From Leafing to Browsing: Materiality, Virtuality, and Accessibility of Medieval Manuscripts

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Introduction

This thesis will investigate how digitization affects the study of materiality of the medieval book. More specifically, I will focus on the relationship between materiality and virtuality of the physical object and the impact that digital representation has on our perception and interpretation of the artefact. New technologies and advancements in digital humanities have changed and transformed the way we interact with historical texts. The digitization of texts and the creation of digital special collections has provided a new manner of viewing, altering readers' engagement with manuscripts from the physical to the virtual. This process is becoming one of the most popular forms of preservation for libraries and archives. Through digitization, institutions can provide access to organized collections of information (digital object including texts, video and audio), as well as preserve and propagate culture in multimedia form. This digital access to collections has become increasingly important and useful to scholars: "old-fashioned" research (involving a scholar searching through an actual book) is in fact supported and sometimes replaced by the digital material which is easier to access. The proliferation of digital resources has provided greater access to reproductions of manuscripts. Digitization has thus undoubtedly brought significant benefits and we now have much wider access and use of materials, enabling different types of research that could not otherwise be carried out. But is digitization a good thing for those who want to study and investigate the physicality of the manuscript? Are there qualities and aspects which cannot be detected from a digital surrogate? Is digitization affecting the way scholars investigate medieval books?

Over the last few years there has been growing interest among scholars, book historians and researchers regarding the relationship between medieval manuscripts as physical objects and their presentation in different media, as digital facsimiles. One of the most effective contributions defending the value of a book's physical features comes from D. F. Mckenzie, professor of bibliography and textual criticism at the University Oxford and distinguished scholar on the history of the book. Since manuscripts encode the history of their production, he said "it follows that to abstract a conceptual or verbal information content from them by representing them in another medium is to contradict the very assumption that the artefact is the product of a distinctive complex of materials, labour and mentality". He defined the reproduction of books as, "an impoverishment, a theft of evidence, a denial of more exact and immediate visual and tactile ways of knowing, a destruction of their quiddity as collaborative products under the varying historical condition of their successive realizations".[1]One of the

[1] D. F. Mckenzie, 'Computer and the Humanities' in M. Katzen (ed.), *Scholarship and technology in the humanities*, London: Bowker-Saur for British Library Research, (1991), p. 164.

obvious limitation of the virtual world is the size of the computer screen; it is often difficult for viewers to take in the scale of the object being presented.

The following discussion will explore the benefits and limitations of digitization when applied to manuscript studies and its related issues of materiality, virtuality and the consequences of digital surrogates on scholarly research and access to medieval manuscripts. We are still in the process of discovering the impact of multimedia technology on the interpretation of the original object and the restriction this technology poses. Johanna Drunker discusses digital visualization tools as systems that give information characterized by ambiguity and uncertainty. In her article, '*Humanities Approaches to Graphical Display'*, she states that graphical tools act as "intellectual Trojan horse"[2], a vehicle through which assumptions about what constitutes information can hide behind the appearance of data. The way knowledge is represented affects how we perceive information contained in those visual reproductions. In this regard, Melissa Terras claims that the production of digital images can lead to further uncertainty and technical distortions, affecting the resulting representation.[3] When a digital image is produces and delivered by internet technologies, many physical characteristics such size, texture and color, are inevitably lost. Furthermore, there can be problems compounded with image suppliers dependent on the devices characteristics and visual effects that are related to the conversion from one format to another.[4]

Even though the digital age brought significant changes and developments to many fields of study, the imaging field it is still poorly understood. In fact, one of the biggest drawbacks is that users accessing digital facsimiles are often not aware of the potential deficiencies of the material they are consulting, "A digital representation of an artefact is a representation of certain relevant characteristics of the artefact. It is not the original and complete artefact, nor even a metonymy or simulacrum of the complete artefact. It is only a representation of some "relevant characteristics".[5] It is therefore the effect of digitization on study and access of medieval manuscripts that will be assessed in the following chapters. In Chapter 1, through an exploration of the notions of materiality, I will provide an insight into the material aspect of the medieval

[2] J. Drunker, 'Humanities Approaches to Graphical Display' in *Digital Humanities Quarterly* 5 (2011) <http://www.digitalhumanities.org/dhq/vol/5/1/000091/000091.html> (Accessed August 25, 2018).
[3] M. Terras, Artefacts and Errors: Acknowledging Issues of Representation in the Digital Imaging of Ancient Texts, in *Kodikologie und Paläographie im digitalen Zeitalter 2/Codicology and Palaeography in the Digital Age 2*, ed. by F. Fischer, C. Fritze & G. Vogeler, Norderstedt: Books on Demand (2010), pp. 43-61.
[4] Ibid., p. 53.
[5] D. Arnold, 'Digital Artefacts: Possibilities and Purpose' in M. Greengrass, L. Hughes (Eds), *The Virtual Representation of the Past*, Ashgate (2008), p. 159.

book. I will also address the advancement of the digital medium applied to manuscript studies and how new digital technologies have contributed to the study of medieval manuscripts. The issue of authenticity and the interpretation of digital surrogates is addressed in chapter 2. In order to investigate what gets lost when a digital copy is created and put online, I will present a case study of a 13th century manuscript kept at Leiden University Libraries. Finally, the impact of digitization on physical access and the consultation of manuscripts will be discussed in chapter 3 through three case studies of precious manuscripts. While digital technologies and the creation of surrogates provide immediate access to digitized version of artifacts and serve as preservation strategies, they are, at the same time, responsible for altering our engagement with original sources, thus, threatening the original sources' value of materiality. Therefore, this thesis will focus on the limitations and implications of the technology of digitization, by considering how this practice can affect the interpretation and access of the original object.

Chapter 1

Books as Archaeological Objects

Medieval manuscripts are fascinating physical objects: all of them are unique artefacts which transmit all the traditions of the Middle Ages to us. But these handwritten and decorated objects, created mainly for the purpose of knowledge transfer, are more than just repositories of knowledge - they - are a powerful way of touching the past. While the words of a manuscript can convey information about law, theology, liturgy, science, education, literature and medicine, the varying and countless combinations of material support, design, layout, pigment and binding are vehicles conveying a different set of information regarding the history of the object. The physicality of the manuscript itself, which can vary according to the time period and the geographical area in which the manuscript was conceived, if accurately interpreted, can help to place the artefact in its particular setting of use.[6] The materials used to make the manuscript, and its contruction, can reveal valuable information about its historical and social context. Through examination of the medieval handbook, information may come to light that could not have been found in another way, such the item's provenance and origin.[7] The making, dissemination and reception of the book is often embedded in its material aspects.

The idea that medieval manuscripts are not just text-carriers but material informants as well is acknowledged by many scholars nowadays. Experts, such as Erik Kwakkel, read the physical properties of manuscripts as 'cultural residue', that is, clues to the societies and cultures that made and used the artefact itself. Medieval manuscripts were most likely the products of plans envisioned either by the scribe or by the reader. This means that manuscript books were products of a culture where every aspect of production was carried, and this culture also left its imprint on the codex. Scribes left their personal mark on the manuscript's design as a result of their cultural baggage, possible affiliation with an institution, and geographical location.[8] At the same time, the reader affected the design of the book through his or her own preferences and by the intended use of the manuscript.[9]

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[6] E. Kwakkel. 'Decoding the material book: Cultural residue in medieval manuscripts' in M. Johnston & M. Van Dussen (Eds.), *The Medieval Manuscript Book: Cultural Approaches* (Cambridge Studies in Medieval Literature, 2015), pp. 60-76.

[7] E. Kwakkel, 'The Cultural Dynamics of Medieval Book Production' in J. Biemans et al. (Eds.), *Manuscripten en miniaturen: Studies aangeboden aan Anne S. Korteweg bij haar afscheid van de Koninklijke Bibliotheek*, Zutphen: Walburg Pers (2007), p. 245.

[8] S. Nichols. 'What is a manuscript culture?' in M. Johnston & M. Van Dussen (Eds.), *The Medieval Manuscript Book: Cultural Approaches* (Cambridge Studies in Medieval Literature), pp. 34-59.

[9] E. Kwakkel explains that the reader had a significant impact on the design of commercial and personal books, but less influence on monastic book production. In fact, established scriptorium practices and monastic regulations developed their very own style of writing and local codicological features, as demonstrated by the writing practices

Chapter 1

Texts were both visual and tactile objects designed to engage multiple senses: they were often employed as part of institutionalized rituals in churches and public spaces,[10] and used as devotional objects by laypeople who exercised a large degree of individualized control in respect to their material design. Medieval readers constantly touched and used handwritten books, leaving fingerprints in the margins as a sign of their reading, resulting in discoloration and darkening of the parchment. Upon scientific examination, these signs of wear constitute a form of forensic evidence that can reconstruct reader's' habits. Dirt, smudges and discoloration due to wear are considered a topic of inquiry by Kathryn Rudy, who investigates patterns of use to gain a view into medieval cultural practices.[11] In her article, '*Dirty Books: Quantifying Patterns of Use in Medieval Manuscripts Using a Densitometer*', she explains how to identify patterns of use using a densitometer, an instrument that measures the darkness of a reflecting surface in a noninvasive way, to "apply objective criteria to the physical book"[12] in order to quantify and measure the reader's' marks. Her research demonstrates how medieval books are interactive and porous objects, that would "absorb the desires of an owner"[13] revealing their emotional state, private rituals and habits.[14]

The physical clues and permanent marks, whether left intentionally or unintentionally by past users, are distinctive signs that make objects unique and different from one another. Seth Lerer, in his essay, '*Bibliographical Theory and the Textuality of the Codex: Toward a History of the Premodern Book'*, explores the many ways in which information and meaning can be extrapolated from medieval manuscripts. He states that the uniqueness of manuscripts and their dynamic nature recur as defining features of manuscript culture, as a codex is "the unique product of human hands…the work of scribes, correctors, binders, illuminators".[15] Due to personal signs and marks of style and handwriting left by people involved in the process of producing and shaping the manuscript, medieval books can thus project the physical presence

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of Cistercian monasteries. See: M.B. Parkes, *Pause and Effect: An Introduction to the History of Punctuation in the West*, Aldershot: Scolar Press (1992), pp 38-40.

[10]C. Symes, 'Liturgical Texts and Performance Practices' in H.Gittos, S.Hamilton (Eds), *Understanding Medieval liturgy, Essay in Interpretation*, (Routledge, 2016).

[11] K. Rudy, 'Dirty Books: Quantifying Patterns of Use in Medieval Manuscripts Using a Densitometer,' *Journal of Historians of Netherlandish Art* 2 (2010), www.jhna.org/index.php/past-issues/volume-2-issue-1-2/129- dirty-books.

[12] Ibid.

[13] K. Rudy, *Piety in Pieces How Medieval Readers Customized Their Manuscripts* (Cambridge: Open Book Publishers, 2016), p. 10.

[14] K. Rudy notes that the damage found in the opening of the Missal of the Haarlem Linen Weavers' Guild is due to the repeated act of kissing the page by the priest.

[15] S. Lerer, 'Bibliographical theory and the textuality of the codex: Toward a history of the premodern book', in M. Johnston & M. Van Dussen (Eds.), *The Medieval Manuscript Book: Cultural Approaches* (Cambridge Studies in Medieval Literature, 2015), p. 18.

of their creators,[16] revealing the close interaction between the object and the context from which it originated. Human connections with the book continue as traces of use build upon layers of 'dirt' as it is circulated, allowing numerous agents (scribes, readers/users) to participate in its life-cycle.

Manuscripts were in constant flux, always having the potential to be reshaped when the current owner altered quires, added text, or modified the binding support. Michael Johston and Michael Van Dussen argue that the physical aspect of medieval books "opened up and foreclosed forms of cultural exchange that were different from those facilitated by the printed book and the digital text".[17] With the move toward mechanized production, those forms of human contact which characterized the handwritten book were drastically reduced, as well as the readers influence on its production. Therefore, through the study of codices, the modern user witnesses the human labor required to produce the object and the subsequent history of its reception and use, bringing back to light the human connections to the objects.

Later alteration and changes to books, whether in the form of addition or subtraction of material, can reveal their owners' fears and desires. Medieval readers constantly altered their books, demonstrating both their physical engagement with, and the emotional attachment to, the object. While reading the content, they used their senses to explore the composition of the manuscript by smelling, touching, and even tasting the surface of the vellum from which it was made. There is evidence medieval people would often interact with their books in such a way as to reveal something of their habits and ultimately, their emotional lives. One form of interaction includes kissing and touching words or devotional images of figures whose physical presence embodied divinity, revealing the interest of personal users towards specific prayers or Saints.[18] The damaged images of several apes found in the *Hours of Jeanne de Navarre* tell quite a different story. According to Madeline Caviness, users would often expunge offensive images due to the anxiety they felt towards what they considered to be inappropriate representation. Other erasures include parts of grotesque figures in the margins of a Nativity scene, and other obscene motifs with immoral content.[19] These sort of 'marks' left on the

[16] A. Chen, 'In One's Own Hand: Seeing Manuscripts in a Digital Age' in *Digital Humanities Quarterly* 6, no. 2 (2012): 2 <http://www.digitalhumanities.org/dhq/vol/6/2/000138/000138.html> (Accessed April 6, 2018).
[17] M. Johnston, M. Van Dussen, *The Medieval Manuscript Book: Cultural Approaches* (Cambridge Studies in Medieval Literature, 2015), p. 1.
[18] K. Rudy attributes the darkness of some margins to their intensity of use and handling. This was apparent in the first nine folios added at the beginning of the Ms.135 G 19 including a prayer to Christ and a Prayer to Jacob, to which it seems the owner of the book was much interested. K. Rudy (2010).
[19] M. H. Caviness, *Reframing Medieval Art: Difference, Margins, Boundaries* (e-book, Medford, 2001), <http://dca.lib.tufts.edu/caviness/> (Accessed April 6, 2018).

surface of manuscripts not only allow scholars to understand how the book was used, but it may also give us insight into the emotional state of people who lived in the medieval past.

The material composition of manuscripts can unveil the physical engagement past users had with their books and establish a connection between past and present reading habits. Materiality was significant in the Middle Ages: believers imitated the priests' act of either kissing or touching certain section of the book during mass in the attempt to experience the same divine interaction.[20] Books of Hours, the most popular books of the late Middle Ages, were used by laypeople who wanted to participate in the daily round of prayer and worship that characterized the lives of monks and priests.[21] Daily Christian liturgy required the use of liturgical manuscripts to validate the rite's sanctity.[22] Carol Symes, in her article '*Liturgical Texts and Performance Practices'* discusses the use of texts in liturgical performances by analyzing visual clues such as rubrics and size. She noted that some specific clues and visual aids reveal how texts may have been used during performances. These rituals, performed by the clergy and often attended by the public, linked multiple churches throughout the city together and were real public displays involving choristers, relics, devotional objects and sumptuous vestments.[23][24] The public celebration of rituals, with the engagement and emotional response of the participants, was crucial for the consolidation of the wider community.[25]

While it is difficult to understand what really occurred during those rituals, it is possible to reconstruct what probably occurred during liturgy, and to understand how those books were used, from their physical properties and the directions and rubrics found in liturgical texts describing the body postures to be assumed during liturgical performances. The study of such 'cultural residue', (a definition proposed by Erik Kwakkel to label these codicological traits and patterns of previous use), can deepen our understanding of medieval manuscripts and allow us to sense their real aura and uniqueness. The perception of the of these unique objects' material identity facilitate the physical connection with the past and, more importantly, take us back to when it was originally made, allowing us to experience the medieval habit of touching and smelling the book. According to Walter Benjamin, the author of the article, '*The Work of Art in the Age of Mechanical Reproduction'*, the aura and uniqueness of past objects and works

[20] K. M. Rudy, *Kissing Images, Unfurling Rolls, Measuring Wounds, Sewing Badges and Carrying Talismans: Considering Some Harley Manuscripts through the Physical Rituals they Reveal*, Electronic British Library Journal (2011). < http://www.bl.uk/eblj/2011articles/article5.html> (Accessed April 7, 2018)
[21] C. Raymond, T. Graham, *Introduction to Manuscript Studies* (Cornell University Press, 2007), p. 208.
[22] C. Symes (2016), pp. 239-67.
[23] C. M. Malone, *Façade As Spectacle : Ritual and Ideology at Wells Cathedral* (Leiden : Brill, 2004), p. 143.
[24] This is especially apparent in the celebration of processional rituals such as the Palm Sunday, the Candlemas and the Rogations.
[25] C. Symes (2016), pp. 239-67.

of art basically cease to exist in their technological reproduction.[26] The notion of 'aura' proposed by Walter Benjamin can be considered to be the special property which defines a historical or artistic object. Peculiarities such as changes in the physical structure of the object over the time, in other words the aging of the artefact, make up the history of the artefact and can be traced only through the investigation of the physical object. Benjamin insists that the authenticity of an object is essentially jeopardized by reproduction, since it "detaches the reproduced object from the sphere of tradition".[27]

What Walter Benjamin terms the 'aura' of an object, is the unique historical sensation of the artefact depending on its physical qualities which cannot be conveyed through its reproduction but through the human physical interaction with the object. Can Walter Benjamin's definition of aura still be present in digital historical objects? Benjamin argues that this is not possible, because "in even the most perfect reproduction, one thing is lacking: the here and now of the work of art–its unique existence at the place at which it is to be found. The history to which the work of art had been subjected as it persists over time occurs in regard to this unique existence–and to nothing else".[28] The essential qualities, as well as the meaning and significance of objects, are not transferred to their digital copy. In this sense, it can be argued that since the digital object does not carry qualities such as weight, evidence, sign of use, and passage of time, which together contribute to its aura, it is enable to provide a sensory engagement between the modern user and the past.

The Digital Revolution in Manuscript Studies

The study of medieval manuscripts has drastically changed since the introduction of new digital technologies. The advent of digital imaging, the spread of the World Wide Web and the ability of these two technologies have quickly transformed the way we interact with and study works of art and past objects. In manuscript studies, the traditional approach of studying manuscripts involving scholars searching and investigating the actual books has been replaced by the less expensive and less strenuous online consultation of digital photographs of manuscripts.[29] Open

[26] W. Benjamin, *The Work of Art in the Age of Its Technological Reproducibility* [First Version] *Grey Room*, no. 39 (2010), pp. 11–37.
[27] Ibid., p. 13.
[28] Ibid.
[29] A study by Dorothy Carr Porter surveyed a selected group of medievalists at university faculties across the US on their use of and attitudes towards electronic resources. The survey reported that the use of digital manuscript increased in 2002 by 33% and by 44% in 2011. See, "Medievalists and the Scholarly Digital Edition," *Scholarly Editing: The Annual of the Association for Documentary Editing* Volume 34 (2013). < http://www.scholarlyediting.org/2013/essays/essay.porter.html> (Accessed April 7, 2018).

access to digital representation of cultural artefacts allowed students and scholars interested in the content of medieval manuscripts to finally work with primary sources wherever they are, a concept which would have been unimaginable as little as 25 years ago.

In the period between the Middle Ages and the nineteenth-century, reproduction of artworks were circulated in the form of woodcuts and lithographies until the medium of photography took over and surpassed graphic art.[30] Photographic technology spread around the globe, but not without criticism. Art historians themselves were among the first to notice the methodological problem posed by the new medium. Heinrich Wölfflin's three articles published in 1896-97 and 1915 on the photography of sculpture can be considered the first explicit attempt to analyze the problem of how photography could affect art-historical scholarship.[31] Wölfflin in his 1896 essay '*How should one photograph sculpture*' complains about the lack of skills and insight on the part of historians who, being early practitioners of the emerging discipline, failed in finding the correct photographic angle, "that through beauty and clarity makes itself felt to be the leading one".[32] He then specifies that "this normal viewpoint is first of all naturally none other than the direct frontal view".[33] Walter Benjamin also express concerns about the issues of original material versus reproduced, claiming that with photography the work of art shifted from cult to construct, gaining a new function and destroying the cult value of the object.[34] Within only a generation of its invention, and despite the criticism, photography became the leading means for distributing images of famous works of art and monuments. Vast number of photographs spread throughout the world in the form of individual prints and, increasingly, in printed books. For many experts, the potential usefulness of this new technology for documentation was so evident that pioneering photographers and publishers of photography promoted photography not only as a means of reproducing images and making major work of art better known, but also as a means of preservation. The "descriptive graphic medium", as it was called at the very beginning,[35] became so dominant among historical disciplines that it was eventually used to produce photographic reproduction

[30] W. Benjamin, *The Work of Art in the Age of Its Technological Reproducibility.*
[31] H. Wölfflin, 'Wie man Skulpturen aufnehmen soll', in *Zeitschrift für bildende Kunst*. Neue Folge 7 (1896), pp. 224–228. H.Wölfflin, H. Wölfflin, 'Wie man Skulpturen aufnehmen soll', *Zeitschrift für bildende Kunst*. Neue Folge 8 (1897), pp. 294-297. H. Wölfflin, 'Wie man Skulpturen aufnehmen soll? (Probleme der italienischen Renaissance)', *Zeitschrift für bildende Kunst*. Neue Folge 26 (1915), pp. 237-244.
[32] H. Wölfflin, & G.A. Johnson. 'How One Should Photograph Sculpture', in *Art History*, 36. No. 1 (2013), pp.52–71.
[33] Ibid.
[34] W. Benjamin, *The Work of Art in the Age of Its Technological Reproducibility.*
[35] R. Lieberman, 'Thoughts on an Art Historian/Photographer on the Relationship of His Two Disciplines', in R. H. Roberts, *Art History through the Camera's Lens*. Gordon and Breach (1993), pp. 217-248.

of manuscripts. The French photographer Camille Silvy, who was interested in reproducing works of art, began producing a series of facsimiles of early manuscripts, such as the Manuscript Sforza, in 1960 to facilitate scholarly research.[36] Such facsimiles made it possible to examine entire manuscripts from the accurate reproductions for the first time, enabling museums and libraries to make unique manuscripts much more accessible.

Despite the unquestionable usefulness and advantages of printed facsimiles, their availability was still limited. The access and circulation of facsimiles only reached its peak with the advent of the digital age at the end of the twentieth century, when the combination of three areas of technological advances created an environment for digital conversions turning it into a global phenomenon. The first important driver for this development was the invention of digital scanning, which captures high-resolution images allowing computers to convert manuscripts into digital files. The second advancement was the exponential increase in storage capacities of digital data, enabling the creation of rich digital information. The success of digitization can also to be attributed to a third factor, the rapid expansion of the World Wide Web, which provided easy access to and wide distribution of digital facsimiles. Therefore, these technological advancements and capabilities fostered by the advent of the web provided the conditions necessary for the development of digital technologies.

One of the first manuscripts to be digitized is also one of the earliest surviving European poems written in Old English. The Electronic Beowulf project, started in the early 1990s, represents a pioneering seminal project that allowed greater access to this important and precious medieval text. Within four years, a full-color digital facsimile of Cotton Vitellius A. xv[37] was made available on the Web by the British Library, providing a solution to problems of access and conservation.[38] Aiming to reveal bits of the text damaged by a fire in 1731, the electronic Beowulf, it was claimed, would provide, "better access to part of the manuscript than studying the manuscript itself".[39] The use of the digital camera recovered and revealed previously illegible letters of the manuscript, allowing researchers and readers to acquire information that otherwise would have been lost.

The rapid advancement of the digital medium applied to manuscript studies not only provided a solution to the problem of access and conservation, but also helped to define issues

[36] A. Hamber, 'The Use of Photography by Nineteenth-Century Art Historyans', in R. H. Roberts, *Art History through the Camera's Lens*. Gordon and Breach (1993), pp. 135-161.
[37] London, BL: ms. Cotton Vitellius A.xv.
[38] A. Prescott, *Towards the Digital Library: The British Library's Initiatives for Access Programme*. The British Library (1998) pp. 30-49.
[39] *Electronic Beowulf:* < http://www.uky.edu/~kiernan/eBeo_archives/ > (Accessed April 9, 2018)

which could be tackled by non-invasive technologies. For instance, the Optical Character recognition (OCR), a tool for character localization based on binarization algorithms, allows researchers to identify, interpret and reconstruct texts word by word or even symbol by symbol.[40] This revolutionary technology can transform digital images (scans) of manuscripts into readable and searchable texts, solving problems related to manual transcription, such as human error and time-consuming procedures. Another modern technology is HTR (handwritten text recognition), an emerging field very similar to OCT, but still in development. Unlike OCR, HTR does not focus on individual letters. Instead, it scans and processes the image of entire lines and tries to decode this data.[41]

The large-scale reproduction of medieval manuscripts as digital data changed the way we study and understand handwritten books. Nowadays, the digital facsimile is a common starting point for research projects on manuscripts, because it is easily accessible and cost-free. Today's medievalists are part of the so-called 'Google Generation' which is completely accustomed to and familiar with online or digital media. They are thus more inclined to research content and primary sources through a proxy and to only consult the original when absolutely necessary. Digitization signified that scholars, students and the general public could finally gain free access to something that waspreviously almost inaccessible, controlled by restricted use policies and unknown to most. Thus, large-scale digitization lead to a global dissemination of cultural and historical information resulting in a democratization of knowledge, which can now be accessed from every location in the world. The transformation of primary sources into digital images is particularly important for researchers in the field of medieval studies, since scholars often need to see texts, images and even manuscripts' covers relevant to their research. John Unsworth, university librarian and Dean of libraries at the University of Virginia, has noted that, "the most obvious benefit of digitization, for the humanities, is access to primary source materials. The aggregation of these resources, in digital form, is bound to provide new sources for humanities scholarship".[42] Digital facsimiles can therefore "represent" their source in scholarly research when the originals are rare and too fragile to be accessed and when tools and software can reveal more than the manuscript itself does under ordinary circumstances. [43]

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[40] G. Vamvakas, B. Gatos, S.J. Perantonis, *Handwritten character recognition through two stage foreground sub-sampling. Pattern Recognition* 43, 2807–2816 (2010)

[41] <https://transkribus.eu/wiki/index.php/Questions_and_Answers - How_much_training_data_do_I_need_to_create.3F> (Accessed May 31, 2018).

[42] J. Unsworth, *The Value of Digitization for Libraries and Humanities Scholarship*, Innodata Isogen Symposium, The Newberry Library (2004). <http://people.virginia.edu/~jmu2m/newberry.04.html>. (Accessed April 10, 2018).

[43] For instance, the digital version on the Archimedes Palimpsest allows the user to read parts of the text that were scraped off and overwritten with a prayer book by Johannes Myronas in 1229Ad. The digital facsimile, it is said,

Nevertheless, it is important to recognize that a digital copy is not the object itself, but a representation of certain relevant characteristics of the artefact. As already mentioned, Walter Benjamin argued that mechanical reproduction threatens the authenticity and real value of the artefact, leading to the loss of the "auric presence" defined as the "essence" of the art work. Similarly, Melissa Terras claims that the production of digital images can lead to further uncertainty and technical distortions, affecting the resulting representation.[44] She goes even further when posing the issue of the quality of digitized images, questioning the reliability of the virtual representation of artefacts. In discussing the problem of digital representation, Terras contends that, "issues raised by the digitization process include distortion caused by lens shape, difficulties in colour management and reproduction, and the unintentional introduction of 'artefacts' into images, which can have an effect on the resulting image."[45]

Discussions on this matter have centered around representation and the status of the digital copy as "inferior" to its analog equivalent, and how this change in format can potentially separate the artefact from its authenticity. When it comes to the act of digitizing, settings like file-format, color-correction, resolution and other properties contribute to the creation of a digital surrogate. This digital surrogate is the result of a conversion to something that is meant to portray the original object as faithfully as possible. In other words, digital images can be viewed as a set of colors or pixels combined with instructions for computing applications regarding how this data should be displayed.[46] In discussing the status of the digital facsimile, John Unsworth claims that the digitization process lead to a change in the nature of the object: "with respect to the humanities, objects of study can be images, texts, sounds, maps, performances, concepts, three-dimensional objects. When we make a digital surrogate for any one of these, we always believe that our aim is to represent it as faithfully as possible, with the least possible interference, or noise, in the process – but when, as scholars, we deal with these digital surrogates, or produce our own, we learn that there's no such thing as an innocent act of representation: every representation is an interpretation".[47] The relevant features of every "interpretation" of a cultural artefact depend upon the purposes behind creating and using the

" has some advantages over the manuscript. It is freely available on desktops around the world, it is far easier to reas the under texts in some of these images than it is in the manuscript itself". See <http://archimedespalimpsest.org/digital/> (Accessed May 28, 2018).

[44] M. Terras, (2010), pp. 43-61.

[45] Ibid., p.45.

[46] Ibid.

[47] J. Unsworth (2014).

digital representation. There can, therefore, be as many digital copies of a single original object as there are purposes leading to their creation.[48]

Even though the digital surrogate is not an object itself, it can nevertheless convey many aspects and characteristics of the original features. It would be erroneous to suggest that the advantages brought to the study of manuscripts by digitization should be dismissed and considered inferior to the material superiority of original artefacts. The value and benefits of digitization are widely recognized by many scholars. The experts of digital cultural heritage, Marilyn Deegan and Simon Tanner, explain the benefits of digital access to library collections: "immediate access to high-demand and frequently used items; easier access to individual components within items (e.g. articles within journals); rapid access to materials held remotely; the ability to reinstate out of print materials; the potential to display materials that are in inaccessible formats, for instance, large volumes, or maps; the ability to enhance digital images in terms of size, sharpness, colour contrast, noise reduction, etc.; the potential to conserve fragile/precious objects while presenting surrogates in more accessible forms; the potential for integration into teaching materials; enhanced searchability, including full text; integration of digital media (images, sounds, video, etc.); the ability to satisfy requests for surrogates (photocopies, photographic prints, slides, etc.); reducing the burden of cost of delivery; the potential for presenting a critical mass of materials".[49]

Furthermore, digital images can be replicated, downloaded, printed, annotated, shared compared and even restored, opening new modes of use and providing greater access to our cultural heritage. The introduction of digital technologies is therefore seen both as a threat to the authenticity of the real object and as an opportunity for innovation. Whether it is for better or for worse, the digital revolution had a profound impact on the way that many scholars conduct and share their research. The affordances of digital media reduce travel time and cost and provide access to vast collections of images of medieval texts not only to scholars but also to the section of the public interested in such artefacts.

[48] A typical range of purposes for digitization of cultural artefacts might be concerned with either documentation and analysis for use by scholars and heritage professionals, or related to the dissemination of culture to the general public.

[49] M. Deegan, S. Tanner. *Digital Futures: Strategies for the Information Age*. London: Library Association Publishing (2002), p.32.

Chapter 1

New technologies and opportunities

The widespread availability of a large amount of digital material required tools and software that historians, researchers and common users could use to expand possibilities and to improve the quality of their research and experience. Digitization has had a profound impact on the way scholars and students approach and interact with medieval manuscripts. Nowadays, we tend to deal with digital images of texts more than we handle original texts, and we do that not just because of their accessibility. Open access to valuable and fragile historical material is obviously one of the main benefits of digitization, and through many online catalogues it is possible to search, view, and compare images of folios on a computer screen without threatening their fragile condition. We are now able to view digitized manuscripts in detail via many portals, due to the ability to zoom and magnify aspects that otherwise would be indiscernible to the human eye. For instance, anyone can examine texts and illuminations in detail and download pages of the Vatican Library's digitized collection from the Digital Vatican Library[50] website for free, to use for research and private study.[51] With remote-access scholarship increasing exponentially, digital images became a standard research tool for many scholars. This encouraged repositories to offer more services to their users and provide tools that enable more effective forms of scholarship. For example, a digital facsimile of the Utrecht Psalter is available in high resolution along with its annotated edition via the Utrecht Library website, so that users can see how specific illustrations are related to specific parts of the psalm text.[52] Similarly, the 'Turning the Pages' software on the British Library's website, to leaf through the British Library's digital collection, completely engages the user with features like deep zoom and audio or video related to the pages, giving a sense of object-immersion.[53]

But, the process of digitization is not only about making images, and it is much more that global accessibility and dissemination of historical artefacts. Once digital images are created, they can be manipulated, altered, and reconstructed by advanced technology and

[50] The DigiVatLib is a digital library service, providing free access to the Vatical Library's digitised collections. It contains 6,368 digitised manuscripts and incunabula of the Vatican Library, mostly from the Middle Ages and Humanistic period, with bibliographic references linked to digital materials. The collection includes manuscripts of: literature, history, art, law, astronomy, mathematics, natural science and medicine. The projects of the DigiVatLib projects are supported by NTT DATA, DEDAGROUP and FEDERLAZIO SOLITARIETÀ.

[51] See, <https://digi.vatlib.it/view/MSS_Urb.lat.1> (Accessed April 19, 2018). The images are delivered as JPEG files in colour.

[52] See, <http://psalter.library.uu.nl/page?p=10&res=1&x=0&y=0> (Accessed April 19, 2018).
The text of the psalms is available in four languages: English, Dutch, French and Latin. A rectangle on the image links that specific illustration to a specific part or parts of the psalm text, and vice versa. A description of each image is provided, along with a list of academic publications on the illustrations of the psalms. The user can browse through the digital facsimile, share the images on social media, and download images in three different sizes.

[53] See, <http://www.bl.uk/turning-the-pages/> (Accessed April 19, 2018).

sophisticated tools to address different problems. With advancements in electronic image manipulation, scholars have been applying forensic techniques to the study of alterations and damage in medieval manuscripts. I have already mentioned the study by Kathryn Rudy, lecturer in the School of Art History at the University of St Andrews, on patterns of use revealed by measuring the darkness of the manuscript surface. She adopted densitometrical analysis to examine the dirt and signs of wear in manuscripts, a technique used in forensic science and applied by immigration authorities to disclose altered cheques and doctored passports. The densitometer is used by Kathryn Rudy on several manuscripts to measure the optical density of a reflecting surface, revealing which pages in medieval books are dirtiest, and therefore, the most read. Dr Rudy's research made it possible to identify, "more specific narratives about books and their users".[54] She then goes on to claim that, "as we listen to the last gaps of the physical book, it is important to think about this material evidence and what it represents. What we have to gain by digitization and by abandoning the book as a physical object may be negated by what we have to lose".[55]

The use of powerful technologies combined with digital formats give scholars new means to explore and investigate historical artefacts. However, the digital counterpart cannot be disconnected from its original and should not be considered more reliable and important than the artefact itself. At the end of her article '*Dirty Books: Quantifying Pattens of Use in Medieval Manuscripts'* Kathryn Rudy clearly stresses the importance of physically approaching cultural artefacts, and of avoiding falling in the trap of replacing objects with two-dimensional images, for "studying manuscripts for their dirt content cannot be accomplished by use of a digital or photographic proxy, and even the photographs published with this article do not always convey the subtleties of the dirt that the densitometer is able to distinguish".[56] Umberto Eco saw that we create realistic fabrications in an effort to come up with something that is better than the real, a virtual version of all cultures which are more exciting, more beautiful, more inspiring and generally more interesting that what we encounter in everyday life.[57] In his essay '*Travels in Hyperreality'*, dated 1975, Umberto Eco criticizes the contemporary culture responsible for creating imitations and replicas in museums. He explains the concept of "the absolute fake" or "hyperreality" where imitations are not just a reproduction of reality, but an effort to improve

[54] K. Rudy, 'Dirty Books: Quantifying Patterns of Use in Medieval Manuscripts Using a Densitometer' *Journal of Historians of Netherlandish Art*2:1-2 (2010). See, <https://jhna.org/articles/dirty-books-quantifying-patterns-of-use-medieval-manuscripts-using-a-densitometer/ - citation> (Accessed April 20, 2018).
[55] Ibid.
[56] ibid.
[57] <http://www.transparencynow.com/eco.htm>. (Accessed April 20, 2018).

it. Even though digital facsimiles are indeed improvements which are supposed to bring new opportunities to manuscript research, we should not identify the "completely fake" with the "completely real", as Umberto Eco would say. Material things, in this case three dimensional medieval manuscripts, are complex objects which cannot be fully represented by two-dimensional digital facsimiles. In fact, a book is made of several layers which need to be described. For instance, a medieval manuscript generally consists of bookbinding, sewing support and quires, as well as being made with different materials each with different textures and thicknesses. These subtleties are inevitably lost during the conversion to a flat photograph. Therefore, one obvious limit of a digital representation is the codicology and materiality of the book. The stringent focus on facsimiles not only presents limitations to the analysis of the object (images cannot deliver features like size, weight, sound and smell), but also precludes the physical feel of the original artefacts, which is an extremely important and formative experience when it comes to handling fragile materials.

These are issues well known to scholars, who struggle to teach and practice codicology based on digital copies.[58] For this reason, the Leuven university has spent the last decade working on the development of a visualization instrument capable of rendering small inscribed and illuminated artefacts, such as seals, bookbinding, illuminations, archeology artefacts, cuneiform tablets and other historical objects. Dr. Lieve Watteeuw (Illuminare, Center for the Study of Medieval Art, KU Leuven, Belgium) and Dr. Hendrik Hammeuw (Ancient Near Estern Studies, KU Leuven, Belgium) used the innovative multi-spectral imaging tool on objects from the special collection at Leiden University Libraries in November 2017. The new technology called the Portable Light Dome System uses the polynomial texture mapping, known as Reflectance Transformation Imaging (RTI), a technique of imaging and interactively displaying object of different size to reveal surface phenomena. This technique reveals physical characteristics, alterations and degradations and structural changes in surfaces of fragile medieval documents and books, which otherwise would be invisible to the human eye. The Portable Light Dome (PLD) system consists of a light-weight hemispherical shape device (the dome) equipped with 260 LED-lamps evenly spread across the inside of the hemisphere and a single downward looking 28 million pixels digital camera. The different angles of light that illuminate the artifact positioned in the center of the hemisphere is able to capture both 2D features (color, reflectance and intensity) as well as 3D aspects (fine measurements and height

[58] P. Strokes, Teaching Manuscripts in the Digital Age, in (Ed.) F. Fischer, C. Fritze & G. Vogeler, *Kodikologie und Paläographie im digitalen Zeitalter 2/Codicology and Palaeography in the Digital Age 2*, (Norderstedt: Books on Demand (2010).

profiles).[59] The advantage of this technique is found in the multiple ways in which the single resulting image can be handled and used through advanced filters, enabling the visualization of erased or damaged texts and the identification of different inks to be used for instance. Tools such as this can support different types of research questions and help curators analyze damaged surfaces without further compromising heritage objects. But the PDL is a very expensive instrument, and not every heritage institution can afford the expenses of this technology. So, the question that arises is whether the number of cultural and heritage institutions adopting this technology will be enough to impact the heritage sector and transform the way we approach and study historical artefacts.

Manuscript studies relied for years on traditional methods of scholarship until the new digital age brought significant changes and developments to many fields of study. The emergence of digital humanities and the increasing collaboration between medievalists and specialists in digital media and computer sciences resulted in the development of new research tools and methods: from the mass digitization of historical documents, which suddenly made millions of images of manuscript available online, to the development of automatic analytical tools for evaluating the relations between text versions and the creation of digital tools for transcriptions. Digitization of texts and the creation of digital special collections provided a new manner of viewing, altering the engagement with manuscripts from physical to virtual. After the first big step was achieved, the next goal was to make all the information contained in these historical books available to scholars and the general public through text recognition tools.

In recent years, many tools for handwritten text recognition (HTR) have been developed to help paleographers in the enormous task of analyzing and transcribing large amounts of handwritten texts.[60] TexT, the interactive text extractor tool, stands as one of the latest achievements in this field. Anders Hast, senior lecturer of computer graphics and scientific visualization at Uppsala university, presented a tool for semi-automatic transcription of medieval manuscripts called TexT. In his research, Anders Hast outlined the principles for a less boring and more exiting methodology based on a word spotting system. This text extractor tool is a semi-automatic transcription instrument for historical handwritten manuscripts and is

[59] See <https://lirias.kuleuven.be/bitstream/123456789/622614/1/18ARC-Vandermeulen-PG-64.pdf>. (Accessed April 21, 2018).

[60] To mention a few: Catti, the Computer Assisted Transcription of Text Images for fast transcription. See, V. Romero, A.H, Toselli, E, Vidal: Multimodal Interactive Handwritten Text Transcription, vol. 80. World Scientific, Singapore (2012); iDOC, Interactive Analysis, Transcription and Translation of old text Documents, for transcription and translation of images of old archive documents.
See, <https://www.prhlt.upv.es/wp/project/2016/idoc>. (Accessed April 22, 2018)

based on the approach of transcribing each unique word only once for the whole document, speeding up the entire process of transcription. Furthermore, the system is equipped with a word spotting system: an interactive approach which finds other possible occurrences of the same word.[61] The proposed approach, which offers a quick and easy transcription of text using computer assisted interactive techniques, proved to be an effective form of support for scholars. For the next step in the project, the author advocates improving the level of accuracy by further refining the transcription algorithm. Many other transcription tools have been developed over the years due to the tedious and time-consuming task involved in transcription. The Transkribus[62] platform for the automated recognition, transcription and searching of historical documents is one of the most popular. This application, hosted by the Digitization and Digital preservation group (DEA) at the University of Innsbruck, combines HTR with manual transcription, and includes the ability to 'learn' to 'read' handwritten texts by 'seeing' as much of the handwriting as possible. [63] [64] While manual transcription is in many cases the most common way to create reliable electronic texts from handwritten texts, it can be time consuming and prone to human error. An alternative that can speed up the process, and simultaneously provide a good level of accuracy, is the use of the semi-automatic or semi-supervised transcription method.[65]

But are these digital approaches a good thing for those who want to study and investigate medieval manuscripts? What capabilities does the digital medium add to the scholarly repertoire? In this respect, Joris van Zundert reflects on the role and function of digital scholarly editions, arguing that there is no methodological innovation in it, but just renovation.[66] Digital editions can be modified, changed, and processed. However, as of now the access to new technologies and developments in digital imaging such as the Portable Light Dome is currently

[61] A. Hast, P. Cullhed, E. Vats, Text- Text Extractor Tool for Handwritten Document Transcription and Annotation, in G, Serra, C. Tasso, (eds) *Digital Libraries and Multimedia Archives*. IRCDL 2018. Communications in Computer and Information Science, vol 806. Springer, Cham.
[62] See, <https://transkribus.eu/Transkribus/> (Accessed May 31, 2018).
[63] According to Transkribus Wiki, at least 20,000 words of document are needed to train the HTR to recognize a certain style of handwriting. See, <https://transkribus.eu/wiki/index.php/Questions_and_Answers_-_How_much_training_data_do_I_need_to_create.3F> (Accessed May 31, 2018).
[64] For further information see, M. Jander, *Handwritten Text Recognition – Transkribus: A User Report*, eTRAP Research Group, Institute of Computer Science, University of Gottingen, Germany, 2 November (2014), Available at <http://www.etrap.eu/academic-output/> (Accessed May 31, 2018).
[65] A. Hast (2018), p. 84.
[66] Zundert, J.J. van, By way of conclusion: truly scholarly, digital, and innovative editions?, in T. Andrews and C. Macé (Eds.), *Analysis of Ancient and Medieval texts and manuscripts: digital approac*hes, Turnhout (2014), pp. 335-346.

too restricted and limited to make a real difference and to take the fruition of digital facsimiles to a level of considerable quality.

The most obvious advantage of digital humanities technology applied to manuscript studies is indeed interactivity and openness. The proliferation of digital resources has provided greater access to reproductions of manuscripts, thus reducing previous limitations on viewing these artefacts and ensuring that digital tools are useful aids for improving researcher's' experience working with digital manuscripts. Even though the contribution of digital humanities to the field of medieval studies is unquestionable, especially in the paleographic field, digital imaging technology nevertheless presents obvious limitations which cannot be overcome. Focusing on digital copies alone to study manuscripts removes other aspect of manuscript studies, such as their physical size and weight, or how they feel, sound and smell. For these reasons, the materiality of the manuscript is necessary to the understanding of the artefact and its culture, and should be central to manuscript research.

Chapter 2

Materiality matters

The study of manuscripts is a useful and indispensable approach for the investigation of our past. Lots of information can be retrieved from a codex. Philologists, historians and codicologists look for different information according to their specialty and research questions. Some may be interested in decorations and miniatures, others in their content and language. For instance, a book historian interested in examining a specific book's writing technique will most certainly analyze its script. An art historian interested in illumination technique and tools may decide to undertake a chemical analysis of manuscript pigments.[67] Manuscripts are composite objects and therefor, technical analysis of the different materials they are made with, including the original binding, can shed light on their origin and, date and may even help locate the where the of manuscripts were made.[68]

The binding is a physical object and its form, construction, and decoration can teach us something about the history of the book, its development and its use.[69] Mirjam Foot, Professor of Library and Archive Studies, has long studied decorative bindings, their structures and techniques and, more generally, the history of the book and its place in social history. She

[67] According to Dr. Mark Clarke, who specialized in technical art history and book conservation, there has been little scientific analysis of manuscript pigment in the past, mainly because of the fragile nature of many sources, the need for the pigments samples for analysis, and for the lack of portable equipment. Recently, increasingly sensitive, reliable and non-invasive techniques have become available, such as the Raman micro-spectroscopy, which is useful for identifying inorganic pigments, and the near-infrared imaging. Chemical analysis of pigments can serve many purposes. It can help art historians to assess the date of a manuscript and its attribution on a given center, based also on other evidences, such as the paint practices of the artist. Furthermore, historical techniques can provide information on the artistic process itself, as they are able to distinguish different hands and stages of the same illustration. See, R. Klockenkamper, A. von Bohlen, L. Moens, *Analysis of Pigments and Inks on Oil Paintings and Historical Manuscripts Using Total Reflection X-Ray Fluorescence Spectrometry, John Wiley & Sons, Ltd* (2000).

[68] K. Scheper, The Islamic Bookbinding Tradition. A Book Archaeological Study, Leiden University Centre for the Arts in Society (2014), p. 18.

[69] J.A Szirmai in *The Archaeology of Medieval Bookbinding* describes three important categories of medieval bookbinding: Carolingian, Romanesque, and Gothic. These differ from one another regarding their style, material, and binding techniques. Carolingian binding can be identified by the sewing supports of vegetable–fiber cords which are sewn into the edges of a thick square board and are looped through angular channels. The boards would most likely have been covered by a tawed skin, which often extended into tabs on either end of the flat spine. Romanesque bindings usually have thick wooden boards, flat spines and would have also been covered in tawed skin. Gothic bindings, on the other hand, are easily identifiable by their shaped board, often covered with tanned skin, rounded spine and metal fastening and furnishings. For more information on book bindings terms, materials and methods see, *Medieval & Early Modern Manuscripts* <https://travelingscriptorium.files.wordpress.com/2015/02/binding-booklet-2015.pdf>. According to J.A. Szirmai, variations in bookbinding even reflect local differences in workshop practice. The geometry of the lacing path (tunnels and channels for lacing and clasps shaped in the wooden board) can be very varied: the V shaped channels can range from 30 to over 110 degrees and their lengths vary between 20 and 80 mm. For instance, the bindings from the St Gall monastery, are easily distinguishable from bindings of other origins as the V-shaped channels usually have wide angles of ranging from 70 to 110 degrees and a slight angle of deviation from the spine edge.

explains that the study of bookbinding history was previously concentrated on decoration, but has recently shifted towards binding structure, an interest, which remained overlooked until the mid-1970s, when the history of bookbinding techniques developed as a discipline in its own right. Dr. Foot demonstrates in her research how the use and purpose of the manuscript can be illustrated in the changes in bookbinding styles and techniques.[70] For instance, the twelfth century French Romanesque bindings produced in Paris had the particularity to be made of tanned[71] brown leather instead of the usual tawed leather[72] of which most plainer bindings were made, and they also differed from other ordinary medieval bindings in that they were embellished with stamps. These bindings were also equipped with clasps attached to the outer edge of the upper board with pierced metal finials that fitted over pins, protruding from half-way across the lower cover. Foot explains that the use of ornamental stamps combined with the protruding pins, prevented books from being stored side by side, and this tells us two things: firstly, they were meant to be either held in the hand or displayed on a lectern, and secondly, they were also ornamental object in themselves, maybe even privately-owned manuscripts.[73]

Similarly, Karin Scheper, book and paper conservator at the Leiden University Library, expresses the same concern about the underdeveloped status of Islamic bookbinding studies, "Islamic manuscripts have been studied for hundreds of years by orientalists; by comparison it is only very recently acknowledged that a better understanding of the physical manuscript may help to relate other aspects of the history of the book and its production, distribution and consumption. It follows that the need to preserve these manuscripts as the artefacts that they are, was not reed before. It is now gradually becoming more widely accepted that specialist knowledge is necessary for the preservation of these manuscripts. Still, although the subject is receiving more attention, it is just surfacing; in-depth studies are lacking. Traditionally, studies of the bindings focused on aesthetical and art-historical aspects and as a consequence, these studies were directed exclusively at the elaborately tooled and luxurious bindings".[74] She then points out that the decorative aspect of a book's binding is one of many indicators of its codicological framework. In fact, a relatively small number of bound manuscripts have

[70] M.M. Foot, *Studies in the History of Bookbinding*, Scolar Press (1993)
[71] Tanning is the process of manufacturing leather by soaking animal skin in tannin, an acidic substance made from tree bark, gallnuts, or a similar plant source, giving the leather a red-brown coloration.
[72] In order to obtain a white tawed leather, the white-tawer proceeded to clean and scrape the skin of the animal. This was followed by a process of unhairing the skin and then soaking it in a chemical solution containing aluminium, salts, proteins and other compounds.
[73] Ibid., p. 6
[74] K. Scheper (2014), p. 17.

decorative patterns useful for dating or locating the manuscript.[75] The majority of Islamic book covers were usually made of cheap materials, resulting in a plainer finish. Notwithstanding their apparent simplicity, binding techniques and the different materials used to create these binding's' structures reflect different styles varying from region to region. Hence, Dr. Scheper concludes, "A solid understanding of binding characteristics and variations in structures can therefore contribute to a better understanding of book production and trade as a whole, but in order to acquire that knowledge we must look further than the decorative aspects alone."[76]

Book bindings are not only important for the function of holding and protecting fragile manuscript pages from handling, but also for their value as artefacts and sources of information about the book's life. Understanding the binding technique of a manuscript and the materials used can be extremely important. The binding's craftsmanship and the choice of covering material usually reflect personal preferences, local tradition, and economic factors. Elaborated structures and luxurious bindings embellished with jewels, gold, antique gems and ivory carvings[77] were most often requested by wealthy people or important ecclesiastics and were made to bound precious volumes. [78] One of these luxurious books can be found in the Durham Cathedral Library. It is a four volume Bible which belonged to Bishop Hugh de Puiset and which was written in Durham Cathedral Priory c.1170-80.[79] The textblock[80] was rebound in 1845 but the original cover has been mounted onto the new binding making it possible to admire the jeweled bookbinding enriched with gold and silver-gilt and embellished with precious jewels. On the other hand, more simple and modest bindings made with leather or parchment wrapper were chosen to bind small, frequently used prayer books, cartularies and account books. Thus, the choice for de-luxe bindings or more economical materials can reveal the

[75] Dr. Scheper explains that many of the decorated bindings from the Ottoman period were produced in court workshops, and although book production in these workshops was influencial with regards to aesthetic preferences and the technical possibilities of decorative techniques, many more manuscripts were produced outside the courts and the majority of those were decorated more simply and sparingly. See K. Scheper (2014) p. 17.
[76] Ibid., p. 18.
[77] B. Bischoff, *Latin Palaeography: Antiquity and the Middle Ages*, trans. D. Cróinin & D. Ganz, Cambridge: Cambridge University Press (1990), p. 30.
[78] In, 'The History of Decorated Bookbinding in England' Howard Nixon and Mirjam Foot examines splendid bindings produced in Winchester, London and Durham by the finest binders for wealthy patrons. The earliest known European decorated leather binding, according to the authors, is a seventh-century gospel from Northumbria. The Storyhust Gospel of St John was found on the inner lid of the decorated coffin of St Cuthbert and is in extraordinarily good condition. It has a beautiful original red leather covering: the back cover is engraved with a sharp point and filled with bright yellow and black, while the front cover is decorated with lines tooled with a blunt point in addition to the lines molded -over string. See, T. Brown, *The Stonyhust Gospel of Saint John*, Oxford (1969).
[79] H. Nixon, M. Foot, *The History of Decorated Bookbinding in England*, Oxford University Press (1992), p. 6.
[80] By the term 'textblock' I mean the assemblage of gatherings and their constituent leaves that comprise the total manuscript without its binding. See K. Scheper (2014), p. 237.

circumstances or private preferences of either the patron or the binder. The materiality of the manuscript cover can carry an incredible amount of information accessible to those experts trained to read particular features and details. The study of physical structures and binding decorations is of interest not only for the history of the book. On a wider scale, it can also tell us something about the dissemination and development of techniques and the mobility of people.[81] So, to answer the question, "Are medieval book bindings to be considered as relevant and important as the material they protect?", it can be said that, "Any textblock and its binding are always somehow related, even when they seem mismatched or from different worlds. The crux is to comprehend the connection between a bookbinding and the manuscript it covers".[82]

Despite the awareness and recognition between scholars and conservators that the materiality of bookbinings can provide valuable information about the historical and social context of a manuscript, book covers are still often neglected.[83] The reason behind this trend can be explained twofold. Even though academic interest in bookbinding structure and technique has grown since 1970, giving birth to the discipline of book conservation, their aesthetic aspects are still today the major focal point of research today.[84] Consequently there is a lack of literature devoted to the history of bookbinding: it has been estimated that less than 10% of the literature on bindings is concerned with techniques and cover structures, while the remaining 90% is focused on binding decoration.[85] This means that scholars and students may not be able to retrieve the information they need to investigate bindings of the books they handle. As Nicholas Pickwoad rightly pointed out, "This has had the effect of confining the history of bookbinding to a decorative-arts ghetto, albeit a very beautiful ghetto, but a ghetto nonetheless, because it is a study that can, by definition, not be applied to the vastly greater number of books with little or nothing by way of decoration – the state in which most books were bought and read by their first readers. The complex methodology and terminology for describing such decoration that has resulted from this study does not help, therefore, with the description of books without decoration".[86] As a result of this primacy, the discipline of book

[81] K. Scheper, *The Technique of Islamic Bookbinding: Methods, Materials and Regional Varieties Islamic Manuscripts and Books 8*, Brill (2015).
[82] Ibid., p.13.
[83] Even though many scholars focused only on decoration, a few exceptions must be mentioned: Ernst Philip Goldschmidt, Graham Pollard, John Szirmai and Mirjam Foot are among those pioneers who were also interested in the structural aspects of bindings.
[84] For C. Clarkson, The Conservation of Early Books in Codex Form: A Personal Approach, in *The Paper Conservator*, Vol. 3 (1978) pp. 33-50.
[85] J. Szirmai, *The Archaeology of Medieval Bookbinding*, Aldershot: Ashgate (1999). p. ix.
[86] N. Pickwoad, An Unused Resource: Bringing the Study of Bookbindings out of the Ghetto in R.Mouren (Ed.), *Ambassadors Of The Book : Competences And Training For Heritage Librarians*, Berlin; De Gruyter Saur (2012), pp. 83-94.

history could advance very little without the proper tools to examine the much more complex binding structurs, while plain, modest, unadorned medieval bindings were, and often still are, neglected.

This lack of knowledge and data on bookbinding, exacerbated by the absence of proper terminology, has made researchers "blind" and unable to seeing what the binding can reveal about the book. This is because some are not aware of their potential as source material. On top of that, descriptions about manuscripts' bindings in catalogues are superficial and are of little help to researchers because of the lack of literature. The extremely common description 'bound in parchment' is simply too vague and can refer to the majority of medieval manuscripts. For instance, Nicolas Pickwoad explains why observation and in-depth studies of binding materials and structures can reveal information about provenance, function and even workshop patterns.[87] This is also due to the absence of adequate staff trained to recognize and describe relevant details in book bindings and catalogue them in a coherent way.[88]

This lack of awareness also influenced web catalogues dedicated to manuscripts which often do not show the original cover of books that have been rebounded throughout the years. In fact, since the Renaissance period, it has been customary to rebind manuscripts according to the taste and budge of the collector/owner, especially if the original binding was damaged or worn out, resulting in the annihilation of thousands of medieval bindings.[89] Fortunately, some of these original book covers did not get lost and are kept in manuscript stores under the same shelfmark as their original content. Even though there has been an increased interest in the materiality of the manuscript, and therefore in book bindings, in recent times, digitization programs on book materials still tend to leave out the detached binding even if it is the original cover of the manuscript.[90] So, what exactly happens when a rebound manuscript goes online without its original cover? What are the effects of the 'digital detachment' between the carrier and its content? And how does this change the understanding of the book? To illustrate the problem and analyze the effects that the online consultation of digital facsimiles may have on

[87] N. Pickwoad, The Structures and Materials of Commercial Bookbindings in the Arcadian Library, in G. Mandelbrote, W. de Bruijn, *The Arcadian Library: Bindings and Provenance*, London The Arcadian Library in association with Oxford University Press (2014) pp. 233-278.
[88] Ibid.
[89] J. Szirmai (1999), ix.
[90] However, the detachment of medieval manuscripts from their original binding is not to be imputed to digitization. As Karin Scheper explains, it was a widespread practice among conservators. In the 1960s and early 1970s, almost fifty manuscripts were dismantled, resewn and bound at Leiden University Library. Moreover, after the acquisition of the core collection of Islamic manuscripts, drastic measures were taken when a significant number of manuscripts were rebound. The original bindings once protecting those items are now lost. As a result of these invasive methods of repair on their original structures, many other books no longer bear witness to their initial production and cannot provide information on their original construction. See K. Scheper (2014) p.30.

furthering the sense of detachment from the text I will discuss the case of a 13th century manuscript kept at Leiden University Libraries, which has been 'victim' to poor digitization.

Original vs Facsimile: The case of the overlooked binding of BPL 2395

BPL 2395[91] in the University Library in Leiden is a Latin text manuscript created in France.[92] It is made up of six main parts all dating back to the 13th century: Trattatus de sacramentis (ff. 001r-026v); S. Bernardus Clarevallensis, Meditationes de humana conditione (ff. 026r-037v); Cabertus Sabaudus, Petres de Rosset, Manuale Ecclesiae Sistaricensis (ff. 037r-047v); de decem praeceptis legis (ff. 047v-058v); tractatus de virtutibus, de confessione (ff. 058v-066r); Sermones (ff. 066-131).[9394] The parchment folia measure approximately 175x117 mm and the manuscript has been detached from its original binding. It was probably rebound in the 19th century in a light brown leather binding. BPL 2395 consists of 131 parchment folia of which the air and flesh side are clearly distinguishable. The manuscript has some folia missing including the beginning and the end; the foliation in Gothic hand, probably dating back to the 15th century, starts at folio 9 and ends at folio 200, while only 131 folia are counted. The manuscript text is in Latin and it is written in neat small gothic script, in red for initials and rubrics and black for the main text. The manuscript is kept in a box and stored in the Special collection room. Next to it is its original binding wrapped in a folder with the same shelfmark (see image 1). The original binding is a damaged cover without wooden boards, a so called limp binding, measuring approximately 157x118 mm which is made of several pieces of parchment with no stiffening material between the covering and the leather board and which is laced together with cord strips.[95] The outside parchment binding is covered by what seems to be a piece of paper, perhaps in an attempt to reinforce, protect and hold together the worn and

[91] Leiden, UB: ms. BPL 2395.
[92] 'BPL 2395', Digital Sources, Leiden University,<https://digitalcollections.universiteitleiden.nl/view/item/1613114 - page/1/mode/1up>. (Accessed May 15, 2018).
[93] Leiden, UB: ms. BPL 2395. Opening1.
[94] C. Wijnbergen, H. Zapp, *Verzeichnis kanonistischer Handschriften in den Niederlanden*, Würzburg (1988), p.109.
[95] Even though the majority of medieval bindings were made of wooden boards, there was also a variety defined as *libri sine asseribus, sine postibus, in quaterno* or *in pergameno*. Before the 16th century account on this parchment bindings are scarce. Some limp bindings have been described in the 1369 inventory of the Avignon pontifical Library and in some German inventories. Limp Bindings have been even found in aristocratic libraries, such as the library of Borso d'Este in Ferrara according to its 15th century inventory. See A. Szirmai (1999), p. 285; for more information about limp bindings, see A. Scholla, 'Early Western Limp Bindings. Report on a study', in *Care and conservation of manuscripts 7*, eds, G. Fellows-Jensen and P. Springborg, proceedings of the seventh international seminar held at the Royal Library, Copenhagen, 18-19 April 2002, Copenhagen, 132-158.

damaged parchment layers. Notwithstanding what presumably can be considered a later attempt of binding restoration, the binding is in extremely poor state. The upper part of the spine is missing and the rest of the material is too deteriorated to make the cover stick together. The textblock has probably been detached from its cover because of its poor condition.

Image 1: BPL 2395 in its box on the shelf and its original binding in the folder next to it, on the right side. The binding's shelfmark is not visible.

Therefore, it may be that a new binding was conceived in an attempt to preserve and protect the textblock itself, which is otherwise in exceptionally good condition despite the missing folia.[96]

The original limp binding made for BPL 2395 has been used all over Europe in many variants, but it became extremely popular among university students given the very cheap

[96] Intervention on the physical condition of manuscripts and rebinding was very common practice among collectors and institutions in the 18th and 19th centuries, especially if the item was deteriorated. For more information on the first practices of rebinding and restoration see, A.Szirmai, *The archaeology of the Medieval Bookdinding,* Aldershot: Ashgate (1999), p. 277.

binding material and the lightweight support which lent itself to be carried by both friars and lay people in their travels.[97] Agnes Scholla shows in her paper, *Early Western limp bindings* that six out of eight limp binding manuscripts analyzed are made of cheap or low-quality parchment, some even obtained from leftover parchment and recycled material from other books.[98] On the other hand, it has been demonstrated that limb bindings were also adopted for illuminated and decorated manuscripts. In fact, its soft material lent itself well to inscribed decoration. When referring to some more expensive and elaborated exemples of limp binding, Alexandra Gillespie makes clear that, "it is important not to reduce such observations to a too-simple dichotomy, with expensive board bindings on the one hand, and cheap, limp, wrapper-like structures on the other".[99] Some covers which have simple leather bindings may be very detailed and finely-crafted. The most common form of decoration found on limp binding consisted of writing on the parchment binding which formed elegant patterns, like the ones written on the upper cover of the limp parchment binding of the 16th century illuminated music book[100] designed for Lancelot Wharton Prior of Rumburgh.[101] The structure of limp bindings usually consisted of a parchment sheet or more sheets pasted/sewn together and cut off flush with the text block. The cover was then affixed to the text block using loops of parchment or thread, a faster and simpler process called 'tacketing' which, "took no more time than was required to acquire some thread, parchment or tawed skin, make holes through the folds of each quire and a cover, push the tackets through and knot them at the back".[102] Therefore, even though limp bindings may have served the purpose of reducing the most expensive costs of book production and lowering time expenses,[103] they could be more than simple wrappings. Parchment bindings have been overlooked in the past mainly because of their humble aspect devoid of any kind of decoration and boards. Scholars and students have mistakenly neglected these artefacts, considering limp bindings to be the result of inferior work carried out by poor

[97] Relatively few parchment bindings have survived, partly because the soft leather was exposed to the elements and the wear and tear of travel easily deteriorated and ripped it.
[98] A. Scholla (2002), p. 132-158.
[99] A. Gillespie, 'Bookbinding' in A. Gillespie, D. Wakelin (Eds), *The Production of Books in England 1350-1500,* Cambridge University Press (2011), p.166.
[100] Cambridge, St John's: ms K.31.
[101] The vellum binding is inscribed in large letters with the words '*lancelot prior bassus'*. See A. Gilespie (2011), p. 166.
[102] Ibid.,p. 165.
[103] N. Pickwoad argues that the ubiquitous spreading of limp parchment binding across Europe corresponds to the worsening of economic conditions which could have led to the adoption of a cheaper and less complex binding structures. See N. Pickwoad, 'The Interpretation of Bookbindings Structure. An Examination of Sixteenth-Century Binding in the Ramey Collection in the Pierpont Morgan Library' in *The Library*, vol. 17, no. 3, 1995, pp. 209–249.

skilled binders, without recognizing its value as a historical object.[104] On the contrary, it has been proven that limp binding structures were carefully executed. This carelessness resulted in a lack of understanding and knowledge of the binding structure itself and a lack of secondary literature.

But we should not only blame the past. It seems that even the limp binding of BLP 2395 received little attention. While its textblock and post-medieval binding are available for viewing online via the Leiden Library catalogue, no trace of the original binding can be found on the same online source. This could be due to two main things: firstly, the original binding is preserved separately from the manuscript and its shelfmark is not visible form the spine-side but has been attached to the outer back of the folder, meaning it is overlooked and left out from the digitization process. Secondly, the digitization staff could have deliberately chosen not to digitize the binding because of its poor condition and their lack of adequate training. In fact, too often digitization projects are carried out by inexperienced staff with no codicological knowledge, as management too often prefers to use funds to pay for institution's services rather than to employ trained and adequate personnel.[105] Many heritage institutions ask librarians and other specialized staff to be competent in art, music, history, digital media and publishing studies. But this background may be insufficient for handling special collections safely and reading codicological features effectively to prevent items from being neglected, as is demonstrated by of BPL 2395.

For this reason, a list of competencies for librarians working with special collections were put together in 2008 by the Rare Books and Manuscripts section (RBMS) of the Association of College and Research Libraries (ACRL/RBMS), a division of the American Library Association (ALA).[106] The main purpose of this initiative was to, "define core competencies among special collection librarians and create training opportunities",[107] in order to establish a shared professional practice among professionals. The document specifies a series of fundamental and specialized competencies needed to work with special collections materials successfully. For instance, special collection librarians must "understand the basic principles, objectives, and techniques for the preservation and conservation of objects in various formats, including printed books and ephemera; manuscripts and archival material; photographs, prints,

[104] A. Szirmai (1999), p. 286.
[105] During a meeting, Dr Scheper lamented that nowadays libraries use sources to improve services for their users instead of using those funds to hire specialized and trained staff for the preservation and conservation of physical collections.
[106] <http://rbms.info/> (Accessed May, 2018)
[107] Guidelines: Competencies for Special Collections Professionals , American Library Association, July 8, 2008. <http://www.ala.org/acrl/standards/comp4specollect> (Accessed May 21, 2018).

maps, and other graphic works; audio-visual material in all formats; digitized and born-digital media; and art objects and other three-dimensional objects".[108] A particular emphasis is placed on the skills needed to approach and understand physical materials, with, the strained staff being able to: a) understand issues and trends and apply all library, archival, and museum preservation and conservation standards and best practices to their work, including ensuring the appropriate standard of storage, transportation, exhibition, as well as ensuring the correct preservation of works on paper, other special formats, digitized material, and born-digital content; b) advocate the proper handling and storage of special collections materials; c) Implement preservation assessment activities within a collection development; d) identify the preservation and conservation needs of collection materials and establish treatment priorities; e) prepared for environmental disaster and know the procedures required for the proper storage of various types of collection materials.[109]

Despite the increasing interest in preservation and conservation practices, the number of staff needed to fulfill thess needs is in many cases too low and they are limited to basic skills. Too often, heritage librarians do not understand the immeasurable value that text-blocks and bindings have for scholars and researchers. The role of heritage collection specialists should be that of selecting and preserving collections, and making them available to the public, but this cannot be done without a deep knowledge of the discipline. The job of heritage specialists is enhanced by the inclusion of digital forms of exploitation. They must ensure that the digital counterpart is as faithful as possible to its original. Therefore, with the introduction of digital facsimiles they are responsible for both the preservation of the physical artefacts and the integrity of its digital copy.

[108] III.F. Preservation and Conservation. <http://www.ala.org/acrl/standards/comp4specollect>. (Accessed May 21, 2018)

[109] Guidelines: Competencies for Special Collections Professionals (2008). <http://www.ala.org/acrl/standards/comp4specollect> (Accessed May 21, 2018).

Chapter 2

Issues of interpretation: should we trust digital surrogates?

Even though recent decades have seen an unprecedented growth of digital manuscripts available on the internet, an extensive number of medieval books held in libraries and museums are still waiting to be digitized. Many museums, libraries and archives have struggled to create digital collection databases. This is due to a combination of factors; lack of funding for digitization projects, shortage of qualified and experienced staff to carry on the digitization of artifacts, lack of a shared digital model for creating digitized manuscript collection infrastructures, lack of available and affordable equipment and the willingness to pursue different ambitions and projects. The digitization of manuscripts might seem a relatively easy process with many wondering what challenges the simple activity of scanning books to create realistic copies of original artefacts could possibly create? However, the process itself I very challenging. There are risks of wear and tear when handling[110] fragile original materials, removing them from the storage room, and exposing them to light, heat and scanning procedures which can threaten fragile artefacts.[111] For this reason, heritage institutions normally strategically choose it is usually to prioritize unique pieces and highly requested items from their manuscript collection. Digitizing these has the added advantage or reducing in-person consumer demand as they are available online.[112] If a manuscript appears to be damaged and/or in critical condition, it can be prepared for image capture by a qualified curator. However, not every heritage institution has a conservator working for them, and if an entire collection is to being digitized, as is very often the case , it is difficult (if not impossible) for only one person to carry out all the preparation work for hundreds of items within a given timescale.[113] Therefore, non-specialized staff may be asked to handle and prepare fragile and rare items for imaging capture causing further damage to the already fragile objects.[114]

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[110] According to Ross Harvey and Martha R. Mahard, careless or inattentive handling of manuscripts can cause severe damage resulting in the need of expensive treatments and restoration processes. They suggest to, "handle only blank areas of the (manuscript) page". With regards to wearing white cotton gloves, they claim that "instead of using gloves, it is recommended that users be required to wash and dry their hands carefully before using collections and to rewash them whenever their hands begin to feel dirty. Hands washing is preferable to using alcohol-based hand-sanitizing gels, which may be effective in killing germs but do not remove dirt and leave behind lotions and oils that can damage collection materials. R. Harvey, M. Mahard, *The preservation Management Handbook: A 21st-Century Guide for Libraries, Archives, and Museums.* Rowman & Littlefield (2014), pp.158-159.

[111] D. Arnold, (2008), pp. 159-170.

[112] For instance, this strategic choice has been adopted by the Vatican Library, See <https://digi.vatlib.it/news/ -news-1> (Accessed May 24, 2018).

[113] Conservators may also be committed to many other projects and could be busy undertaking research and teaching course units and workshops.

[114] For more information on the preparation of damaged material for digitization, see A. Bulow, J. *Preparing Collections for Digitization*, London: Facet Publishing (2011), pp. 137-158.

Chapter 2

Virtuality issues

Digitally representing artefacts involves reducing three-dimensional objects to two-dimensional facsimiles, and even though 'accurate representation' is a key objective of digitization, there is an inevitable loss of its physical materiality. In fact, one of the main drawbacks of digital imaging is that the true shape and size of the artifact are not really conveyed. Some manuscripts cannot even be opened 180 degrees making it impossible to take a full-page picture. In this case the digital facsimile will be an inaccurate and unfaithful copy of the original.[115] Other material properties, like colour and light, are crucial for a correct interpretation of the artifact, and yet they represent a challenge when it comes to digitization. Many factors influence the recording of colour during digital imaging;[116] both natural light such as shadows and reflections, and artificial light sources and material property, such as translucency and colour bleeding all have an impact[117] The careful use of color demosaicing - the ability to calibrate and reconstruct color according to known standards - and color balance can help to alleviate some of these issues.[118]

The physical features of original artefacts are not the only characteristics in need of preservation and recording. Artifacts of cultural relevance have information and knowledge attached to them regarding their explicit meaning and significance. This information, which can be their history, use, ownership, and production, define the artefact and may be as important as the object itself. When a digital representation of a manuscript is created, a set of information called metadata (digital information about digital files that permits their retrieval and use) [119] become connected to the manuscript in order to give context to the object and describe the digitized item. Metadata is therefore an essential and necessary aspect of the digital facsimile as without it, users would not be able to search and access images files on the web. Four basic

[115] This problem can be avoided by using professional scanners equipped with cradles to digitize manuscript without opening them at 180 degrees. This solution has been adopted at the Vatican Library, see <https://digi.vatlib.it/news/ - news-1>. (Accessed May 24, 2018).
[116] D. Arnold (2008), p. 162.
[117] Color bleeding is the phenomenon in which objects or surfaces are coloured by the spread of colour information across color boundaries. Color bleeding occurs when one color in a region inappropriately bleeds into or overlaps another colour region across the coloured edges. See A. Punchilewa, A. De Silva, *Influence of luminance on color bleeding artefacts in color image compression.* 17th European Signal Processing Conference, EUSIPCO (2009), pp. 1607-16011.
[118] For more information on the process of colour calibration and colour balancing, see M. Baltsavias, A. Gruen, *Recording, Modeling and Visualization of Cultural Heritage*, Taylor & Francis/Balkema (2006), pp. 134-136.
[119] There has been much effort to find a standard definition of metadata. "Metadata is difficult to define as an activity for two primary reasons. First, unlike library cataloging, metadata development involves a large number of stakeholders…second, metadata evolved from several different communities, each with its own disciplinary background and objectives." See G.D. Campbell, 'Metadata, Metaphor, and Metonymy' in R. Smiraglia (Ed), *Metadata: A Cataloger's Primer,* New York: Neal-Schuman (2008), p 59.

kinds of metadata have been identified according to their functions: (1) descriptive metadata, concerned with information about the item's content, material properties of the artefact, title, author, etc. (2) administrative metadata, regarding uses of the item and information about the creation of the surrogate (3) technical metadata, recording information necessary for accessing the item's access and (4) structural metadata, including information about its relationship to other related electronic items.[120] Therefore, a sophisticated system of descriptive metadata which includes both a physical and intellectual description of the source is pivotal for the understanding of the artefact and to select items for research or study. Without information such as the title, author, place of origin, script, and content it can be quite difficult for researchers and students to gain access to manuscripts.

Notwithstanding the importance of metadata in the interpretation and correct understanding of digital surrogates, the quantity and quality of descriptive metadata is often too poor.[121] Considering the complexity of cataloging medieval books, and the sort of details needed for accurate identification, it is no wonder the challenges in describing them also affect digital catalogues. The lack of literature, analysis and description of the original bookbinding of BPL 2395 illustrates the extent of the problem. This medieval bookbinding has been completely neglected during the digitization process, and it is not even mentioned in the online manuscript description. The Leiden Library catalogues provides a very basic and superficial description of BPL 2395, including its: title, shelfmark, language, provenance, content and reference. The entry 'binding' is not even mentioned in the digital record. This generalized description is inconsistent and inaccurate, and offers too little useful information for potential researchers. The lack of a comprehensive and efficacious description that could allow researchers to find the relevant binding information has several consequences. Firstly, the lack of a digital image of the original binding and the relative metadata leads to a further separation between the textblock and its cover and all the information contained in it. The structure and material of BPL 2395's book cover can provide useful information about the history of the manuscript itself: in which country it was bound, in which workshop and for what kind of person it was conceived. Secondly, the digital surrogate of BPL 2395 is far from being a comprehensive digital reproduction of the original item. A digital facsimile of an artifact is a

[120] E. M. Corrado, H. L. Moulaison, *Digital Preservation for Libraries, Archives, & Museums,* Rowman & Littlefield (2015), p. 113.

[121] Some heritage institutions, aware of the issue, have been working to reverse the situation. Joy Humphrey in the article, *Descriptive Metadata in Three Manuscript Catalogs: DigCim, MALVINE, and Digital Scriptorium,* deals with three cataloging projects aimed at expanding and developing online description of manuscripts: the British Library's Digital Catalogue of Illuminated Manuscripts (DigCIM); Manuscripts and Letters Via Integrated Networks in Europe (MALVINE); and Columbia University's Digital Scriptorium (DS).

virtual representation of its physical appearance and it should provide an accurate depiction of the physical object. By omitting the picture of the manuscript's original cover and the metadata regarding the original and post-medieval binding, researchers potentially interested in the study of this book may be led to think that the medieval cover is either missing or that it was destroyed in catastrophes or a bad deposit. As such, the interpretation of the artifact is affected due to the distorted picture of the object.

An accurate representation and description of the artifact in its digital environment enables researchers and scholars, who are not able to analyze the original manuscript or do not have the competence or expertise to draw conclusions for themselves, to more accurately understand the object. Online Codicological descriptions of manuscripts and bindings should be accurate and specific. More detailed information on the material, decoration, and structure of the binding should be included in the description summary. A section describing board materials and a brief account of edge treatments, sewing structures, conservation and restoration processes, would satisfy the needs of two types of users.[122] The first is the student who wishes to use the description as a guide for study and research purposes. Information such as the type of leather and cords used to make the cover and the physical condition of the binding would enable a better understanding of medieval bookbindings and prove their greater value as historical sources. Creating quality metadata to better describe digitized medieval book covers will help to draw more attention to the importance of bindings in education and research, and to bring the study of book bindings out of the ghetto. The second user whose needs are met by such descriptions is the researcher or scholar who needs to consult the manuscript remotely, and thus requires access to information and to the digital facsimile itself that would otherwise be regulated by access policy and may be not accessible without references. This information provides not only a summary on the condition and history of the artifact, but also allows users to study and conduct research from the comfort of their own home or office, by consulting the replicas of objects instead of the original.

[122] An example of a successful digital platform is Ecodices, the Virtual Manuscript Library of Switzerland, which contains a 2048 digitized manuscript from 84 different collections, many of which retain their original bindings. On the Ecodices site each facsimile is accompanied by at least one detailed description, translated into four languages and completed with scholarly manuscript descriptions. In many cases the binding structure is accurately described, as in the case of the Evangelistar (gospel longum) from St. Gallen library. See <https://www.e-codices.unifr.ch/en/description/csg/0053/Scherrer>. (Accessed May 25, 2018). Users can search the virtual library by institution or by manuscript shelf number to find high resolution digital images of entire manuscripts. If someone is interested in manuscript bindings it is even possible to refine the research by checking the 'binding' entry. Scholars and researchers may benefit from a well-structured environment such as Ecodices, which provides a sophisticated system of descriptive metadata.

Chapter 2

Authenticity in digital environments

As already mentioned, the digital environment raises a series of questions regarding the authenticity of digital information. Should we trust digital surrogates? What guarantee do we have that the digital surrogate is a reliable copy of the original? How do we acknowledge the quality of digitized images of texts? Digital objects are not accurate portraits of physical objects. Information referring to the physical aspect of the manuscript such as size of the textblock, measurements of bindings, thickness of parchment, the type of material used and, all the tangible features of the artifact cannot be faithfully reproduced via digital surrogates. This category of information can be distorted during a conversion from the material to the digital and can change our perception and understanding of the artifact. Electronic catalogs are often equipped with tools for manipulating pictures, including zooming, panning and rotating. For instance, users of the TTP software (Turning the Pages), developed by the British Library in partnership with Armadillo systems, can visualize pages of books in high resolution up to 2,000,000 pixels, as well as deep zoom and rotate images. While such technologies are incredibly user-friendly, useful and are better able to give access to information and conduct detailed analysis, they also tend to alter and distort the sense of scale within a manuscript and between multiple books. An accurate system of descriptive metadata would help users to understand some basic material features of the book and to avoid misleading interpretations of the artifact. Thus, a lack of sufficient information and context can lead to an impoverishment of the historical artifact, threatening its cultural interpretation. The greater use of book binding images together with descriptive metadata would be of great support to everyone interested in researching them. As Martin K. Foys rightly points out, "the large-scale reproduction of medieval manuscripts as digital media has the potential to challenge and change how such works are studied and understood. But digital resources for manuscript study are still relatively immature, and largely have not realized their own methodological and technological logic. Standing where we are today, looking back at precedent media and forward to emergent ones, we have an opportunity to gauge what we privilege in the long lives of manuscripts, and why".[123]

[123] M.K. Foys, 'Medieval Manuscripts: media archaeology and the digital incunable' in M. Johnston & M. Van Dussen (Eds.), *The Medieval Manuscript Book: Cultural Approaches*, Cambridge: Cambridge University Press (2015), p. 120.

Chapter 2

As we have seen, the physical object has additional value as an historical artefact and act as a carrier of the information that is not contained in the digital facsimile as evidenced by BPL 2395. Digitization as a means of preservation and dissemination of rare and inaccessible cultural objects is a powerful innovation; countless manuscripts have been digitized and made available online for users all over the world. But while the general public may benefit from unlimited accessibility to cultural objects, researchers and scholars cannot completely trust digital surrogates and base their judgements solely on virtual images. The lack of awareness that book bindings are of great value for medieval studies and that they can offer lots of information even outside the small field of binding-historians, as claimed by Szirmai and Pickwoad, means that book bindings have often neglected in research and adequate descriptions of them are frequently omitted online. One of the major consequences of the under-developed status of binding research in digital manuscript studies is the paucity of metadata related to book bindings and lack of digital images showing the physical object. Carelessness in treating BPL2395 has therefore resulted in the distortion of its digital facsimile, virtually removing the historical evidence contained within the original binding.

Chapter 3

Managing Special Collections: Medieval Manuscripts and Digital Objects

The leaflet of the Rare Books and Manuscript Section, IFLA (The International Federation of Library Associations and Institution) reads, "rare books and manuscripts are part of the global cultural heritage. Their significance as intellectual creations, historic collections, and *objets d'art* exceed boundaries of language, state or period. Scholars, librarians, book and art historians, bibliophiles, and library users from all over the world read, study, and admire them. Special collections preserve these treasures with great care. They are the sources of history, the evidence that can be interrogated by new researchers who ask their own questions. Through archives and publications, previous generations speak to us with original voices".[124] According to Jan Bos, Head of the Collections Department of the Koninklijke Bibliothek, National Library of the Netherlands, the first legal deposit system[125] for books in Western Europe was issued by King Francis I of France in 1537 who wanted toos , "have these books as a resort if they happen to have been lost from memory of man, or would have been corrupted or changed from their true and original publication".[126] The decree required that every book sold in France should have had a copy deposited in his library.[127] The aim of the act was to "gather in our library all the works worthy to be seen that have been or will be made, compiled, modified, corrected and amended in our time",[128] in order to identify, collect and preserve the current production of all book editions worthy of being remembered and to improve the development of the royal collection.[129] This 16th century ambition to gather and preserve all the world's books is an early attempt of what we would now call protecting and safeguarding our documentary cultural

[124] IFLA is the leading international body representing the cause of librarianship to promote international understanding, cooperation, discussion, research and development in all aspects of library activity, and to share its findings with the library community all over the world. See, <https://www.ifla.org/publications/leaflet-rare-books-and-manuscripts-section> (Accessed June 3, 2018)

[125] J. Bos, 'All Books are Equal, but Some Books…Towards a Modern Vision of Special Collections' in R. Mouren (Ed.), *Ambassadors of The Book: Competences And Training For Heritage Librarians*, Berlin; De Gruyter Saur (2012), pp. 16-23.

[126] "… pour avoir recours aux dits livers si de fortune ils étoient cy apres perdus de la memoire des hommes ou aucunement immués ou varies de leur vraye et première publication". C. Fournier, 'Le depot légal' in *Documentation et bibliotheques*, Volume 39, numéro 2 (1993), p. 96.

[127] J. Larivière, Guidelines for Legal Deposit Legislation, Paris: United Nations Educational, Scientific and Cultural Organization UNESCO (2000), p. 6.

[128] "…mettre et assembler en notre librairie toutes les oeuvres dignes d'être vues qui ont été ou qui seront faites, compilées, amplifiées, corrigées et amendées de notre terms". C. Fournier (1993), p. 96.

[129] The legal deposit legislation has also been used as a surveillance tool, as a means of censorship to control the diffusion of dissident ideologies. The act should also be referred to within its religious context, whose importance must be underlined, since the deposit requirement enabled the content of published work to be controlled and therefore widely disseminated. See, <http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/mow/nomination_forms/FranceBanniers_01.pdf> (Accessed June 04, 2018)

heritage: preserving both the content and material of texts, to prevent their loss and ensure that these sources of history stay intact for future generations. Thanks to this act, many texts have been preserved up until now that would have otherwise been lost forever. The *depot legal* has had such a great impact that in the seventeenth and eighteenth centuries many European countries established procedures imitatating the French model.[130] Moreover, in 2009 the archival copy of the decree by Francis I was inscribed on the international UNESCO Memory of the World Register, whose aim is to ensure preservation and access to documentary heritage in various parts of the world.[131]

Nowadays, the preservation and management of documentary heritage (rare books and manuscripts) does not only involve keeping multiple copies of manuscripts, both physically and digitally, but also primarily involves preservation practices which ensure the usability, durability and longevity of special collection materials. Moreover, the terms 'special collection' and 'documentary heritage' cover all materials worthy of preservation and safeguarding with historic and cultural significance. LIBER, the Association of European Research Libraries, refers to special collections as, "primary sources, essential for research across a range of disciplines, or significant accumulations of materials relating to particular topics. They may have artistic, historic or research importance beyond their purely textual content that justifies their preservation as artefacts whatever surrogates may be available. They provide important evidence for our material, intellectual and cultural heritage and reflect our human diversity".[132] Thus, 'special collections' is used to indicate ancient and medieval manuscripts, printed books, drawings, maps and photographs, and can even be extended to include films, videos, recordings and digital materials. Even though the terms 'special collection' and 'documentary heritage' embrace a very broad range of heritage material, and since there is no real distinction between

[130] A legal deposit system has been in established in Sweden in 1661, in Denmark in1697 and in Finland in 1702.
[131] Memory of the World Program was established by UNESCO in 1992 with the aim to: (1) facilitating the preservation of the world's documentary heritage (2) assisting universal access to documentary heritage and (3) increasing awareness worldwide of the existence and significance of documentary heritage. See, <https://en.unesco.org/programme/mow> (Accessed June 04, 2018).
[132] Members of the Association of European Research Libraries are committed to the stewardship of special collection by collecting, preserving and providing access to them. In maintaining special collections they adhere to the following principles: (1) include special collections in the strategic plan and library development (2) continue to build special collections (3) focus on the needs of the users (4) provide reliable funding for maintenance, preservation and access (5) provide adequate information about the materials held in special collections for users and to make as much information as possible visible online (6) ensure proper security and storage of special collections. See, <https://www.liberquarterly.eu/articles/10.18352/lq.7879/> (Accessed June 05, 2018)

collections,[133] I use it in this section to indicate the management of ancient books, more specifically from the medieval period.

The stewardship of cultural heritage collections implies a broad set of activities and planning; it involves everyone in the heritage institution working with those collections, from cataloguers, curators and, preservation managers, to exhibition planners and users. This broad view of stewardship focuses on the three main components of: preservation policy, preservation assessment, and planning. The role of preservation policies is to, "ensure the survival of material entrusted to their care. Museums, galleries, libraries and archives are all seeking their policies in preservation and to demonstrate their capabilities."[134] The preservation policy gives the organization the possibility to think about what needs to be preserved, why, for what purpose, and for how long.[135] For instance, each primary source of the special collection requires different treatment due to factors such as the material, its state of conservation and aging, which together determine the preservation needs at policy level.

Books and documents made from animal skin and paper are prone to decay if not properly managed and stored. Due to their fragile and vulnerable state, manuscripts are sensitive to radiant energy (light) and environmental conditions,[136] particularly atmospheric pollutants and biological pests such as fungi. Since they are made from organic raw materials, these materials can also be exposed to insect or rodent attacks, with: woodworm and mice can undermining even the most well-cared-for of books.[137] Medieval books are also subject to ink and pigment deterioration. The frequent used of tannic acid solution to produce the ink has resulted in parts of the texts themselves corroding, a process which sometimes cannot be stopped or reversed. In some cases, a black sheet of acid-free paper behind an affected leaf can allow one to read the text more easily.[138] When exposed to humidity and changes in atmospheric

[133] Notwithstanding the diversity of content and purposes, many collections share a number of common objectives, including the acquisition of materials, retaining them, providing access to them and keeping them fit for use. For more information see, R. Harvey, M. Mahard (2014), p. 31.
[134] H. Forde, 'Preservation Policies—Who needs them?' *Journal of the Society of Archivists 18,* no 2 (1997), p. 165.
[135] M. Foot, C. Peach, *Building a Preservation Policy*, London: British Library Preservation Advisory Centre (2013), p. 1.
[136] Atmospheric oxygen and excessive or low humidity levels can cause the deterioration of parchment. The long-term effect of the environment, associated with temperature, humidity, oxygen concentration chemical pollutants and light can cause aging or chemical modifications of the original material and facilitate the formation of microorganisms and fungi. For more information on the effect of environmental conditions on physical properties of vellum see, E. Hansen, L. Steve, H. Sobel, 'The Effects of Relative Humidity on Some Physical Properties of Modern Vellum: implications for the Optimum Relative Humidity for the Display and Storage of Parchment' in *The Book and Paper Group Annual, volume 10* (1991). <http://cool.conservation-us.org/coolaic/sg/bpg/annual/v10/bp10-09.html> (Accessed June 6, 2018).
[137] C. Raymond, T. Graham (2007), p. 94.
[138] Ibid., p. 101.

conditions, pigments can expand or contract making it difficult if not impossible to read the affected area. Dirt particles can cause damage to manuscripts as well. The accumulation of these dust particles can have an abrasive effect causing a weakening of fibers and the discoloration of manuscripts.

The preservation and storage of manuscripts, whether made of vellum or paper, differs from that of other objects or works of art. Unlike other artifacts, books and documents are often used, handled and subjected to restoration procedures. Improper handling and any form of general use can accelerate the deterioration of the item.[139] As far as the storage is concerned, distinctions should be made between bound manuscripts and unbound documents. In fact, loose sheets, maps and other documents devoid of their own protective binding, are more fragile and vulnerable to damage. For this reason, they need to be stored inside folders or boxes and handled safely.[140]

Therefore, in order to guarantee special housing and care for these items and to ensure that they are maintained in appropriate conditions compliant to international standards, a good preservation policy must be in place. The preservation policy may be based on various factors involved in the stewardship of the collections and on the needs and priorities of the library's and archive's work. Broadly speaking, a well-defined preservation policy should determine the objectives and ambitions which the organization intends to achieve while thinking about maintaining the usefulness of the collections and their abilities to meet the needs of intended users.[141] An appropriate policy should therefore contain: (1) standards for storage (monitoring temperature, light, relative humidity, proper housing , enclosures and shelving),[142] cleaning and handling material, (2) a conservation program to repair damaged item, (3) priorities for fragile and unique objects, (4) the introduction of new copies of materials that cannot be used or displayed in the original form, (5) secure access of staff and users and (6) a disaster plan (power failure, flood, earthquakes and fire).[143]

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[139] P. Chapman, UNESCO, *Guidelines on Preservation and Conservation Policies in the Archives and Libraries Heritage*, Paris (1990), p. 1. <http://unesdoc.unesco.org/images/0008/000863/086345Eo.pdf> (Accessed June 6, 2018).

[140] Storage boxes and folders should be chemically stable and made of lignin-free, alkaline-buffered stock. See, E.M. Corrado, H.L. Moulaison, *Digital Preservation for Libraries, Archives & Museums*, Rowman & Littlefield (2015), pp. 147-182.

[141] Ibid., p. 5.

[142] For example, the British Library operates with the Science & Research team to apply environmental standards and guidelines, such as PAS198 specification for managing environmental conditions for cultural collections and PD5454, guide for storage and exhibition of archival materials. See <https://www.bl.uk/aboutus/stratpolprog/collectioncare/preventive/> (Accessed June 7, 2018).

[143] R. Harvey, M. Mahard (2014), pp. 31-56.

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Before embarking on the development of a preservation policy, a survey assessing the preservation needs is essential for establishing a baseline from which to monitor conditions and the effect of changes. Gathering data about the contents of a collection, what its environmental and storage conditions are, and about the physical state of the collection is an essential step and an opportunity to spot potential problems and prevent physical damage to heritage items. Many approaches and methods have been developed to help heritage institutions evaluate the conditions of their collections. In 2001 the National Preservation Office formally launched its Preservation Assessment Survey (PAS),[144] a statistical method for assessing the preservation needs of libraries and archives. This guidance has been designed to assist organizations in assessing priorities and, problems and successfully managing collections. The questions in the Preservation Assessment Survey have been created to identify any shortcomings and the strengths of specific areas of the library collections: level of use, storage, physical protection, environment and security, and to track progress and changes within the collection stewardship. In 2008, the British Library made use of the Risk Management method for assessment, developed by ICCROM, CCI and Robert Waller at the Canadian Museum of Nature.[145] The purpose of this model, as described in Robert Waller's Cultural property Risk Analysis Model, is to establish an overview of the condition of heritage materials in a collection, identify the quantity of materials in need of care, determine primary risk factors or potential threats to a collection, and prioritize the actions needed. Furthermore, it assesses the potential loss of value caused by ten agents of deterioration: physical forces, criminals, fire, water, pests, contaminants, light, incorrect temperature, and relative humidity.[146]

Thorough assessment of the collection risks and condition improves preservation practice and strategy for the benefit of current and future users, ensuring collections survive forward and minimizing the risk of damage and loss. The data gathered during the assessment can then be used to established priorities and lines of action to tackle specific problems. In this phase, it is important to develop a strategic plan to set goals, objectives, and outcomes, covering collection conditions, potential preventive and stabilization measures, and repair and

[144] The Preservation Assessment Survey (PAS) has been used by over 200 libraries and archives in the UK and Ireland since its launch in 2001. Participants have successfully used the results to support funding bids and to inform internal planning and budgeting for preservation. See <https://libereurope.eu/preservation-assessment-survey-workshop-training-day/> For more information on how The Preservation Assessment Survey works, see <https://www.bl.uk/aboutus/stratpolprog/collectioncare/publications/articles/2009/92-walker-en-IFLA.pdf) (Accessed June 7, 2018).

[145] R. Waller, *Cultural Property Risk Analysis Model: Development and Application to Preventive Conservation at the Canadian Museum of Nature*, Acta Universitatis Gothoburgensis (2003).

[146] R. Waller, 'Conservation risks assessment: a strategy for managing resources for preventive conservation' in A. Roy, P. Smith (Eds.) Preventive Conservation: Practice, Theory and Research: Preprints of the Contributions to the Ottawa Congress, 12-16 September, London (1994). pp. 12-16.

conservation procedures. Consequently, the strategic plan must, "address how appropriate levels of funding will be found and sustained; it must also be consistent with the overall mission of the organization and the preservation policy."[147] The strategic plan of the Utrecht University Library for 2018 to 2020 is an informative example of an accurate and good structured strategic planning process.[148] It provides details of the library's goals, strategic priorities, objectives and its finances to ensure that the targets are achieved. It states its strategic goals clearly and with focus, addressing topics such as open access to scientific data, sustainable access and, use and reuse of collections. Specific key actions for the accomplishment of each of those aims are clearly stated and a prediction of the financial resources that should be invested in each area is provided. Furthermore, every section of the report reviews the accomplishments and results achieved from following the strategy of the previous strategic plan between 2015 and 2017.

Prior to 1970, heritage institutions focused primarily on the physical care of special collections.[149] Before the advent of digitization, cultural heritage professionals applied their specialized knowledge to prioritize the needs of the physical objects in their collections, collaborating with preservation managers who, in turn, draw on experts in climate control, fire safety and pest management. Therefore, preservation referred only to collecting and providing safe storage for physical objects. As pointed out by the IFLA 'Principles for the Preservation and Conservation of Library Materials' preservation included, "all the managerial and financial considerations, including storage and accommodation provisions, staffing levels, policies, techniques and methods involved in preserving library and archive materials and the information contained in them."[150] However, since the beginning of the 21st century, the stewardship and preservation of cultural heritage has undergone fundamental changes. The impact of digital technologies has been as profound in preservation as in the study of artefacts. As we have already seen in chapter two, the reason for making copies of artifacts was mostly for dissemination purposes. It was only with the first photographic manuscript reproduction by photographer Camille Silvy that copies started to serve the purpose of preservation. By creating multiple copies of one item it was possible to not only make unknown and rare manuscripts available to the public and researchers, but also to minimize further damage to the originals by increasing the use of digital surrogates and limiting the access to the physical objects. Since

[147] R. Harvey, M. Mahard (2014), p. 50.
[148] Strategic Plan Utrecht University Library 2018-2020. file:///Users/alandonofrio/Downloads/strategisch_plan_ub_2018-2020_engelstalig_(1).pdf> (Accessed June 7, 2018).
[149] R. Harvey, M. Mahard (2014), p. xiii.
[150] E.P. Adcock, IFLA Principles for the Care and Handling of Library Material, International Preservation Issues Number One, p. 5. <https://www.ifla.org/files/assets/pac/ipi/ipi1-en.pdf> (Accessed June 9, 2018).

then, the number of digitized collections has increased at a dramatic rate, changing the view of the preservation landscape or, better, extending its scope. In fact, digital facsimiles created to preserve those materials, are themselves in need of preservation.

Now, the term 'preservation' is used to refer to the curation and stewardship of both physical and digital objects. Preservation requires active care and stewardship not only of a manuscript, or other object in its original form, but also of digital materials. Libraries and archives have realized that digital content is fragile, unstable and prone to deteriorate just like physical objects. The materials that are used to make digital facsimiles how the digital facsimiles they are stored, directly affects their longevity: "digital objects also need specialized equipment for capturing, accessing and rendering the information they contain; they have further complication of needing software to access and interpret the information stored in them. If any of several components is missing, the information cannot be accessed."[151] For instance, one of the primary concerns when it comes to preserving images and datasets is that the equipment used to store this data is often dated and the material may therefore no longer be available. So, how does one manage digital content to ensure continuous and indefinite access indefinitely in the future? In December 1994, the Commission on Preservation and Access and the Research Libraries Group joined forces to create a Task Force with the purpose of developing reliable systems for preserving access to digital information.[152] The museums, archives, libraries and publishers involved in this initiative, recognized that simply storing heritage data and hoping that it will remain usable in the future was a risky approach to take. Even though the technology used to store digital files complies with requirements and standards, if not properly updated it can work against long-term digital preservation. This is because, "technology is always changing. Digital preservation software as well as the software that created digital content needing to be preserved are both constantly evolving. Because of ever-changing technology and the fact that digital storage media are not very stable compared to most traditional physical storage containers, such as books, letters, and sculptures, preservation in the digital terrain is always and already an act of will, and one that takes ongoing work for every asset."[153]

Devices, processes and software are constantly changing and institutions providing digital preservation must overcome the problem of media fragility and remain flexible. In order

[151] R. Harvey, M. Mahard (2014), p. 63.
[152] D. Waters, J. Garret, *Preserving Digital Information, Report of the Task Force on Archiving of Digital Information* (1996). <https://www.clir.org/wp-content/uploads/sites/6/pub63watersgarrett.pdf> (Accessed June10, 2018).
[153] E.M. Corrado, H.L. Moulaison, (2014), p. 81.

to tackle digital preservation issues, the Task Force identified the actions needed to preserve and ensure access to digital information. Three key activities can be performed to safeguard digital objects: bitstream copying[154], refreshing[155] and migration.[156] Digital files, for example, produced from digitizing, must be scrupulously stored and managed. According to the Commission on Preservation and Access and the Research Libraries, "Image resolution, accuracy of color representation and compression for storage all require attention, but the interaction of these structural factors tends to pit judgments about the quality of content against the need for its efficient archival storage and use. In general, one can express the tradeoffs as follows: the higher the resolution and the richer the color register, the larger the file size and costlier the storage. The use of compression technologies further complicates the equation because the application of some algorithms to reduce space needs may involve an irreversible loss of data."[157] Furthermore, facsimiles of manuscripts are expensive to produce and the possible deterioration of digital images can result in an incredible loss for heritage institutions.

Libraries face issues of digital obsolescence every day. One of the most known cases of digital failure concerns the famous medieval Domesday Book. The original Domesday book, commissioned by William the Conqueror, surveyed the landholdings and resources of late 11th century England. It is one of the first English public records and a great source of information for historians and historical economists. In 1983, the British Broadcasting Company television producer, Peter Armstrong, decided to commemorate the 900th anniversary of the Norman Domesday Book with a new digital Domesday.[158] The goal of the BBC Domesday project was to create a modern version of the book using new multimedia technology. The project captured, "the essence of everyday life in the UK in the mid-eighties. Hundreds of thousands of school children from across the country, a team of 60 researchers at the BBC and countless other scholars, statisticians and photographers contributed to this mammoth resource."[159] The new survey recording the British life of over one million people, resulted in 150,000 pages of texts and over 20,000 photographs, all saved in digital form on two videodiscs worth £2.5 million.[160]

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[154] Bitstream copying refers to the activity of making exact copies of a digital object.
[155] Refreshing involves copying from one storage medium onto another of the same type.
[156] Migration is the most common preservation strategy. During migration digital materials are transferred from one hardware/software to another, or from one generation of computer technology to a subsequent generation with the purpose of preserving the integrity of digital objects as well as the ability to be retrieved and displayed.
[157] D. Waters, J. Gattet (1996), p. 13.
[158] P. Wheatley, *Digital Preservation and BBC Domesday*, Electronic Media Group Annual Meeting of the American Institute for Conservation of Historic and Artistic Works, Portland, Oregon (June 14, 2004). <http://cool.conservation-us.org/coolaic/sg/emg/library/pdf/wheatley/Wheatley-EMG2004.pdf> (Accessed June 11, 2018).
[159] Ibid., p. 1.
[160] E.M. Corrado, H.L. Moulaison (2014), p. 8.

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As technology rapidly evolved, the BBC Domesday system became obsolete and the discs could not be read by the computers of the time.[161] The BBC Domesday Project presents a perfect example of digital preservation failure and shows that digital obsolescence can have dramatic consequences if not properly prevented with preservation processes.

According to the Northeast Document Conservation Center, digital preservation principally serves three purposes: protecting original sources and limiting the access to them by creating copies of sufficient quality, building a digital system that represents the original source in such detail that the system can be used to satisfy most of the research questions, and providing products that can be used for purposes that are impossible to achieve with the original source.[162] Each of these functions require rigorous demand on digital technologies and focus in planning the process and, managing and securing the content. Having access to the appropriate technological infrastructure is a central concern, but it should not be the only priority. The complexity of the preservation practice and of the ability to guarantee longevity, quality, integrity and access of data, has led to the establishment of fundamental preservation principles meant to govern the management of digital resources and to reassure institutions and users that digital material is reliable. In recent years, significant progress has been made in developing standards to preserve digital media, especially in the context of institutional repositories. The most well-known general standard for digital preservation has been the Reference Model for an Open Archival Information Systems Framework [163] (OAIS), created by the Consultative Committee for Space Data System in 2002. The purpose of the OAIS model was to provide a common glossary across disciplines and domains, "to facilitate a much wider understanding of what is required to preserve an access information for the long term."[164] The OAIS Reference Model therefore provides: (1) a framework for the understanding and increased awareness of archival concepts needed for long term digital information preservation and access (2) the concept needed to be effective in digital preservation (3) a framework for describing and comparing preservation strategies and techniques (4) guidelines showing how digital objects should be preserved.

[161] P. Wheatly (2004), p. 2.
[162] NEDCC, *The relevance of Preservation in a Digital World*. <https://www.nedcc.org/free-resources/preservation-leaflets/6.-reformatting/6.4-the-relevance-of-preservation-in-a-digital-world> (Accessed June 12, 2018).
[163] Consultative Committee for space Data Systems, Reference Model for an Open Archival Information System (OAIS), CCSDS 650.0-M-2 (2012). < https://public.ccsds.org/Pubs/650x0m2.pdf> (Accessed June 12, 2018).
[164] Ibid.p, 2-1

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The OAIS model is neither an implementation plan nor a certification for quality of service. It is a reference model that operates at a conceptual level.[165] Institutions began to declare themselves 'OAIS-compliant' to underscore the trustworthiness of their digital repositories.[166] However, claims of trustworthiness are easy to make but are far more difficult to justify or objectively prove. For this reason, the Research Libraries Group (RLG) and the National Archives and Records Administration (NARA) created a joint task force to specifically address digital repository certification and subsequently published *Trustworthy Repositories Audit & Certification: Criteria and checklist* (TRAC) in 2007.[167] A more recent focus on digital trustworthiness and on long-term preservation led to the development of criteria and certifications that can be used as tools when auditing digital preservation systems. In fact, curating digital data by meeting preservation standards is one way to show serious commitment to long-term digital preservation. Furthermore, the certification process can positively impact digital preservation policies, leading to the improvement of documentation and procedures.[168] Three of the most notable certifications are: the Data Seal of Approval (now CoreTrustSeal),

[165] The OAIS model is a conceptual framework for thinking about digital preservation. Institutions do not necessary need to follow all the guidelines, but they can use the set of recommended standards as a model to preserve their digital material.

[166] A Trusted Digital Repository (TDR) is a repository, "whose mission is to provide reliable, long-term access to managed digital resources to its designated community, now and in the future… (Trusted Digital Repositories) must: accept responsibility for the long-term maintenance of digital resources on behalf of its depositors and for the benefit of current and future users; have an organizational system that supports not only long-term viability of the repository, but also the digital information for which it has responsibility; demonstrate fiscal responsibility and sustainability; design its system(s) in accordance with commonly accepted conventions and standards to ensure the ongoing management, access, and security of materials deposited within it; have policies, practices, and performance that can be audited and measured." In 1996, the influential Task Force on Archiving Digital Information, identified the need for trusted organizations capable of storing, migrating and providing access to digital collections. In order to assess the reliability of digital repositories, the task force developed a set of criteria to facilitate the certification of digital repositories. See, RLG-OCLC, *Trusted Digital Repositories: Attributes and Responsibilities*, Research Libraries Group (2012), p.5. <https://www.oclc.org/content/dam/research/activities/trustedrep/repositories.pdf> (Accessed June 19, 2018); CRL, *Trustworthy repositories Audit & Certification: Criteria and Checklist (TRAC)*, OCLC and CRL (2007), p. 1. <https://www.crl.edu/sites/default/files/d6/attachments/pages/trac_0.pdf> (Accessed June 19, 2018).

[167] Center for Research libraries (CRL), *Trustworthy Repositories Audit and Certification Criteria and Checklist (TRAC),Version 1.0*, Chicago and Dublin, Ohio: CRL and OCLC (2007) <https://www.crl.edu/sites/default/files/d6/attachments/pages/trac_0.pdf> (Accessed June 12, 2018).

[168] According to the survey on DSA-certified digital repositories conducted by Barbara Sierman and Kees Waterman, the 18 surveyed repositories reported that the certification process had the strongest impact on preservation policies, "by imposing structured, professional and community-driven expectations (guidelines or requirements) on the applicants' policies and work processes, DSA-certification guides and encourages organizations to describe, document, improve and monitor their essential preservation tasks". See, B. Sierman, K. Waterman, *How the Dutch prepared for certification*,<https://ipres2017.jp/wp-content/uploads/3Barbara-Sierman.pdf> . For the complete survey see, B. Sierman, K. Waterman, *Survey of DSA-certified digital repositories: Report on the findings in a survey of all DSA-certified digital repositories on investments in and benefits of acquiring the Data Seal of Approval (DSA*). The Hague: Netherlands Coalition for Digital Preservation, (2016), <http://www.ncdd.nl/wp-content/uploads/2016/10/201611_DE_Houdbaar_Report_DSA-survey_2016.pdf> (Accessed June 13, 2018).

[169] *Criteria for Trustworthy Digital Archives* (DIN 31644),[170] and *Audit and Certification of Trustworthy Digital Repositories* (ISO 16363)[171]. Developers of these standards attribute multiple benefits to audit and certification.

The Core Trust Seal method was originally proposed by Data Archiving and Networked Services (DANS), located in the Netherlands in the effort to develop a basic certification distilled from Nestor and TRAC. The certification is made up of 16 guidelines pertaining to the application and verification of quality aspects with regard to the creation, storage and reuse of digital research data.[172] Despite being designed for research data repositories, many Dutch institutions have already made use of the Core Trust Seal certification to assess and guarantee the trustworthiness and the efficiency of their repositories. Among these institutions are: the National Archives, the Dutch National Library, the International Institute of Social History,[173] the Netherlands Institute for Sound and Vision[174] and the Dutch Language Institute.[175]

Complexity, diversity and fragility of digital data require extensive curation, preservation policies and written procedures to ensure proper management and successful reuse in the future. Preservingdata is an ongoing process requiring constant vigilance and improvement, and issues can arise if proper preservation procedures are lacking. One example of data loss as a result of poor preservation standards involves Brill publisher and Leiden University Libraries. In 2012, Brill publisher and Leiden University Library collaborated to digitize 140 volumes from The Warner Collection of the Leiden Library's oriental collections, now published online under the title The Ottoman legacy of Levinus Warner. The publication

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[169] Core Trust Seal: <https://www.coretrustseal.org/> (Accessed June 12, 2018).
[170] Deutsches Institut für Normung. *Information and documentation: Criteria for trustworthy digital archives.* Berlin: Deutsches Institut für Normung. (2012).
[171] ISO 16363: <http://www.iso16363.org/standards/iso-16363/> (Accessed June 12, 2018).
[172] There is a two-stage process that a repository must follow to obtain a Core Trust Seal: the first is to perform a self-assessment against the requirements. Afterwards, the self-assessment is peer-reviewed by a member of the CTS assessment group who provides feedback. The organization applying for the certification can then modify and improve the assessment and submit it for a final round of review. See <https://www.coretrustseal.org/why-certification/>. Core Trustworthy Data Repositories Extended Guidance for 2017-1019 <https://www.coretrustseal.org/wp-content/uploads/2017/01/20171026-CTS-Extended-Guidance-v1.0.pdf> (Accessed June 12, 2018).
[173] During my five-months internship at Leiden University Libraries I worked on the preliminary investigation for the certification of the repository infrastructure. The project leader Saskia van Bergen and I examined the benefits and risks of acquiring the Core Ttrus Seal in relation to the specific cases of the scholarly and heritage repositories of the University Library. To this end, we collected data during interviews with various institutions about their experience with the certification process. The interviews were carried out with specialists of digital curation that were in the process of acquiring the Core Trust Seal to certify the quality of the heritage digital collection of their organization. Among these experts were: Robert Gillesse, digital archivist at the International Institute of Social History, Barbara Sierman, digital preservation manager at the National Library of the Netherlands and Remco van Veenendaal, preservation adviser at the National Archives Responders.
[174] See, <https://beeldengeluid.nl/nieuws/beeld-en-geluid-ontvangt-data-seal-approval> (Accessed June12, 2018).
[175] See, <https://ivdnt.org/clarin-eric> (Accessed June 12, 2018).

consists of 140 volumes, amounting to 45.809 pages of Ottoman Turkish texts.[176] As part of the collaboration, Brill Publisher committed to providing access to and storage of the digital images, while Leiden University Libraries offererd the digital service. Recently, due to the loss of 148 high resolution images of those manuscripts, Brill publisher asked Leiden University Libraries for assistance, confident that they would have kept copies of the original scans. But that was not the case, as according to the original contract, Leiden University Libraries was only responsible for providing the digital service. The original agreement between the two parties was never found, leading to further problems and extra work. Eventually, Brill publisher managed to find the storage media containing the digital images and salvage the lost material. This accident revealed the lack of formal documentation in place, particularly of agreements or other forms of paperwork clarifying the obligations set out in accordance between two parties.[177] Therefore, to mitigate the risks of data loss, a preservation system would benefit from well-documented documentation being a key requirement for the Core Trust Seal and other trusted repository certifications.[178] The process of writing procedures and normative policies inevitably encourages organizations to think deeply about their purpose, goals and visions of the future. Having a preservation policy in place establishes parameters that can be monitored and assessed, helping the organization to maintain high standards and improve the stewardship of its special collections.

Hence, management of special collections requires active care and preservation of both the original and the digital surrogate. As we have already seen, the creation of digital facsimiles is adopted by institutions as part of the preservation strategy of medieval manuscripts. Thanks to unlimited access to digital facsimiles, heritage institutions can elaborate policies and restrict public access to original artifacts. This means that they can control their access, better protect rare materials and reduce access to vulnerable objects. But is digitization exacerbating what Siân Echard would call a situation of "arrest" of medieval manuscripts? [179] Is unlimited virtual

[176] MEMO 2, < http://catalogue.leidenuniv.nl/UBL_V1:All_Content:UBL_ALMA61269193040002711> (Accessed June 13, 2018).

[177] The need for formal documentation is specified in requirements 9 and 10 of the CoreTrustSeal guidline: (R9) Documentation describing data procedures and processes of data storage including security, backup, and data recovery (Repositories with a preservation remit must also offer 'archival storage' in OAIS terms); (R10) Contract between depositor and repository that clearly indicates how the data will be stored and kept accessible. See, Core Trustworthy Data Repositories Extended Guidance for 2017-1019, pp. 18-19. <https://www.coretrustseal.org/wp-content/uploads/2017/01/20171026-CTS-Extended-Guidance-v1.0.pdf> (Accessed June 13, 2018).

[178] One of the guiding principles of the CTS is "transparency". The board behind the seal believes strongly that transparency assists in establishing trust. Thus, in order to acquire the certification, the applicant institution must make the documentation which demonstrate the compliance to the 16 criteria publicly available.

[179] Siân Echard borrows this term from Jacques Derrida, who, in his 1994 *Archive Fever: A Freudian Impression*, calls the space of the archive "house arrest". In his article, *House Arrest: Modern Archives, Medieval Manuscripts,* Echard describes the situation of medieval manuscripts in modern archives as a sort of physical incarceration.

access to digital surrogates affecting physical access to artifacts? Echard, comparing archives to a "house arrest", was referring to strict archival practices which "imprison" books controlling the reading of medieval manuscripts and the texts they contain. As he points out, "in the case of the medieval text, then, one attempts both to approach the object in its "medieval" condition—to recover the medieval book—*and* to trace the evidence of that object's passage from one culture to another. But these efforts are conducted in specific surroundings."[180] The surroundings Echard talks about are excessively protective, such as "climate-controlled walls and sometimes recalcitrant catalogues." He then goes on, "It may be difficult to access original Chaucer manuscripts, but facsimiles and editions abound — this is an imperfect kind of access (…) but it is nevertheless more than is available for many medieval texts."[181] Echard's criticism of controlled and too limited access to manuscripts wants to reflect on the consequences that strict rules and guidelines have on the tactile engagement with artifacts. Each institution has its own policies and rules regarding accessibility and handling of manuscripts which are imposed to safeguard and preserve manuscripts. Even though the primary concern of heritage institutions should be that of complying to standards and best practices to guarantee the longevity of our cultural heritage, they should also be able to respond to the needs of scholars, researchers, and students who are in need of accessing and examining the anatomy of the object itself. Curators and managers must make originals available also for exhibition purposes. The notion of audience focus has, in some cases, been ignored by cultural institutions and justified by the fragility of many medieval manuscripts. In order to guarantee the preservation of rare historical books, institutions in the heritage sector have opted for digital or physical copies to display in place of the originals.

Policies for Medieval Manuscripts in five Libraries: access and digitization

"The most celebrated illuminated manuscripts in the world are, to most of us, as inaccessible in reality as very famous people. To a large extent, anyone with stamina and a travel budget can get to see many of the great painting and architectural monuments, and may stand today in

[180] S. Echard, 'House Arrest: Modern Archives, Medieval Manuscripts' in Journal of Medieval and Early Modern Studies 20, no. 2, Spring (2000), p. 186.
[181] Ibid.

the presence of the Great Wall of China or Botticelli's *Birth of Venus*. But try – just try – to have the Book of Kells removed from its glass case in Dublin so that you can turn the pages. It won't happen. The majority of the greatest medieval manuscripts are now almost never on pubic exhibition at all, even in darkened display cases, and if they are, you can see only a single opening. They are too fragile and too precious."[182]

Accessibility of rare and precious manuscripts has long been an issue. Christopher De Hamel's opening words to his latest work, *Meetings with Remarkable Manuscripts* incriminate the archival conditions which control the modern use of medieval manuscripts, what Siân Echard calls "physical incarceration of manuscripts" through an "imperfect kind of access". According to manuscript historian De Hamel, access to medieval manuscripts gets harder year by year. The reason for this tendency may be twofold. First, institutions restrict the access of more and more manuscripts as they age through time and become more fragile. Although natural, the process of aging combined with use and, real wear and tear can lead to parchment deterioration and contribute to the fading of pigments. Aging and inappropriate and careless handling are the primary reasons for controlling and limiting access to manuscripts. Even though it is impossible to "freeze" manuscripts in time and completely stop their deterioration process, heritage institutions can slow their aging down by making the access to originals more exclusive. Second, considering the preservation purpose of many mass digitization programs[183] and convenient and easy access to digital surrogates, digital collections can affect the stewardship of original sources. Digitization has introduced new factors to the interaction between the access and preservation of heritage materials in libraries, archives and museums.

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[182] C. De Hamel, *Meetings with Remarkable Manuscripts: Twelve Journeys into the Medieval World*, Penguin Press, New York (2016), p. 1-2.

[183] In the past decades, the cultural heritage community has been discussing the use of digitization as a preservation strategy. Abby Smith in her article, Why Digitize? expressed concerns about using digitization as long-term preservation, for "though digitization is sometimes loosely referred to as preservation, it is clear that, so far, digital resources are at their best when facilitating access to information and weakest when assigned the traditional library responsibility of preservation. Digital imaging is not preservation, however. Much is gained by digitizing, but permanence and authenticity, at this juncture of technological development, are not among those gains.". See, A. Smith, *Why Digitize?*, Council on Library and Information Resources (1999). <https://www.clir.org/pubs/reports/pub80-smith/pub80-2/> (Accessed June 21, 2018).
As already stated in chapter one and two, copies of manuscripts were accepted as a form of dissemination and easier access. Only recently has technological advancement enabled the creation of high quality surrogates of original materials which, in some cases, can improve poor legibility revealing more than the manuscript itself does. In 2013, Janet Gertz noted that digitization, "can facilitate exposure of materials kept under restricted access due to threat of damage, theft, or vandalism or because of difficulties in handling or extreme fragility. Digital copies play an important preservation role as surrogates protecting fragile and valuable originals from handling while presenting their content to a vastly increased audience around the world. Some day, the digital version may be the only record left of an original object that deteriorates or is destroyed". See, J. Gerts, 'Should You? May You? Can You? Factors in Selecting Rare Books and Special Collections for Digitization' in *Computers in Libraries* (2013). <http://www.infotoday.com/cilmag/mar13/Gertz--Factors-in-Selecting-for-Digitization.shtml> (Accessed June 21, 2018).

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Access and preservation are two related concepts, and their relationship is particularly close when considering fragile manuscript materials, as damaged, valuable and difficult to access original sources may not only hinder their use, but also pose issues of conservation. For example, digital copies act as preservation aids by providing instant access in case the original counterpart is too damaged to be consulted. Digitized versions can also be stored to provide a backup in case the physical object is lost.[184]

Even though one of the primary goals of museums, libraries and archives is to share our cultural heritage and engage the general public, in an era when digital technologies are gradually taking over, unlimited access to digital facsimiles can result in an increase in access restriction to precious and fragile medieval manuscripts. In fact, the electronic version of a book does not age visually and its decay it is not associated to use and interaction, but to technological obsolescence. Consequently, many cultural heritage repositories have selected the most fragile, popular material and sought-after material sources threatened by public access and made them available online. The Endangered Archives Programme (EAP), started in 2004 at the British Library, tries to safeguard rare printed sources, manuscripts and visual materials supporting digitization projects as a means of preservation. Since its inception, the programme managed to support over 300 projects in 90 countries worldwide, providing free online access to 6.5 million images for the benefit of scholars and the general public.[185] The programme's guidelines point out that, " the programme is not intended for the purpose of digitising *en masse* documents held by an official archive. Indeed, applications from national or regional institutions are only funded where the resources of that country are scarce and the significance of the endangered material is particularly high".[186]

Restrictions to special collection items depend on several factors such as the status of the object, its value and its rate of demand. Within the libraries' housing of medieval manuscripts, many precautions are taken to preserve rare items, granting access only to those few who can really prove worthy of that access. Echard defines the access to medieval manuscript as, "the access to that territory limited to those who can prove their citizenship of it".[187] Furthermore, this "limited territory" has hierarchies defining levels of access. Usually, a library privileges scholars and researchers over the general public, prioritizing either those who are known to the library, or who wish to consult a material for research purposes. For instance,

[184] O. Y. Rieger, *Preservation in the Age of Large-Scale Digitization: A White Paper*, Council on Library and Information Resources Washington, D.C. (2008), p. 1.
[185] The Endangered Archive Programme, <The Endangered Archives Programme> (Accessed June 21, 2018).
[186] See, < https://eap.bl.uk/about> (Accessed June 21, 2018).
[187] S. Echard (2000), p. 195.

the British Library guide to accessing manuscripts and archives urge everyone interested in consulting vulnerable, valuable and fragile manuscript to provide a letter of introduction or recommendation written by "someone appropriate or suitable, such as an academic colleague, tutor, archivist, publisher, agent or member of relevant society", stating the type of research they intends to undertake.[188] From this statement, it is clear that simple visitors without clear research needs and references are not allowed to browse and view the major highlights of the library's collection. Access to these items is a privilege, and the general public is forced/limited to see manuscripts only when displayed in exhibitions. By attempting to further restrict the circle of those interested in viewing special collection's items, the British Library encourages the use of digital reproductions and physical facsimiles as substitutes for the originals, mentioning that they have surrogates, "for many of the items in the Special Access (Select) category, so you may be able to conduct your research without a letter. There may be reasons why we cannot make something available (on exhibition, undergoing conservation or digitisation, etc.) but we may be able to supply a surrogate in place of the original". And also, "surrogates in the form of digital images, microfilms, facsimiles, etc. are normally available for material in the Special Access or Restricted categories, and many of them have been edited, published, translated and discussed at length in secondary sources".[189] Furthermore, the access to digital surrogates is presented and fostered as the easiest, fastest and cheapest way to see rare historical books in order to shift the attention from the vulnerable original artifact to its everlasting copy.

So, digital facsimiles can enhance preservation efforts by not only creating high-quality digital copies that can represent originals and answer fulfilling many research questions and serve as backups in case the originals are lost or deteriorated, but by also protecting manuscripts from handling, limiting their access and decreasing wear and tear to fragile, valuable and rare items.[190] By placing digital images of medieval manuscripts online and

[188] The letter should supply the following information: subject of research; reason for conducting research (indicating the status of person, academic/student. Ph.D. student etc.); the type of material to be consulted, the level of experience in the use of vulnerable, original material and, if possible, the training received in this respect; the name and position of the person supplying the letter. The British library stresses that the letter is required to remind users that, "they are requesting access to material that is vulnerable and valuable (both culturally and financially) and that they should either have experience of handling fragile and important material or have received training in how to handle it."The manuscript reading room requires also a valid British Readers Pass for manuscript access. However, additional restriction can be applied to the most vulnerable and valuable items for which is necessary to contact the British Library Reference Service for further advice.
British Library, *Access manuscripts and archives* <https://www.bl.uk/help/access-manuscripts-and-archives> (Accessed June 22, 2018).
[189] Ibid.
[190] Indeed, control over the access of special collections is one of the most important parts of the preservation strategy. As Mary Lynn Ritzenthaler writes, "Preservation that can also be gathered on collections at the point of

providing free and unlimited access to them, an institution may decide to restrict access to valuable manuscripts as part of its preservation strategy.[191] An increase in digital access to facsimiles has therefore lead to a series of changes in the way we interact with original sources.[192] Libraries and archives do not always facilitate the process of making original sources available for research purposes, and instead they strongly encourage scholars to consult digital copies first. According to Peter B. Hirtle, inevitable changes will occur as the pace of digitization increases, and these developments will also have serious implications for the future of special collections. In addition to bringing many benefits such as free availability of digitized rare books and manuscripts and bringing scholars and the general public closer to heritage artifacts, the use of digital surrogates, will however replace the use of physical manuscripts kept in libraries and archives. Peter B. Hirtle explains that this trend is based on one observation, "while users in special collections reading rooms enjoy the experience of working with the physical volume, their primary purpose when making a visit is to read the text at hand (…) Reading and not the analysis of the physical nature of the artifact, it the primary motivation for using material in special collections."[193] Since access to originals is subjected to limited hours and rules of access, most users will choose the digital facsimile instead. So, as access to originals becomes more and more exclusive, and the availability of electronic materials increases, "the preference for electronic surrogates of originals material will only

use, thus contributing to the overall preservation profile of the holdings. Equally important, the preservation review provides a mechanism for intervening and withholding from use records that because of their condition on format simply cannot be handled until they receive preservation attention (...) Materials that should be withheld include severely damage or fragile records that are too vulnerable to handle, materials that are in the process of receiving conservation treatment, and records that must be duplicated or reformatted to provide use copies. Access to such materials should be uniformly denied (…) In situation where access will clearly jeopardize the material, the archivist must be assured of administrative support in denying use." See M.L. Ritzenthaler, *Preserving Archives and Manusctips*, Chicago: Society of American Archivist (1993), p. 133.

[191] According to Mary Lynn Ritzenthaler, a policy should also be established to regulate the use of manuscripts after they have been digitized, "Access to an original should be permitted only if physical examination of the item will provide answers to questions that cannot be answered by the reproduction. Verification of the authenticity of a document, as well as examining the paper (watermarks, chain and laid lines, etc.) to help date or locate the item's origin, are need that casual researchers will not have. Researchers who insist that they cannot gain a true understanding of the intellectual content unless they are allowed to use and handle the material in original format should not be indulged." Ibid., p. 114.

[192] Karin Scheper argues that digitization and the accessible increasing digital collection will influence the preservation and accessibility to original manuscripts. Scheper expects a repercussion on preservation and conservation strategies as digital facsimiles increase and access to originals is more and more restricted. Digitization, "may and ultimately should change policy-making on a high level and thus have an impact on the preservation of collections as a whole. On a smaller level the acceptance of the artefactual function of the book affects the decision-making for individual objects. Indeed, when printed works or manuscripts are digitally available the need for physical consultation will diminish (…) Will the function of the book as a physical object change towards that of a museum object?." See, K. Scheper (2014), p. 13.

[193] P.B. Hirle, 'The Impact of Digitization on Special Collections in Libraries' in *Libraries & Culture*, Volume 37, no. 1 (2002), p. 45.

increase."[194] In the following section I would therefore like to reflect on the impact that digitization had on the physical engagement with original manuscript sources by comparing the access to medieval manuscripts from three university libraries: Leiden University Library, Utrecht University Library and the Trinity College Dublin.

Leiden University Library: The Leiden Aratea

Cod.Voss. Lat Q79[195] is itself a ninth-century[196] copy of an astronomical and meteorological treatise, containing a Latin didactic poem written by Germanicus (15 BC-19 AD), based on the *Phaenomena* written by the Greek poet Aratus of Soli (c.315-240/239 BC).[197] The Codex is richly illuminated and is one of the most precious treasures of the Leiden University Library. This beautifully decorated manuscript of Germanicu's translation of the Aratea is one of the earliest and most important of the surviving illuminated Carolingian manuscripts.[198] The codex is a relatively small square shape book, measuring approximately 225 x 200 mm and comprising ninety-nine parchment folia. The text is written in *capitalis rustica*, the typical ancient Roman script, and lavishly decorated with thirty-nine miniatures depicting constellations, seasons and planets, all placed on the *verso* side of the manuscripts.[199] Since the Leiden Aratea is a faithful copy of a lost Latin manuscript made probably in the fourth or fifth century it offers evidence regarding the appearance of illustrated late antique codices. Its exceptional fidelity to ancient

[194] ibid.
[195] Leiden, Universiteit Bibliotheken: Cod. Voss. Lat. Q 79.
[196] F. Mutherich, 'Book Illumination at the Court of Louis the Pious' in P. Godman, R. Collins (Ed.) *Charlemagne's Heir: New Perspectives on the Reign of Louis the Pious (814-840)*, Oxford: Clarendon Press (1990), p. 597.
[197] The Leiden Aratea, made at the court of Louis the Pious at Aachen, is an attempt to recreate the Latin version of Aratus' work, and testify the great cultural interest of the Carolingian emperors in classical antiquity. Indeed, the Carolingian period, known for its cultural revival through *renovatio* and *reparatio* put emphasis on schools, study, and books. Monasteries and cathedrals served as the principal centres where libraries were built, where masters and monks could preserve both the literary legacy of Roman antiquity and of the Latin Patristic age, and where new teaching manuals were created for new students. However, the study of the classical past was rooted in Charlemagne's interest in church liturgy and its correct propagation and adequate performance throughout the empire. Study of the classics could help layman and church men alike to comprehend the Holy Scriptures and discourage misinterpretations and copying errors. The Carolingian fascination for astronomical-cosmological works was also motivated by the wish to establish correct liturgical practices, and this was evident in their extensive use of astronomical books. Bruce Eastwood's research on Carolingian commentaries of Roman ancient texts reveals that from the middle of the ninth century astronomical and cosmological diagrams started to appear in many manuscripts due to an increasing interest in classical astronomy. These astronomical diagrams, that gradually led to a deeper understanding of celestial phenomena, were used as a learning device for students and a memory device for the teacher. See B. S. Eastwood, *Ordering the Heavens, Roman Astronomy and Cosmology in the Carolingian Renaissance*, Brill (2007), pp. 95-179.
[198] C. De Hamel (2016), p. 146.
[199] At least five others miniatures representing Jupiter as a personification of the heavens, along with the sun, the moon, and two additional constellations (Virgo and Centaurus) were originally included but are now lost. See R. Katsensteing, E. Savage-Smith, *The Leiden Aratea: Ancient Constellations in a Medieval Manuscript*, J. Paul Getty Museum (1998), p. 6.

models makes it difficult to distinguish the Carolingian *Aratea* from the late antique original. As pointed out by De Hamel, Carolingian scribes were able to accurately reproduce both the format and appearance of the classical model, creating a very similar copy.[200] Notwithstanding the striking fidelity of the Leiden *Aratea* to late antique manuscripts, De Hamel explains that characteristics such as thickness and texture of the parchment, the aspect of the miniatures' figures and the presence of one leaf completely written in Carolingian minuscule make it possible to date and localize the manuscripts.[201]

In 1989 Cod.Voss. Lat Q79 was restored and rebound by a Benedictine nun of Oosterhout,[202] sister Lucie Gimbrère, who worked for many years with the holdings of the Leiden University Library.[203] According to De Hamel, sister Lucie Gimbrère disassembled the manuscript in order to allow the item to be photographed for the creation of its physical facsimile. When policies regulating and protecting the original conditions of valuable and rare manuscripts were still not in place, and there was little money for conservation treatment,[204] book conservators often performed invasive restoration activities to ensure an object's stability and continued preservation.[205] Rebinding of old and precious manuscripts was a very common practice, even if the reason to do that was the creation of a paper facsimile. Nowadays, the tendency to alter the physical book to prevent further damage has been abandoned.[206] Conservators are more aware of the value of original bindings and changes in book preservation ethics and treatments testify this shift in attitude.[207]

[200] "At first sight, one might even believe that the volume in Leiden was actually an original manuscript from the late Roman Empire. The general style of painting in dabs of rich dark colour, at times blotchy and even verging on impressionistic, is a good imitation of Roman art: the frescoes in Pompei and sarcophagus portraits from Egypt, for instance, are examples familiar to us. The script, in a beautiful rustic capital, looks entirely authentic. The almost square shape is utterly classical too". See De Hamel (2016), p. 167.
[201] For instance, Cepheus' face of the Leiden Aratea recalls the miniatures in the Psalter of Emperor Lothair I held in the British Library, made for a member of the royal family at Aachen between 840 and 850. The possibility that the Aratea originated in this area is supported by the fact that it probably belonged to the abbey of St. Bertin in Northen France around 1000. See C. De Hamel (2016), p. 171.
[202] De Hamel (2016) p 159.
[203] Sister. Lucie Gimbrère restored c. 372 bindings working as a conservator mostly at the University Libraries of Leiden, Nijmegen and Utrecht. See J. Szirmai (1999) p. 278.
[204] K. Scheper, 'Islamic manuscripts in a western research library: The conservation approach of Leiden University Library' in M. J. Driscoll, R. Mósesdóttir (Ed.) *Care and Conservation of Manuscripts*, Vol 12, Copenhagen (2011), pp. 151-169.
[205] F. M. Mirjam (1993), p. 419.
[206] This attitude is discussed in K. Sheper, 'Considering Book Conservation. Developments in Materials Techniques, and Approaches' in *Journal of Paper Conservation*, (2010) pp. 32-33. And in F. M. Mirjam (1993), pp. 419-425.
[207] K. Sheper (2010), p.13.

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Leiden University Library, the oldest university in the Netherlands, has a conservation department set up by Dr. Karin Scheper in 2000,[208] where restoration and special treatments of special collection items take place.[209] Manuscripts are selected, examined and accurately conserved on a daily basis, depending on their preservation needs and their place and function within the collection. Furthermore, assessment surveys and damage inventories are periodically carried out in order to evaluate the specific conservation needs of manuscripts collections and to assess their material aspect.[210] The preservation strategy of the Leiden University Library, and more gnerally of the majority of heritage institutions, is to preserve the items in their most authentic state as possible and only adapt the original construction when really needed, for instance to facilitate their use.[211] Leiden University Library's conservation department works to make the heritage collections available for both study and research. Students and Scholars in possession of a library card (LU card) can easily access medieval manuscripts and consult them after having requested them via the online Special Collections Catalogue.[212] Considering the precious and fragile material contained in the special collections, preservation-related actions have been carried out in the Reading Room, in order to guarantee the security of the items. Anyone wishing to consult a manuscript in the Reading Room must respect the following rules: (1) no material may be removed from the room [213] (2) water and food is not allowed, only pencils and computers can be carried in and (3) cushions must be used to support items. In addition to the images that are available in the digital catalogue, students and scholars consulting original items in the Reading Room can take photographs of manuscripts and publish them.[214]

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[208] In addition, Karin is a guest lecturer for the Book and Paper conservation at the University of Amsterdam. She also contributes to courses at Leiden University such as: to Book and Digital Media studies, as well as to the course 'From Manuscript to Modern Media' at the School of Middle Eastern Studies.

[209] According to the Leiden Library manuscript conservator, Karin Scheper, before the constitution of the conservation department, manuscripts were, with respect to conservation, rather neglected and conservation treatment were undertaken sporadically on a mostly ad hoc basis.

[210] These measures help to identify the most urgent preservation treatments, addressing problems of risk of loss and inaccessibility. See K. Sheper (2011), p. 152.

[211] This may be the case when manuscripts have lost their original binding, or when they are too damaged to be handled safely. When they are so badly damaged, the application of additional board attachment support can allow both the conservator and users to consult the manuscript without worsening the text block conditions and this thus prevents the original materials from becoming damaged again. Dr. Sheper ensures that, "Bindings and book-blocks will no longer be separated, as they were in the 1960s. The current approach guarantees the preservation of as many of the physical characteristics of the manuscripts as possible". See K. Sheper (2011) p. 168.

[212] Information from the website <https://www.library.universiteitleiden.nl/special-collections/using-special-collections/access> (Accessed June 27, 2018).

[213] Items are weighed before and after use to prevent theft and vandalism.

[214] Information on the Leiden University Library imaging policies can be found at <https://www.library.universiteitleiden.nl/using-the-library/using-special-collections/photographic-orders-and-publication-of-images> (Accessed June 27, 2018).

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According to the Leiden Library website, contemporary today users can access almost three million books through their digital catalogue. Among them are medieval manuscripts, incunabula, old prints, letters, maps, drawings, prints and photographs. Even though Leiden University Library also guarantees open access to their Special Collections items, every single object has its own access policy depending on its condition and value. The Leiden *Aratea* is one of those manuscripts whose access is highly controlled. When I submitted the request to consult the original book, I was actually surprised I could go through the entirety of the process and receive a positive response. A few hours later, I received an email of 'request cancellation notice" from the library stating that the manuscript could only be consulted with the permission from the conservator Dr. André Bouwman. Its digital copy and facsimile though were available to be consulted in its place. Fortunately, my research needs were only concerned with the access of the item, and not with its materiality. However, obtaining access to this precious item can involve significant hurdles even if someone desperately needs to consult the original manuscript for his/her research. Christopher De Hamel, Fellow of Corpus Christi College and Fellow of the Parker Library, is one of the world's leading expert on medieval manuscripts, and among those to which the access to this unique object was initially denied. In his latest contribution to the field, Meeting with Remarkable Manuscripts, De Hamel uncovers some of the most famous illuminated manuscripts and describes what it really means to access them. On his first request to consult the Leiden Aratea, Leiden University Library denied him access. Since the digital facsimile of the manuscript is fully available online for free they did not see the need for him to browse through the actual artifact. Only after more persistence, he writes, "Dr. André Bouwman, curator of Western manuscripts, courteously agreed to my request (…) partly because I was to be in Leiden to give one of what are called Lieftinck Lectures on manuscript and so the university owed me a favour".[215] It seems that digital facsimiles are almost considered as substitutes of their originals, making it increasingly difficult to handle them in person, even if the person asking for their access is one the most famous historians of medieval manuscripts. Today, libraries discourage users from consulting originals by providing an easier and costless way to access the rare and precious manuscripts which spare researchers and students the obstacles of bureaucracy and security.

[215] De Hamel (2016), p. 145.

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Utrecht University Library: The Utrecht Psalter

Of all the surviving illustrated Carolingian manuscripts the Utrecht Psalter[216] stands out as one of the most incredible and intriguing books. It is regarded as the masterpiece of Carolingian book production, containing a rich iconographic programme of no less than 166 dynamic and sketchy pen drawings.[217] Like the Leiden *Aratea*, the Psalter looks almost like manuscript from the Late Roman period of the 4th or 5th century. The manuscript's notable style seems to violently move the program of psalm illustration, in which nearly every verse of a psalm is brought to life in pictorial representation. The uniqueness of the Psalter is not just limited to its dynamic style: it was larger than its contemporaries, was written in an unusual script and even the layout was different.[218] Despite the extensive study and scholarship surrounding the Psalter, many aspects of the book still remain unknown. It is challenging to determine the circumstances which enabled the the production of the Utrecht Psalter. The manuscript itself does not give direct clues on who commissioned it, for whom and for what purpose, but it is believed it was written for an important person on an important occasion. Its dates are subject to argument as the organization of the scriptorium that produced it.[219] The manuscript has been executed in a very distinctive style attributed to a scriptorium at the Benedectine monastery of Hautvillers in Epernay, just south of Reims. Its dates and origin are based on stylistic and iconographic similarities to the Ebo Gospels commissioned by archbishop Ebo himself, and made at the monastery of Hautvillers between 816 and 823. The style of the Psalter is so similar to that of the Ebo Gospels that scholars believe it must have been made in the same scriptorium, at about

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[216] Utrecht, Universiteitsbibliotheek: MS Bibl. Rhenotraiectinae I Nr 32.

[217] K. van der Horst, 'The Utrecht Psalter. Picturing the psalms of David' in K. van der Horst, W. Noel, W. C. M. Wüstefeld (Ed.), *The Utrecht Psalter in medieval art. Picturing the Psalms of David*, Hes Publishers BV (1996), p. 23.

[218] The Utrecht Psalter's main text is written in Rustic capitals, in contrast with the vast majority of Carolingian manuscripts written in Caroline miniscule. Rustic capitals were, however, used in a large number of Carolingian manuscripts for selected passages of text (incipits and explicits). In the Ebbo gospels, for example, entire passages with dedicatory poems and other introductory matter were written in Rustic capitals. However, apart from the Utrecht Psalter, the only example of a manuscript with Rustic capitals for its entire main text is a Gospel book of c.840 from Metz in which the Rustic capitals are in a single column. Even the texts copied in the ninth century from classical models do not follow these examples in their use of Rustic capitals. The two copies of Terence in the Vatican and Paris (Vatical library, Ms. lat. 3868 and Paris, BN, Ms. lat. 7899 respectively) are not in Caroline minuscule. Only the Aratea manuscript in Leiden followed its classical model in using this script. So, in this respect the Utrecht Psalter stands alone. Moreover, in the Middle Ages the layout of two columns was predominant, and the presence of three columns during the Carolingian period is restricted to specific cases: the Liber Glossarum, the earlier Theodulf Bibles, Stuttgart HB II. 16 and London, BL Add 24,142, and The Utrecht Psalter. For more information, see: B. Bischoff, *Latin Palaeography: Antiquity and the Middle Ages*, Cambridge University Press (1990) p.28.

[219] Celia Chazelle in the article '*Archbishop Ebo and Hincmar of Reims and the Utrecht Psalter*' supports her view that the Utrecht Psalter was not commissioned by Ebo but by his later successor, Hicmar of Reims. Nevertheless, this dating, around 850, contrasts with the results of the majority of the scholars, according to which the Psalter is to be dated to the first period that Ebo was archbishop of Reims, namely from 816 to 834.

the same time (c. 816-834).[220] Given the still unsolved issues and questions surrounding the manuscript such as the execution of the drawings,[221] the origin and the sources of the miniatures and the possible functions of the manuscript, the Utrecht Psalter received and still receives exceptional attention from researchers and art historians and is one of the most studied and examined books in Dutch collections.

The Utrecht Psalter has been owned by the Utrecht University Library since 1716, when the Utrecht citizen Willem de Ridder gave it to the University Library in the Janskerk. The manuscript has been published four times in facsimile and in 1996 the Library made a digital reproduction in order to satisfy the need of researches who, "wanted to study the manuscript without having to travel to Utrecht".[222] The manuscript is kept in a large vault in one of the depots of the Utrecht University Library and the keeper of manuscripts, Dr. Bart Jaski, is directly responsible for its care. Since it is a so-called 'restricted manuscript' it cannot be accessed without the permission of the keeper of manuscripts. On average, it is on public display once every ten years, the last time in 2007 (Brussels).[223] In 2016, the 300th anniversary of the donation of the manuscript to the city of Utrecht was celebrated by an exhibition in Museum Catharijneconvent, the Dutch museum of Christian art in Utrecht, and I was lucky enough to see it on that occasion. The Utrecht Manuscript guide invites researchers and students to consult the increasing number of digitized manuscripts online, since, "they are available and perfectly suited for use in teaching and research".[224]

Since the Utrecht Psalter was subjected to an intense study involving handling and manipulation, it is no wonder that the most special and unique[225] of all the Carolingian

[220] B. Jaski, 'The ruler with the sword in the Utrecht Psalter' in R. Means, D. Van Espelo, M. De Jong, (Ed.) *Religious Franks: Religion and power in the Frankish Kingdoms: Studies in Honour of Mayke de Jong*, Manchester University Press (2016), pp. 71-89.

[221] There is a debate over the stages in execution of the Utrecht Psalter's illustrations due to the difference in clarity between the 166 pen drawings. The interpretations of the faint and bold illustrations of the Utrecht Psalter lead to two conflicting theses. Dewald's hypothesis shows a reworked and retouched manuscript, whose drawings are Carolingian as much as Anglo-Saxon. On the other hand, the more recent study undertaken by Koert van der Host suggests that the drawings, executed in stages, were supposed to be painted, but were never finished. For more information, see: K. Horst, W. Noel, W. Wüstefeld (1996), pp. 45-84 and E.T. DeWald, *The illustrations of the Utrecht Psalter*, Princeton (1932), p. 2.

[222] Information can be found at <http://bc.library.uu.nl/utrecht-psalter.html> (Accessed June 28, 2018)

[223] Utrecht Psalter, Nomination form International Memory of the World Register, <http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/mow/nomination_forms/netherlands_psalter_eng.pdf> (Accessed June 28, 2018).

[224] Loon, Daan van, *LibGuides: Bijzonder Materiaal: Handschriften*, (Accessed June 28, 2018). <//libguides.library.uu.nl/bijzondermateriaal/handschriften> (Accessed June 28, 2018).

[225] The Utrecht Psalter is so special and important in the history of Christian art and Carolingian culture for the following arguments: (1) the whole production of the Utrecht Psalter, with its extensive iconographic programme, combined with the high quality of the drawings, is unique among the extant Carolingian manuscripts (2) the revolutionary new style of the drawings. The Utrecht Psalter is the epitome of the sketchy, dynamic way of drawing which is characteristic of the influential Reims school of manuscript illumination (3) the Utrecht Psalter contains

manuscripts has being digitized with the intention of preventing inattentive handling and to reducing further damage. In recent e-mail correspondence about the Utrecht Psalter access policy with the keeper of manuscripts Bart Jaski, it was explained to me that the Psalter was digitized as part of its preservation strategy. When it was clear that good digital reproductions would keep researchers and students away from original artefacts, decreasing the need to consult manuscripts, Utrecht library started digitising documents, including the Utrecht Psalter. Dr Jaski specified that no increased limit to the Utrecht Psalter has not been limited because of the free availability of its digital surrogate, as its access was already subject to special restrictions given its extraordinary value. Since the digital reproduction of the Utrecht Psalter can satisfy the needs of many scholars interested in its content and drawings[226] there is less need for individuals to consult the original document, Bart Jaski concludes.[227]

Trinity College Dublin: The Book of Kells

The Book of Kells[228] is held at Trinity College Dublin and is its most popular attraction, so popular that 500,000 people spend €8 each to see it per annum, resulting in € 4 million revenue for the library.[229] This "most precious object of the Western world"[230] is regarded as Ireland's greatest historical treasure and is probably the most famous example of medieval Christian art. It

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the most complete cycle of psalm illustrations inherited from the Late Roman period. Parts of this cycle are also found in Byzantine and Western manuscripts. The artists have used the basic material, but have given the illustrations a Carolingian twist, skilfully combining the old and the new (4) the significant influence of the style and iconography from between 830 and 1200, at first in northern Francia, later in England. No other illuminated manuscript has enjoyed such prolonged and directly important influence as the Utrecht Psalter. See <http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CI/CI/pdf/mow/nomination_forms/netherlands_psalter_eng.pdf> (Accessed 2 July, 2018).

[226] The main goal of the annotated digital edition of the Utrecht Psalter is to establish the link between text and image. The psalms and cantica are available in four languages and illustrations are linked to specific parts of the psalm text. Users can either click on the text or on the rectangle in the image to discover the connection. The 2015 annotated edition also provides a descriptions explaining each illustration as published in E. T. Dewald, *The illustrations of the Utrecht Psalter*, Princeton (1932) pp. 3-73, with some additions and corrections. Further information can be found at <http://utrechtpsalter.nl/page?p=0&res=1&x=0&y=0>. (Accessed July 2, 2018).

[227] With regards to the Psalter, Utrecht Library has stricter policies about showing it to the public in classes or exhibitions, Dr Jaski writes, "I never show it in classes, and do not honour every request to have it in an exhibition. But this applies, to a somewhat lesser extent, also to other top manuscripts such as the Pontifical of St Mary (Ms. 400) and the Zwolle Bible (Ms. 31)".

[228] Dubin, Trinity College Library: MS 58.

[229] K. M. Rudy, 'Open Access Imaging Policies for Medieval Manuscripts in Three University Libraries Compared' in *Visual Resources*, vol. 27, no. 4, (2011), pp. 345-359.

[230] The Book of Kells was described by the 11th century Annals of Ulster as "primh-mind iarthair domain", " the most precious object of the western world". See <https://www.digitalmedievalist.com/things/manuscripts/book-of-kells/> (Accessed July 3, 2018).

was included in the Memory of the World Register compiled by UNESCO in 2011.[231] The manuscript is an elaborated and decorated copy of the Gospels made in the late eight or early ninth century. It presents a modified Vulgate text of the Gospels in a large format.[232] The manuscript is lavishly embellished with decoration so detailed that, in spite of its apparently unfinished state,[233] the book stands as one of the most spectacular western manuscripts.[234] The manuscript is written in, "a bold, very expert"[235] script known as *minuscule* and *majuscule* Insular style.[236] Every page is embellished with decorations and images. The major decorated pages are complex in composition and iconography. They comprise canon tables, symbols of the evangelists, a depiction of the Virgin and Child surrounded by angels, portraits of St Matthew, Christ and St John, narrative scenes, and the famous Chi Rho on folio 34r.[237]

The manuscript is unique and remarkable in a number of respects. It symbolizes the power of learning, the impact of Christianity on the life of the country and the rich artistic imagination and skill of the period. It provides evidence of high achievement in Ireland's historical past and for this reason became a symbol of national culture.[238] The book is on permanent display in a special darkened shrine called the Treasury, at the eastern end of the library, and over 520,000 visitors queue to see it each year. Since the opening of the Book of Kells visitor center in 1992, the library welcomed more than 10 million visitors,[239] a tourist venue which De Hamel describes as, "pilgrim shrines of the Middle Ages".[240] The Trinity College Library has been promoting visibility and access to all of its collections with the aim to, "improve the reach, and impact, of the Library's collections, and make them visible and accessible to a wider range of users for research, for teaching and for learning".[241] Reaching

[231] Memory of the World: Book of Kells. <http://www.unesco.org/new/en/book-of-kells> (Accessed July 3, 2018).
[232] The leaves measures approximately 330 x 240 mm, but originally probably measures c. 370 x 260 mm. A nineteenth-century binder trimmed the pages cutting into some of the illuminations. See C. Farr, *The Book of Kells: Its Function and Audience*, The British Library and University of Toronto Press (1997) p. 49.
[233] In several areas of the manuscripts, the decoration is not completed. This is the case of the genealogy of Christ in Matthew's Gospel (folios 29v-31r). On folio 245r line 4, a human face, drawn upside down as part of the word *Dicebat*, has not been completed. For more information see B. Meehan, *The Book of Kells*, London: Thames & Hudson (2012), p.218.
[234] Ibis., p. 43.
[235] E. A. Lowe, *Codices Latini Antiquiores. Part ii: Great Britain and Ireland*, Oxford: Clarendon Press (1972). p 43.
[236] B. Meehan (2012), p. 189.
[237] B. Meehan, *The Book of Kells: an illustrated introduction to the manuscript in Trinity College Dublin*, Thames & Hudson (1994), p. 22.
[238] B. Meehan (2012), p. 13.
[239] < https://www.tcd.ie/news_events/articles/trinity-college-welcomes-the-10-millionth-visitor-to-the-old-library-and-book-of-kells-visitor-centre/4181> (Accessed July 4, 2018).
[240] De Hamel (2016), p. 102.
[241] Trinity College Dublin Annual Report <https://www.tcd.ie/library/assets/pdf/annual-reports/AR2015-6spread.pdf>. (Accessed July 4, 2018).

the wider public and accelerating access to collections through digital content creation are two of the primary ambitions and priorities of the Board of the Trinity College Library. [242] In 2012 the Library decided to enhance the visitor experience and improve public access to this precious manuscript by making use of interactive technology. Therefore, the display of the manuscript is now preceded by the exhibition 'Turning Darkness Into Light' which introduces the Book of Kells through a series of panels of replica pages from the manuscript allowing the public to engage with the smallest details of the manuscript's illuminations, from the pigments used in the miniatures to the techniques of the artists. [243] A complete high-resolution digital facsimile is also freely available online, providing an experience, "second only to viewing the book in person".[244] Since the original manuscript on display allows visitors to see only two pages at the time,[245] the Trinity College Library exhorts visitors to see the manuscript in its entirety via the Library's new online repository of digital collections. The digital facsimile enables users to magnify images of several orders, extending the powers of human vision and allowing one to see far more than is visible when viewing the original, which is on permanent exhibition under low light and difficult to see.[246]

Trinity College Library's rules and policies around the Book of Kells are so strict that De Hamel refers to them ironically, "as complex as presidential protection undertaken by the secret service of a great nation".[247] And it is not surprising, given the fact that the most popular tourist attraction in Dublin has been reported stolen twice. The first occasion when the book was stolen, according to the Annals of Ulster, was in 1007, because of the ornamented shrine in which it was kept. The manuscript was recovered three months later, buried in the ground and without its precious case.[248] The second time that the manuscript was stolen, De Hamel explains, was a misunderstanding. It was, in fact, taken to the British Museum in London for advice on rebinding by Trinity College Dublin's librarian , J. A. Malet, who did not really ask

[242] According to the Trinity College Dublin Annual Report, "The Digital Content Creation Policy and Programme was developed in consultation with academic colleagues, and endorsed by the Board of Trinity College Dublin. It comes as the Library considers that: currently less than 1% of Library holdings are digitized; there is a need for largescale digitization of unique and distinct collections; such digitization will activate new areas of scholarship, teaching and learning. The Digital Content Creation Policy and Programme is informed by current best international practice. The Library is now actively reviewing high-value and heavily-used material (e.g. key medieval manuscripts and Pollard children's books); providing a record and a surrogate".
[243] <https://www.tcd.ie/news_events/articles/trinity-college-welcomes-the-10-millionth-visitor-to-the-old-library-and-book-of-kells-visitor-centre/4181> (Accessed July 4, 2018).
[244] <http://www.tcd.ie/library/old-library/> (Accessed July 5, 2018).
[245] A librarian turns over a new page of the Book Of Kells every day, it would therefore take one year to see the entire manuscript.
[246] K. M. Rudy (2011), p.352.
[247] De Hamel (2016), p. 103.
[248] P. Fox, 'Ussher, Kells and Durrow' in *Trinity College Library Dublin: A History*, Cambridge University Press (2014) p. 23.

for permission.[249] Since then, special security measures have been arranged for this precious item. Dr Bernard Meehan, Head of Research Collections and Keeper of Manuscripts, explains that for security reasons, it "would be inappropriate to allow it into the reading-room". Similarly, it is also not possible to disclose where the manuscript is taken when consulted.[250] In order to see the Book of Kells, De Hamel himself was placed at a circular green-topped table, prepared in advance with foam pads, a digital thermometer, and white gloves. He was not allowed to turn the pages himself. The keeper of manuscripts, Bernard Meehan, took the entire day off to assist De Hamel, carefully turning the leaves with the tips of his fingers, from the top and bottom simultaneously.[251]

De Hamel's personal experience with the famous Book of Kells tells us much about the organization's goals and their preservation strategy. Trinity College Library Dublin as also pointed out by the library Preservation Policy[252], is committed to preserve valuable manuscripts through actions that minimize their deterioration, and that prevent the loss of material. The preservation of one of Ireland's greatest cultural treasures and greatest examples of medieval Christian art is ensured by restricting access[253], controlling and monitoring the environment and space and ensuring controlled and safe handling. Furthermore, the library promotes a 'controlled' visibility of the manuscripts in the exhibition context to ensure that the Book of Kells is available for the public to be seen and appreciated. The engagement of the visitor is enhanced by the project 'Turning Darkness into Light' which creates an inspirational, imaginative, enlarged exhibition, along with a greatly improved visitor experience and a sense of anticipation prior to visitors entering the Treasury, where the manuscript is displayed.

Consequences of Digitization on access

While every heritage institution has its own ambitions, policies and preservation strategy, the cases of the three libraries mentioned in the previous section suggest that nowadays libraries

[249] De Hamel (2016) p. 98.
[250] Ibid., p. 103.
[251] Ibid., p. 105.
[252] Preservation Policy, pp. 26-27 <https://www.tcd.ie/library/assets/pdf/Policies/CollectionDevelopmentPolicy2014-5.pdf -nameddest=PreservationPolicy> (Accessed July 6, 2018).
[253] In her article 'The examination of the Book of Kells using micro-Raman spectroscopy', Susan Bioletti, Head of Preservation and Conservation at Trinity College Dublin, explains that previous pigments studies on the Book of Kells have been undermined by inadequate access to the manuscript which prevented a comprehensive examination. See S. Bioletti, R. Leahy, J. Fields, B. Meehan, W. Blau, 'The examination of the Book of Kells using micro-Raman spectroscopy' in *Journal of Raman Spectroscopy*. 40, John Wiley & Sons, Ltd (2009), pp. 1043–1049.

tend to push remote access of high quality digital facsimiles in the attempt to minimize the deterioration of medieval manuscripts with the aim of prolonging their life for future generations. This is especially apparent not only when libraries suggest using digital facsimiles because "they are available and perfectly suited for use in teaching and research", but also in the way they promote easier and faster digital access in comparison to difficult, expensive and time consuming on-site visits. For instance, if someone wants to know more about the famous Utrecht Psalter or is interested in consulting the original manuscript and therefore looking for information regarding its access, he/she can simply go to the official website and after a little introduction and a brief overview of the content and the history of the manuscript, can access the surrogate in a few seconds by simply pushing the red 'Go to the digital version' and 'Go to the digital edition' buttons. Similarly, Leiden University Library defines the experience of accessing its Digital Special Collection as "a feast for the eyes", and while the user studying manuscripts through its website is only "a mouse click away from medieval manuscripts, rare atlases, unique prints and many other treasures",[254] on-site access to physical collections, in contrast, involves the submission of good credentials, reference letters, proper research questions, and involves travel expenses and time expenditure. Furthermore, library websites do not clearly state which actions must be taken in order to have physical access to those items, which is predominantly only granted by appointment with the keeper of the manuscript whose contact is often not indicated.[255]

Institutions are increasingly interested in offering digital services to their users and in increasing the availability of heritage collections via digital mediums. The preservation of cultural heritage is no longer seen as the only and primary reason for creating digital libraries. According to the Survey Report on Digitization carried out by Natasha Stroeker and René Vogels in 2014, academic research is perceived by heritage institutions as the most important reason to provide digital access to collections, and it has been estimated that more that 17% of heritage collections have been digitized so far.[256] The third reason for providing increasing digital access to heritage collections is for reducing the use of the physical originals. Digital access is regarded as increasingly important by libraries and museums and is increasingly used by scholars and students. The widespread dissemination and universal access of digital surrogates has the potential to impact and affect accessibility and the way that scholars work

[254] Digital Collections <https://www.library.universiteitleiden.nl/search-tools/digital-special-collections> (Accessed July 7, 2018).
[255] This is the case of Trinity College Dublin.
[256] N. Stroker, R. Vogels, *Survey Report on Digitization in European Cultural Heritage Institutions*, Zoetermeer: Panteia (2014) pp. 1-54.

with medieval manuscripts. While digitization has the potential to enhance access and dissemination of intellectual content for those who might not be able to access the physical object for preservation reasons, on the other hand, it may also diminish the need for physical consultation. Users are more and more satisfied with the digital object because its immediate online accessibility alleviates many of the hurdles and barriers which hinder physical consultation. Although developments in digital technologies are not yet so advanced as to create surrogates which are able to replace their originals, it is clear that tendency of heritage institutions to prioritize online accessibility and to facilitate content digitization will be responsible for any intentional and unintentional consequences.

27 years ago, the former founding Director of Rare Book School and Honorary Curator of Special Collections at University of Virginia, Terry Belanger, predicted some of the effects of this 'cheap and ubiquitous' technology on the future of rare books. In 1991, universities were already under every kind of pressure to convert their material into machine readable form. According to him, this rapid change was, and is still, driven by the incapability of university libraries to afford the incredible costs of maintaining all their collections, which require separate cataloguing, physical preparation, separate housing, separate housekeeping, and preservation procedures and separate access conventions.[257] He predicted that digitization will have an enormous impact on the future of rare book libraries. The increasing availability of rare books reformatted in the electronic form and their incredible success among users will make institution question the maintenance of physical items, leading to potential repercussions for conservation strategies. Today, Dr Karin Scheper, manuscript conservator at Leiden University Library, share the same concern. Even though she believes that "digitization as a means of dissemination of the intellectual content is a blessing",[258] it may also raise questions about the necessity to preserve and ensure accessibility of manuscripts when digital formats are available.[259]

The specific cases of the three university libraries above, testify how rapidly electronic access is replacing most uses of manuscripts. The use of digital surrogates is replacing the use of physical artefacts, even though digital images cannot supply the materiality of the item they represent. Access to physical volumes is denied even to experts who are instead encouraged to

[257] The 1991 Malkin Lecture of Terry Belanger *The Future of Rare Book Libraries* is available at <https://soundcloud.com/rarebookschool/belanger-terry-the-future-of-rare-book-libraries-16-december-1991> (Accessed July 8, 2018).
[258] K. Scheper (2014), p. 12.
[259] During a meeting, Dr Scheper also lamented that libraries are shifting sources destined for the preservation and conservation of physical collections to the preservation and access of digital surrogates.

use digital copies. The need to consult the original item is diminished precisely because users are presented with the opportunity to use digital facsimiles over the globe at any time of day. At the same time, heritage institutions prioritize 'controlled' access in public exhibition environments where manuscripts are placed in darkened display cases, making items unavailable for research purposes. These manuscripts sources are invaluable for scholars and gaining access to them is extremely important for acquiring information about date, provenance, creation, previous use and function, none of which can be supplied by a digital image. While the ability of digitization to increase remote access to manuscripts gave scholars and students a wider variety of material to freely consult online, it also resulted in an alteration of daily practice as the need to consult unique items has declined or is increasingly denied. This can be detrimental to the study of the manuscripts' physical form because as technology advances, access to the materiality of the codex will continue to diminish and we will experience a more definitive shift from visceral to virtual engagement with medieval manuscripts.[260]

[260] 3 J. E. B. Burns, 'Digital Facsimiles and the Modern Viewer: Medieval Manuscripts and Archival Practice in the Age of New Media' in *Art Documentation: Journal of the Art Libraries Society of North America*, Vol. 33, No. 2 (2014), p. 157.

Conclusion

The emergence of the internet as a ubiquitous, global source of information and the advent of digital media has converted cultural objects into digital collection databases capable of enhancing visibility and accessibility of a greater number of historical material to more people from all over the world than ever before. Digitization for preservation purposes is slowly gaining recognition. In addition to bringing many benefits such as free availability of digitized rare books and bringing students and the general public closer to heritage artifacts, the creation of digital surrogates has become part of libraries' and museums' preservation strategies. As Clifford Lynch pointed out, "digitization is one of the best forms of insurance we have; it is not a replacement for the physical objects, but increasingly a good (albeit not perfect) surrogate that at least preserves the content".[261] In fact, digitization offers an opportunity to capture the content of valuable and damaged material and virtually stop its deterioration in order to ensure that the culture and knowledge contained within the fragile, organic materials will still be viewable to future generations. At the very beginning of this discussion it was asked how digitization affects the study of materiality of the medieval book. In the attempt to explore the role of digital facsimiles in the interpretation of the physical object I analyzed the effects that the online consultation of digital copies may have on scholarly research. As noted in chapter 2, the potential consequence of the transformation of the medieval book from a physical object into a digital copy can be the loss of information quality. Generalized and sometimes inaccurate digital descriptions of manuscripts and human error can generate replicas which are far from faithful reproductions of original items. Despite the unquestionable utility and the several advantages and functionalities of digital images, we should remember that, "in even the most perfect reproduction, one thing is lacking: the here and now of the work of art–its unique existence at the place at which it is to be found. The history to which the work of art had been subjected as it persists over time occurs in regard to this unique existence–and to nothing else".[262] Manuscripts are unique objects and the information conveyed by their physical properties (weight, colour, thickness, materials, smell and other properties) are suppressed when presented on screen. Digital manuscripts cannot represent or be substitute for original artifacts. Scholars cannot completely trust digital surrogates and base their judgements solely on virtual images. The digital environment raises a series of questions regarding the authenticity

[261] Mass Digitization: Implications for Information Policy: Report from "Scholarship and Libraries in Transition: A Dialogue about the Impacts of Mass Digitization Projects", Ann Arbor, Michigan (2006). p. 15. <https://permanent.access.gpo.gov/lps86366/MassDigitizationSymposium-Report.pdf?> (Accessed July 10, 2018).
[262] W. Benjamin (2010) p. 13.

of digital information. Digital objects are not accurate portraits of physical objects and users must understand that the most effective way to best exploit this technology is to combine digital services with the physical consultation of artifacts.

Being free accessibility of digital facsimiles one of the major outcomes and advantages of digitization, I have also evaluated the consequences of free virtual access on the physical examination of artefacts. Given the proliferation of digital resources and the greater access to reproductions of manuscripts, the proper mode of viewing and access to originals has gradually been superseded. Institutions give priority to public exhibition access over the access of the scholar, to the detriment of the study of the manuscript itself. The medieval manuscript as a physical object is a carrier of information and its materiality and physical features not only offer valuable information about the book itself, but also, through tactile experience, provide a sensory engagement with the historical past. With the advancement in technology, access to the materiality of the codex will continue to diminish and we will experience a more definitive shift from physical to virtual engagement with manuscripts, resulting in a loss of 'aura' and the ability to distinguish between the real and the copy.

While this thesis has focused on the potential shortcomings of the digitization and the effects of virtual representation on the study of materiality of the medieval book through the discussion of a few cases studies, it is important to note that it is not a comprehensive evaluation of the digital technology. The aim of this discussion has been to raise issues of digital representation within the study of the medieval book and to consider how manuscripts are handled and displayed by heritage institutions in the digital era. This is not to suggest that we should condemn the technological progress and try to transcribe, study and understand medieval manuscripts without the benefits of the functionalities of the digital object. The rapid advancement of the digital medium applied to manuscript studies has not only provided a solution to the problem of access and conservation but has also contributed to defining issues which need to be tackled by non-invasive technologies. As has been shown in chapter 1, digital images can be manipulated, altered, and reconstructed by advanced technology and sophisticated tools in order to address different problems. Digital imaging technology and text recognition tools proved to be an effective form of support for scholars, allowing users to jump over several hurdles, such as time-consuming text transcription practices and the visualization and analysis of erased or damaged texts. The proliferation of digital resources has provided greater access to reproductions of manuscripts, thus reducing previous limitations on viewing these artefacts and ensuring that digital tools are useful aids for improving researcher's' experience working with digital manuscripts. As we have seen, the use of powerful technologies

combined with digital formats give scholars new means to explore and investigate historical artefacts. The use of the densitometer in Kathryn Rudy's study was decisive in revealing the intensity of the use and handling of books. However, palaeographers and codicologists should be also aware of the limits and deficiencies of this technology and ensure that they understand what the digital copy of a manuscript cannot provide.

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