	International Council of Museums Committee for Conservation
IIC	International Institute of Conservation of Historic and Artistic Works
NM	Nationalmuseum
ITAM	Institute of Technology of Artistic Materials of Royal Institute of Art
C-R	Conservation-Restoration

Definitions of central concepts

Agents of change	main potential categories of deterioration factors of agents: physical, chemical, or biological that may act on a cultural heritage object singly or in co-associations that are synergistic, antagonistic, or independent
Breakpoint value	a point of discontinuity, change, or cessation, condition, etc., at which discussions can no longer continue because people cannot agree or with materials damage (change) has occurred.
Conservation	all measures, and actions aimed at safeguarding tangible cultural heritage while ensuring its accessibility to present and future generations. Conservation embraces preventive conservation, remedial conservation, and restoration (ICOM-CC 2008/2017)
Damage	Structural deterioration (i.e., damage) is defined as any change to the material or the geometric properties affecting the structural performance (e.g., capacity). The deterioration of the system is commonly measured with respect to a physical parameter; reduced ductility, embrittlement, cracking, horizontal layer separation, failure of binding agents (powdering).
Damage function	in heritage science, functions of unacceptable change dependent on agents of change. Unlike in other domains of science, the reference to unacceptable change implies that a value-based decision needs to be applied to the analytically determinable change, or dose-response function i.e.,

	empirically derived rate of deterioration, affecting a cultural heritage object (IIC)
Durability	a stable structure or system – as a rule cyclic or periodic by nature – e.g., the atomic vibrations (Cramer 1994)
Fragility	the quality of being easily damaged or broken (Cambridge dictionary)
Historic house museum	is a house that has been transformed into a museum. Historic furnishings may be displayed in a way that reflects their original placement and usage containing a collection of the traces of memory, belongings and objects of the people who once lived there.
Intangible	Intangible cultural heritage as the practices, representations, expressions, as well as the knowledge and skills (including instruments, objects, artifacts, cultural spaces), that communities, groups and, in some cases, individuals recognize as part of their cultural heritage.
Interdisciplinary	Interdisciplinarity analyzes, synthesizes, and harmonizes links between disciplines into a coordinated and coherent whole.
Kaleidoscopic	Kaleidoscope symbolizes anything that changes constantly. If you describe something as kaleidoscopic, you mean that it consists of a lot of different parts in a constant change.
Multidisciplinary	draws knowledge from different disciplines but stays within its premises.

Natural ageing	Progressive (graceful) degradation results in capacity/resistance continuously being removed from the structure at a rate that may, or may not, change (randomly) over time. Most progressive degradation models available in the literature assume that the form of the degradation process is known, but the parameters are uncertain, e.g., lead soap development in oil paint, yellowing of varnish, ultramarine disease.
Originality	`authentic as original´, authenticity explained through its dimensions of material, historical and conceptual (Scott 2015)
Primary documentation	Documentary information, (German P**rimardokumentation**, to be collected from the object, description of material structure (e.g., probes), state of preservation, inscriptions, labels etc. (Althöfer 1967, UNESCO 1972) all written material and the primary material evidence on the work of art or heritage object itself. In addition, it would include all marks left by the conservator on the work during C-R (Nicolaus, 1999).
Remedial conservation	Direct action to arrest a current damaging process or to improve the state of conservation on tangible cultural heritage
Restoration	All actions directly applied to a single and stable item aimed at facilitating its appreciation, understanding and use. These actions are only carried out when the item has lost part of its significance or function through past alteration or deterioration

Significance	Meaningfulness: the quality of having historical, cultural, devotional, emotional, aesthetic, symbolical value of great importance
Stewardship	he careful and responsible management of something trusted in one´s care. As an ethic stewardship embodies the responsible planning and management of resources. The concepts of stewardship can be applied to the environment and nature, economics, health, property, information, theology, cultural resources etc.
Sustainable	'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (social, economic, and environmental needs) (Brundtland 1987)
Tangible	Tangible cultural heritage refers to physical artefacts produced, maintained, and transmitted intergenerationally in a society.
Transdisciplinary	Transdisciplinary work moves beyond the bridging of divides within academia to engaging directly with the production and use of knowledge outside of the academy.

Knowledge and skills map for an experienced Conservator-Restorer. (E.C.C.O. Competences 2015)

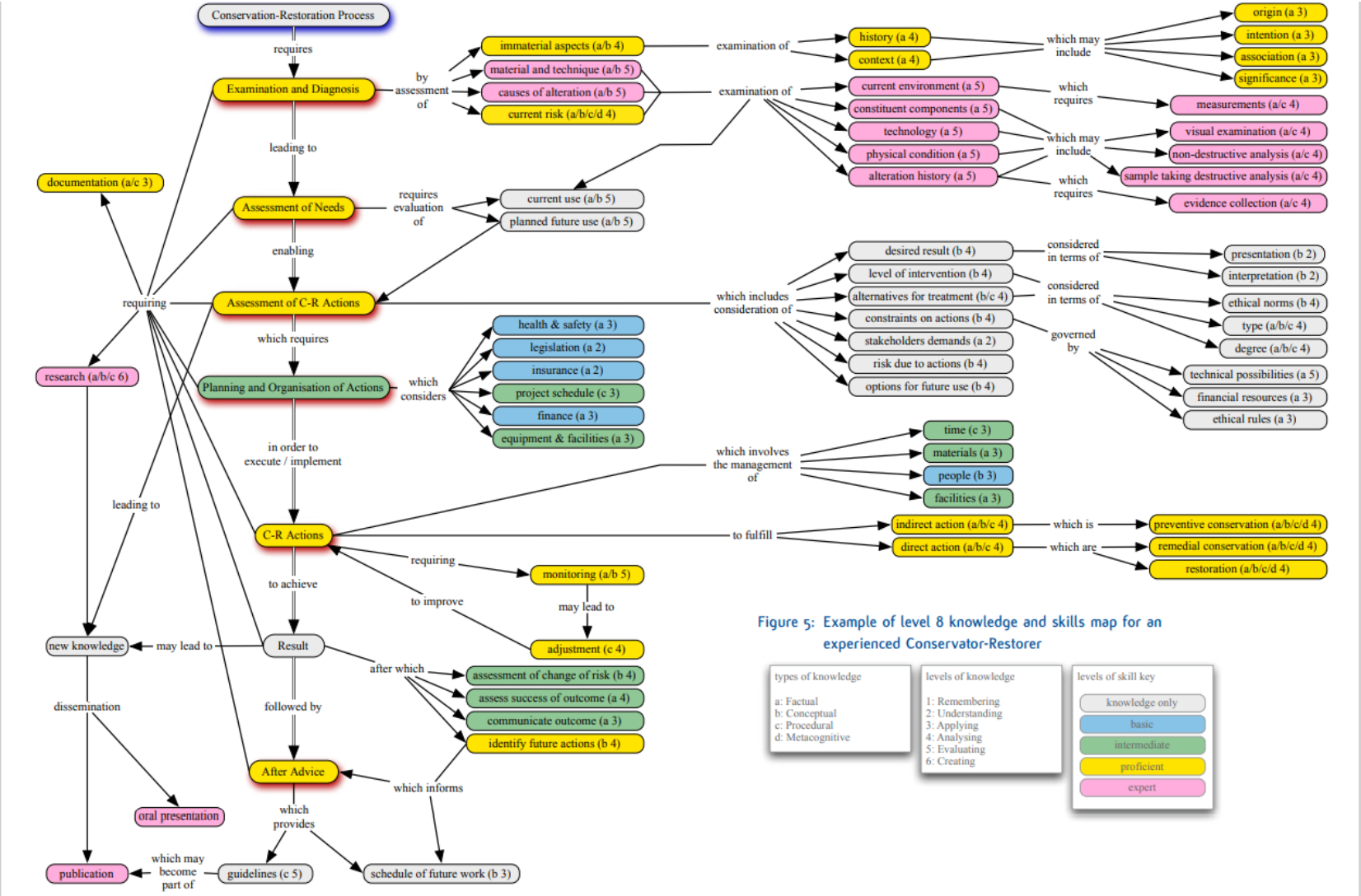


Figure 5: Example of level 8 knowledge and skills map for an experienced Conservator-Restorer