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Modelling the Middle Dutch Prayer Book (c. 1380–1550)

The PRAYER Data Model for Manuscripts and Early Printed Books

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Abstract

Prayer books – handwritten and printed – form the largest corpus of books in Middle Dutch. Hitherto, the size of and variety within the corpus was viewed as a barrier for research. The ERC Starting Grant project 'Pages of Prayer' takes advantage of exactly these features of the corpus to research the full ecosystem of Middle Dutch prayer books (c. 1380–1550) by studying all features of these books – from texts and decorations to producers and owners – in their mutual interdependence. This article presents the conceptual data model that forms the foundation of the project's methodological approach. After introducing the project's aims, this custom-made data model is discussed. The final section reflects on the practical realization of the data model as it was implemented in the data management system *Heurist* and discusses how we try to facilitate the reuse of the dataset and database by conforming to FAIR-principles.

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Keywords

books of hours – prayer books – manuscript and print – digital humanities – data modelling

Introduction

Many modern studies of manuscripts and printed books have benefitted greatly from computational databases.[1] Yet, the conceptual data modelling that, in fact, largely defines our view of the material on which data are gathered, as well as the possibilities for research and analysis, often remain implicit.[2] The study and analysis of Middle Dutch prayer books – handwritten as well as printed – on a large scale and from a multi-facetted perspective, requires a data model specifically designed for this purpose. Such a data model was created as part of the ERC Starting Grant research project 'Pages of Prayer. The Ecosystem of Vernacular Prayer Books in the Late Medieval Low Countries, c. 1380–1550 [PRAYER]' that takes on the task of charting the largest extant corpus of books in Middle Dutch, and the various relationships within that corpus, with the aim to grasp the role (or roles) of vernacular prayer books in late medieval Netherlandish culture and society.[3]

To reach such an understanding, the data model presents a holistic method for examining handwritten and printed books up to c. 1550 that aims to expand epistemological boundaries in several domains of manuscript and book studies. The data model considers the tiered genesis of the books, their material and visual features, including their lay-out, decoration and the presence of pictorial images, their textual contents, as well as the historical contexts of both their production and reception. This allows us to chart, map and visualise the relationships between these books and, eventually, better understand their complexity. The data model thus forms the very foundation of the project's

1 We wish to thank Peter Verhaar (Leiden University Libraries Centre for Digital Scholarship) for his invaluable input in the process of data modelling and Irene O'Daly and Wim van Anrooij (Leiden University) for their suggestions and careful reading of earlier versions of the text. The anonymous reviewers provided valuable additions to the model's theoretical framework.

2 An exception that was inspirational to the present contribution is Claire Battershill et al. (eds.), *Scholarly Adventures in Digital Humanities. Making the Modernist Archives Publishing Project* (Cham: Palgrave Macmillan, 2017), esp. pp. 76–87.

3 The project has received funding from the European Research Council (ERC) (Grant agreement No. 101041517) and runs from 2023–2028 at Leiden University.

methodological approach. Both the data model and methodological approach are useful beyond the specific focus on prayer books in the present project and can potentially be applied to any research projects in the field of manuscript studies and book history that deals with the selection and arrangement of a large variety of texts and images in a large corpus of books.

Before introducing the data model, we first discuss the project, its background, approach, set-up, and aims. The PRAYER data model is then discussed in tandem with the characteristics of the corpus studied within the project, its associated challenges, and the ways in which the modelling attempts to engage with them. We focus primarily on the way relationship(s) between the different types of data are modelled and point to the choices made regarding the selection of the aspects to be included (or excluded). Specific attention is also paid to the difficulties posed by the decision to include both manuscripts and printed books in the research project and hence within the database *and* the conceptual data model. Where relevant, other databases that served as inspiration in the latter's construction are involved in this discussion. Mirroring the stages within the working process, the third and final section, then, is devoted to the implementation of the data model in a database management system, *Heurist*.[4] This section includes a reflection on the ways in which we apply universal standards to our data and ensure that they conform to the FAIR data principles, meaning that they are findable, accessible, interoperable, and reusable.

Since the database will be used intensively over the course of the project – and hopefully will continue to be used after the conclusion of the project – small changes will undoubtedly be applied, and the data model presented here will hence remain a living organism and dynamic resource. This contribution therefore serves first and foremost to document the groundwork developed within the PRAYER project that functions as the basis for both the database (that over time will become publicly accessible) and the new approach to Middle Dutch prayer books it aims to develop.

Research Context and Aims

Prayer books form by far the largest corpus of books in Middle Dutch. At the same time, these books have received the least attention from scholars working on Middle Dutch literature. Even though the field of Middle Dutch literature has significantly broadened, prayer literature has remained a neglected child.[5]

4 *Heurist*, https://heuristnetwork.org/, last accessed 4 December 2023.

5 So far, only rhymed prayers have been studied intensively: Johan Oosterman, *De gratie van het*

The study of prayer literature in neighbouring countries, for example in Germanic studies, is much further developed.[6] Yet, it is precisely the understudied Middle Dutch corpus that is unique and unprecedented at a European level in its scope and abundance. It therefore forms a rich source that can potentially reveal telling insights into textual culture and prayer practice of the late medieval period – without more knowledge of the Middle Dutch corpus we cannot fully understand late medieval prayer culture nor Middle Dutch textual culture.[7] The mainstay of the corpus consists of books with the translation (or translations) from circa 1383/4 of several Hours, the Penitential Psalms, Litany, and Vigil into Middle Dutch ascribed to Geert Grote (d. 1384), the initiator of the Devotio Moderna. Estimates of extant manuscripts with 'Grote's Books of Hours' range from 800 to over 2000.[8] Additionally, from 1480 until the middle of the sixteenth century at least forty-five editions were issued by printers in the northern and southern Low Countries, and in the sixteenth century primarily in Paris.[9]

Even though Grote's authorship of the most widespread translation of the Hours is generally accepted, it is important to stress that the attribution to Grote is, in fact, still a hypothesis.[10] Hitherto, the translation ascribed to Grote

gebed. Overlevering en functie van Middelnederlandse berijmde gebeden, 2 vols. (Amsterdam: Prometheus, 1995).

6 See, e.g., Stefan Matter, *Tagzeitentexte des Mittelalters. Untersuchungen und Texte zur deutschen Gebetbuchliteratur* (Berlin: De Gruyter, 2021), and Jeffrey F. Hamburger and Nigel F. Palmer, *The Prayer Book of Ursula Begerin* (Dietikon-Zurich: Urs Graf Verlag, 2015). The special issue 'Medialität und Praxis des Gebets', eds. Mirko Breitenstein and Christian Schmidt, *Das Mittelalter* 24.2 (2019), advocates an engaging, interdisciplinary approach to prayer.

7 On the latter cf. Youri Desplenter, 'The Latin Liturgical Song Subtitled. Middle Dutch Translations of Hymns and Sequences', *Church History and Religious Culture* 88 (2008), pp. 395–413, p. 401.

8 The differences between the estimates likely result from the fact that they have been proposed by individual scholars working in different areas and handling criteria differently: R.Th.M. van Dijk, 'Het getijdenboek van Geert Grote. Terugblik en vooruitzicht', *Ons Geestelijk Erf* 64 (1990), pp. 156–94, p. 161.

9 These numbers are based on a survey of the *Incunabula Short Title Catalogue*, https://data.cerl.org/istc, last accessed 4 December 2023, the *Universal Short Title Catalogue*, https://www.ustc.ac.uk, last accessed 4 December 2023, and W. Nijhoff and M.E. Kronenberg, *Nederlandsche bibliographie van 1500 tot 1540*, 2 vols. with supplements (The Hague: Martinus Nijhoff), pp. 1923–71.

10 Discussed in Youri Desplenter, 'Psaltervertalingen van de moderne devotie (ca. 1380–ca. 1520)', in *De Bijbel in de Lage Landen. Elf eeuwen van vertalen*, eds. Paul Gillaerst et al. (Heerenveen: Royal Jongbloed, 2015), pp. 151–76, pp. 151–3. The translation ascribed to Grote is not the only nor the earliest translation: see Youri Desplenter, 'De oudste Mariagetijden in het Nederlands. Editie van de tekst in handschrift St.-Petersburg, Biblioteka Akademii', *Ons Geestelijk Erf* 91 (2020), pp. 3–108.

has been regarded as a translation of a *book* (of hours), and it is customary to speak of 'the book of hours of Geert Grote', or for example 'das Grote-Stundenbuch'.[11] The profound influence of the modern edition by Nicolaas van Wijk, a linguist and slavicist, that appeared in 1940 and bears the title *The Book of Hours of Geert Grote*, is still palpable.[12] Based on several testimonies by his fifteenth-century biographers, the current consensus is that Grote translated the Calendar (for the use of Utrecht), the Hours of the Virgin, the Hours of the Holy Spirit, the Short Hours of the Holy Cross, the Hours of the Eternal Wisdom, the Long Hours of the Holy Cross, the seven Penitential Psalms, the Litany of All Saints, and the Vigil of the Dead.[13] However, even though these texts were likely translated by Grote, they were not necessarily composed as a *unitary book* and/or translated in one go, as van Wijk's edition and its title suggest.[14] Each of Grote's biographers, who were all linked to the Devotio Moderna, mention one or more texts, *not* a book of hours. The list cited above is a compilation based on all the testimonies taken together: the Hours of the Eternal Wisdom are, for example, only mentioned by Johannes Busch, while Thomas a Kempis mentions the Hours of the Virgin and several other Hours.[15] Moreover, the prologue at the beginning of the Marian Hours, which outlines the translation principles – which are indeed similar to Grote's other works – only concerns the Hours of the Virgin.[16] It is therefore justified to consider the

11 E.g. G. Achten and Eva Bliembach, *Das christliche Gebetbuch im Mittelalter. Andachts- und Stundenbücher in Handschrift und Frühdruck* (Berlin: Staatsbibliothek Preussischer Kulturbesitz, 1987), p. 32.

12 N. van Wijk, *Het getijdenboek van Geert Grote; naar het Haagse handschrift 133 E 21* (Leiden: Brill, 1940).

13 Most recent discussion in Youri Desplenter, 'Het getijdengebed in het Nederlands', in *De Moderne Devotie. Spiritualiteit en cultuur vanaf de late Middeleeuwen*, eds. Anna Dlabačová and Rijcklof Hofman (Zwolle: WBooks, 2018), 92–5.

14 Cf. R.Th.M. van Dijk, 'Methodologische kanttekeningen bij het onderzoek van getijdenboeken', in *Boeken voor de eeuwigheid. Middelnederlands geestelijk proza*, ed. Th. Mertens (Amsterdam: Prometheus, 1993), pp. 210–29 and pp. 434–4, p. 216: 'Geert Grote heeft de verschillende getijden die hij in zijn Latijnse voorbeelden aantrof, niet zonder meer successievelijk vertaald' [Geert Grote did not necessarily translate the different Hours he found in his Latin examples in succession].

15 Van Dijk, 'Methodologische kanttekeningen', p. 225; Anne S. Korteweg, 'Books of Hours from the Northern Netherlands Reconsidered. The Uses of Utrecht and Windesheim and Geert Grote's Role as a Translator', in *Books of Hours Reconsidered*, eds. Sandra Hindman and James H. Marrow (London: Harvey Miller Publishers, 2013), pp. 235–61, esp. 250–4 on the Hours of the Virgin.

16 Van Dijk, 'Methodologische kanttekeningen', pp. 216–17. The glosses, especially one with a Deventer character in the Vigil of the Dead (Ps. 41), have also been viewed as important

texts listed above as, in essence, individual pieces, which is indeed how they are approached in the PRAYER data model: as a set of texts that themselves show variation and that is subject to processes of selection and arrangement and that can be combined with a large variety of other texts.

Differences in the composition of this 'book of hours' (in the selection and order of the texts from 'Grote's' translation), as well as the fact that many other individual prayers were transmitted in the very same manuscripts, has been widely acknowledged. The study by Rudolf van Dijk, in which he devised a system of 'fingerprints' to assess the different orders in which the texts in 'Grote's book of hours' appear in manuscripts, is of particular importance here.[17] The ultimate aim of Van Dijk's research efforts in the 1980s/90s, however, was to prepare a critical edition of 'Grote's book of hours' that would replace van Wijk's diplomatic one, and consequently to uncover the original text and order in which the textual components appeared in Grote's translation.[18] Due to immense editing issues, this edition never came to fruition. The lack of a critical edition of 'Grote's book of hours' that 'meets modern scholarly standards', as well the near Sisyphus-like nature of such an undertaking, is still lamented, for example in the most recent (2013) history of Dutch literature of the fourteenth century by Frits van Oostrom.[19] Such a critical edition may be a fascinating philological endeavour, but apart from the feasibility issues this quest to establish the translator's original text is far from the most pressing and appropriate question that the corpus, in all its variety, can help us to answer. It is also questionable whether such an edition would keep the implicit promise it holds and truly lead to an increased study and a better understanding of the texts. Moreover, the fascination with Grote's 'translatorship' seems to be a phenomenon of modern scholarship rather than a medieval affair.[20]

The impact of van Wijk's edition did not only lead to a view of Grote's translations of the Hours as a unitary book. The individual texts included in the edition appear to have come to be viewed – falsely – as standard and representative of all manuscripts.[21] Indeed, one more Hours text can likely be added to the texts

indications of Grote's translatorship: e.g., Van Dijk, 'Het getijdenboek van Geert Grote', p. 171–2.

17 Van Dijk, 'Methodologische kanttekeningen'.

18 Van Dijk, 'Het getijdenboek van Geert Grote'.

19 Frits van Oostrom, *Wereld in Woorden. Geschiedenis van de Nederlandse literatuur 1300–1400* (Amsterdam: Prometheus, 2013), p. 492.

20 Only a single, now lost manuscript (from 1398) mentioned Grote as the translator, and not of the Hours, but of the Vigil. See Desplenter, 'Psaltervertalingen van de moderne devotie', p. 153.

21 Already pointed out by Youri Desplenter, 'Lofzangen *overghesedt en gheprent*. Van *Die*

included by van Wijk: the Long Hours of the Holy Spirit. As with the Hours of the Cross, the Hours of the Holy Spirit circulated in a long and short form.[22] The existence of this text is relatively well-known, but few studies systematically distinguish between the two texts. A positive exception is Wierda's work on the Sarijs manuscripts.[23] On the other hand, in their inventory of Middle Dutch manuscripts held at the Royal Library in Brussels, Jan Deschamps and Herman Mulder chose to consciously neglect the difference between the Hours of the Holy Spirit (as edited by van Wijk) and the Long Hours of the Holy Spirit.[24] Nevertheless, the preparatory volumes for a catalogue of Middle Dutch manuscripts held at the KBR, in which Deschamps and Mulder have identified over 300 prayer texts often for the first time, was a major milestone towards describing the textual components of prayer books written in Middle Dutch more precisely and hence improving the disclosure of their contents.[25] This activity clearly built on older initiatives, particularly the *Bibliotheca Neerlandica Manuscripta*, set up at the beginning of the twentieth century by the Flemish philologist and palaeographer Willem De Vreese (1869–1938) and the seminal study of prayer books in the Dutch vernacular by Maria Meertens (1901–1953).[26]

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duytsche souter (1480) tot Sailly's *Verscheyden Litanien* (1595)', *Trajecta* 16 (2007), pp. 5–29, pp. 10–13.

22 A.J. Geurt et al. (eds.), *Moderne Devotie. Figuren en Facetten* (Nijmegen: Katholieke Universiteit, 1984), cat. no. 24 (pp. 100–3). Van Dijk, 'Het getijdenboek van Geert Grote', p. 166. L. Wierda, *De Sarijs-handschriften. Laat-middeleeuwse handschriften uit de IJsselstreek* (Zwolle: Waanders, 1995), p. 49.

23 Wierda, *De Sarijs-handschriften*.

24 Jan Deschamps and Herman Mulder, *Inventaris van de Middelnederlandse handschriften van de Koninklijke Bibliotheek van België*, vol. 15 (Brussel: Koninklijke Bibliotheek van België KBR, 2013), p. 114 (G152): 'Van de Getijden van de H. Geest (vertaling Geert Grote) lijkt een lange en een korte versie te bestaan […] Wij laten deze kwestie rusten en noemen beide versies "Getijden van de H. Geest"'. [There seems to be a long and a short version of the Hours of the Holy Spirit (translation Geert Grote) […] We will let this matter rest and call both versions 'Hours of the Holy Spirit'.]

25 Deschamps and Mulder, *Inventaris van de Middelnederlandse handschriften*. They exclude prayers to saints and prayers in verse. The latter have been inventoried in Oosterman, *De gratie van het gebed*, vol. 2. G. Achten and H. Knaus, *Deutsche und Niederländische Gebetbuchhandschriften* (Darmstadt: Eduard Roether Verlag, 1959), with an 'Initienregister' (pp. 337–94) was also leading in opening up prayer books. See also G. Achten, 'De ontsluiting van het Middelnederlandse getijden- en gebedenboek', in *Ontsluiting van middeleeuwse handschriften in de Nederlanden. Verslag van studiedagen gehouden te Nijmegen, 30–31 maart 1984*, ed. A.J. Geurts (Nijmegen: Alfa, 1987), pp. 71–5.

26 De Vreese's detailed descriptions in the *BNM* were already helpful in Van Wijk's selection of manuscripts (with prologues to the Marian Hours and the Vigil of the Dead and glosses) for his edition: Van Wijk, *Het getijdenboek van Geert Grote*, pp. 10–19 and Van Dijk, 'Het

The PRAYER project aims to move the more precise description of nuances in the content of prayer books further. To reach a fair assessment of the dissemination of the texts, it is not only imperative to distinguish between different texts – as in the case just discussed. Significant variants or versions of texts, that sometimes appear to have been highly influential, must be considered as well. Often these variants have been signalled in individual studies or editions of specific manuscript prayer books, but then ignored in subsequent research. A case in point are the Short Hours of the Cross with its different collects or prayers, as well as a revised version of the Hours of the Holy Spirit.[27]

The PRAYER project ultimately aims to develop an approach that works *with* the corpus instead of against the corpus. The project does not view the translation of the Hours ascribed to Geert Grote as a unitary book nor as a single text made up of components, but rather as a set of related, yet in principle independent, prayer texts. This view also fits better with the physical nature of handwritten and printed prayer books that could result from a production process in which texts were produced as separate units in one or – more often – more gatherings.[28] Kathryn Rudy coined the term 'modular' for manuscripts created in this way.[29]

The ways in which relationships between texts are defined in the project is inspired by various approaches concerned with studying texts in their manuscript context. The most notable influence is that of new (or material) philology, that emphasizes the 'artificiality' of reading medieval texts in modern editions and stressed the importance of the study of medieval texts in their manuscript setting or context.[30] In medievalist Germanistics the less theoretically oriented 'research paradigm' of the 'Transmission history' – *Überliefe-*

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getijdenboek van Geert Grote', p. 172. The digital database is available via https://bnm-i.huygens.knaw.nl/, last accessed 4 December 2023. Maria Meertens, *De godsvrucht in de Nederlanden: naar handschriften van gebedenboeken der XVe eeuw*, 4 vols. (Antwerpen: Standaard, 1930–1934).

27 For the latter, see Geurts, *Moderne Devotie*, cat. no. 24, p. 101. The variant of the Short Hours of the Holy Cross was signalled in L. Indestege, *Een Diets gebedenboek uit het begin der zestiende eeuw* (Gent: Koninklijke Vlaamse Academie voor taal- en letterkunde, 1961), pp. 18–22 and J. Reynaert, *Catalogus van de Middelnederlandse handschriften in de bibliotheek van de Rijksuniversiteit te Gent* (Gent: Universa, 1984), hs. I 205. Van Dijk, 'Methodologische kanttekeningen', pp. 228–9, also presents preliminary research results regarding variations in the Litany.

28 L.M.J. Delaissé, 'The Importance of Books of Hours for the History of the Medieval Book', in *Gatherings in Honor of Dorothy E. Miner*, eds. Ursula E. MacCracken, Lilian M.C. Randall and Dorothy Eugenia Miner (Baltimore: Walters Art Gallery, 1974), pp. 202–25, pp. 212–5.

29 Kathryn M. Rudy, *Piety in Pieces. How Medieval Readers Customized their Manuscripts* (Cambridge: Open Book, 2016), pp. 15–57.

30 Stephen G. Nichols ed., *The New Philology*, Special issue of *Speculum* 65 (1990), pp. 1–108.

rungsgeschichte – similarly calls for a context and reader-oriented approach. *Überlieferungsgeschichte* was originally developed in the 1970s with a focus on late medieval German religious prose texts, long before material philology, but diversified over the years.[31] It is important to point out, however, that the acknowledgement of the manuscript context is not exclusive to studies of religious literature nor to the late medieval period. The nature of late medieval manuscripts stems from a long development reaching back to antiquity.[32] The increasing attention paid to miscellanies, multi-text or multiple-text manuscripts and their implications for understanding late medieval textual culture, has repeatedly brought forward the view that miscellanies are more than simply the sum of their texts.[33] In the field of Middle Dutch literature, similar insights led to the publication of a series of editions of multiple-text manuscripts from the 1990s onward.[34] The underlying idea of such a project, however, i.e., to select miscellanies that are deserving of such a special treatment as to be edited, is impracticable for prayer books; the selection of codices which could be regarded as representative poses insurmountable difficulties while producing an edition of all individual manuscripts is unachievable.[35]

In the typology of multiple-text manuscripts proposed by Brita and Karolewski, prayer books can be primarily considered 'intertwined' multiple-

31 Freimut Löser, 'Überlieferungsgeschichte(n) schreiben', in *Überlieferungsgeschichte transdisziplinär. Neue Perspektiven auf ein germanistisches Forschungsparadigma*, eds. Dorothea Klein, Horst Brunner and Freimut Löser (Wiesbaden: Reichert, 2016), pp. 1–20. Kurt Ruh and Hans-Jürgen Stahl (eds.), *Überlieferungsgeschichtliche Prosaforschung. Beiträge der Würzburger Forschergruppe zu Methode und Auswertung* (Tübingen: Niemeyer, 1985).

32 See, e.g., Armando Petrucci, 'From Unitary Book to Miscellany', in *Writers and Readers in Medieval Italy. Studies in the History of Written Culture*, by Armando Petrucci, ed. and trans. Charles M. Radding (New Haven: Yale University Press, 1995), pp. 15–42.

33 E.g. Lucie Doležalová and Kimberly Rivers (eds.), *Medieval Manuscript Miscellanies. Composition, Authorship, Use* (Krems: Institut für Realienkunde des Mittelalters und der frühen Neuzeit, 2013). Sabrina Corbellini, Giovanna Murano and Giacomo Signore (eds.), *Collecting, Organizing and Transmitting Knowledge. Miscellanies in Late Medieval Europe* (Turnhout: Brepols, 2018).

34 The series 'Middeleeuwse verzamelhandschriften uit de Nederlanden (MVN)' was published by Verloren. The editorial guidelines are outlined in Th. Mertens (ed.), *Richtlijnen voor de uitgave van Middeleeuwse Verzamelhandschriften uit de Nederlanden* (Hilversum: Verloren, 1994).

35 This does not mean to say, of course, that editions of individual manuscripts are not useful. Several editions of this kind have appeared in the past, and they have proven invaluable for the identification of prayer texts: e.g., K. De Gheldere, *Ghetiden Boec naar een handschrift der XVe eeuw* (Gent: Siffer, 1893); F. Prims, *Een Limburgsch Gebedenboek uit de XVe eeuw* (Dendermonde: Bracke-Van Geert, 1926); Indestege, *Een Diets gebedenboek*.

text manuscripts, i.e., 'manuscripts transmitting two or more texts that are related with respect to content'.[36] Although this typology is limited to manuscripts, printed prayer books can be considered to fall in the same category of multiple-text *books*. The dynamics of multi-text manuscripts continue to be relevant after the introduction of the printing press: not only because printed books/gatherings can be integrated in *Sammelbände*, but also because printers published books that were designed to be bound together and books that can also be categorised as multi-text volumes.[37] Mapping the 'life' of a group of related texts within such books, without initially positioning one of them at the core,[38] is a challenge in which computational methods can be particularly helpful. Recently, Gustavo Fernandez Riva has applied network analysis and visualisation to create a network of shared manuscript transmission based on data on German-language manuscripts derived from the *Handschriftencensus*.[39] Considering prayer books as multiple-text books in the PRAYER project will eventually allow for similar types of analyses, showing patterns in the formation of groups or clusters of texts. Approaching prayer books as multiple-text books and differentiating between significant variants in the translations ascribed to Geert Grote also further complicates the use of a hypernym such as prayer book, devotional book, or book of hours, which is still current practice.[40]

The overall aim of the project, however, is to grasp the role of the books in which the texts translated by Grote are included *within* the religious and cultural landscape that sustained their popularity.[41] Therefore, the project maps

36 Antonella Brita and Janina Karolewski, 'Unravelling Multiple-Text Manuscripts: Introducing Categories Based on Content, Use, and Production', in *Exploring Written Artefacts. Objects, Methods, and Concepts*, ed. Jörg B. Quenzer (Berlin, Boston: De Gruyter, 2021), pp. 459–90.

37 Anna Dlabačová, 'The Fifteenth-Century Book as a "Work in Progress". The Dynamics of Dissection and Compilation in the Workshop of Gerard Leeu (d. 1492)', *Gutenberg Jahrbuch* 97 (2022), pp. 70–92. For *Sammelbände* in general, see the project run by Malcolm Walsby et al., *Sammelband 15–16*, https://sammelband.hypotheses.org/author/histoire livre, last accessed 4 December 2023.

38 Which would lead to a study such as José van Aelst, *Vruchten van de Passie. De laatmiddeleeuwse passieliteratuur verkend aan de hand van Suso's Honderd artikelen* (Hilversum: Verloren, 2011).

39 Fernandez Riva, 'Network Analysis of Medieval Manuscript Transmission', *Journal of Historical Network Research* 3(1) (2019), pp. 30–49. https://doi.org/10.25517/jhnr.v3i1.61.

40 The latter is still used for Middle Dutch prayer books by for example e-codices NL, https://ecodices.nl/, last accessed 4 December 2023.

41 This means that the project widens the scope even further and does not only consider books regarded as 'books of hours' (books with the Hours of the Virgin, Penitential

not only the relationships created between the texts through their shared material dissemination, but also their relations to other entities, for instance images, as well as their relationships to actors. The underlying idea, based on Bruno Latour's principle of generalized symmetry and Actor Network Theory (ANT), is that both human and non-humans actors play a role in the social network built around prayer books.[42] The cultural ecosystem surrounding prayer books ought to be viewed as an dynamic assembly resulting from a wide range of interactions between the book themselves, the images disseminated alongside the texts, the devotions connected to the texts, the producers of the books (scribes, printers, patrons), the centres they were part of (religious communities or secular workshops), the buyers and readers, the groups and communities they belonged to (again religious communities or for example confraternities) or places where they lived. These entities all form nodes within the network that we aim to survey and to analyse in the initial, exploratory phase of the project.[43] Because of this inclusion of non-human actors such as actual objects (e.g., books) and more abstract notions (e.g., devotions or communities), the network is better understood as an 'ecosystem' rather than a traditional social network. It was within this ecosystem that the Middle Dutch prayer book, as a new species, reached the heights of its popularity and thrived until well into the sixteenth century.

More specifically, the questions we aim to preliminarily answer during the exploratory phase concern the function of and the relationship between texts and between texts and images, the position of production centres and the impact of the printing press. How does the corpus of texts grow and/or diversify over time? Did certain texts form groups that were transmitted together as a cluster? Which texts were transmitted together most frequently? Can the presence of a certain text be regarded as an indication for the presence of (an) other text(s)? Do clusters of texts interact, or do they have shared characteristics? Does the order of the texts change over time, and how flexible is the order of texts? Can we point to texts that were always/never accompan-

Psalms, and the Vigil of the Dead), but any book with one of the hours in the translation ascribed to Geert Grote. Hence the use of the more general term 'prayer book' in the title of the project. Achten, 'De ontsluiting van het Middelnederlandse getijden- en gebedenboek', p. 71, already noted that books of hours and prayer books must be treated together.

42 Bruno Latour, *Reassembling the Social. An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005).

43 Cf. Klaus Grubmüller, 'Überlieferung', in *Reallexikon der deutschen Literaturwissenschaft*, eds. Georg Braungart et al. (Berlin: De Gruyter, 2003), pp. 717–20, who describes most of these variables as part of the *Überlieferungsgeschichte*.

ied by an image? Were certain text-image combinations more frequent, and could certain texts be combined with different kinds of images? Where were the centres of manuscript prayer book production situated? Can we discern a specialization of certain production centres/regions? Did they produce books for a specific readership? Do the contents and lay out of prayer books change after the introduction of the printing press?

The data model presented below forms the basis of the project's database, and hence of the network analysis and visualisations that will be conducted after a significant amount of data has been acquired during the first phase of the project. Visualisations will for example show groupings of texts and common texts between clusters, they will group manuscripts with high similarities in content and in the order in which the texts appear in the books, visualise the increasing (or indeed) decreasing popularity of certain texts and related devotions, as well as patterns in books from specific production centres and in text-image combinations. The data model has been designed in a collaborative effort between Irene Van Eldere (PhD-candidate within the project), Anna Dlabačová (PI) and Peter Verhaar (senior researcher and specialist in computational approaches). Based on the explorative analysis outlined above, team members will pursue in-depth analyses of specific sections of the network during the second phase of the project: the role of centres of manuscript production, including any possible specialisations of certain production centres or regions, as well as the reception of the manuscripts (Irene Van Eldere); the joint circulation and reception of texts (clusters), the expansion of or changes within the corpus of texts over time (PhD-candidate Susanne de Jong); the function of images in relation to texts (post-doc, to be recruited); and the impact of the printing press on prayer books (Anna Dlabačová). This second analytical phase will be crucial to reach a meaningful interpretation of the data and the network visualisations.

The PRAYER Data Model

A large scale and long-term investigation of a specific yet large group of texts transmitted in different kinds of media requires a custom-made data model that defines the relationships between the various types of entities involved in the ecosystem and hence in the analysis. Data modelling is therefore a crucial step in the research. Not only is the corpus of Middle Dutch prayer books large, but, as already shown in the previous section, prayer books can also be described using a vast range of variables: information about the content and decoration, about codicological characteristics and about traces of production

and reception.[44] We captured these different types of data into one custom-built data model, which is discussed in this section. We list the entities our conceptual model consists of and clarify our decisions based on the nature of the material and the goals of the project described above. Firstly, we will explain the theory behind the key elements of the data model and describe the general considerations made during its designing process, taking into account the potentialities of the data model and database within the PRAYER project.

As discussed in the previous section, the PRAYER project researches prayer books as part of a cultural ecosystem. This ecosystem contains a wide range of interactions between the book themselves, the images disseminated alongside the texts, the devotions connected to the texts, the producers of the books, the centres, groups and communities they were part of, the buyers and readers of the books, and the places where they lived. Based on Bruno Latour's principle of generalized symmetry and Actor Network Theory (ANT), both human and non-human actors play a role in this ecosystem.[45] These entities form the nodes within the network that we aim to map in our conceptual data model. According to Flanders and Iannidis, a conceptual data model identifies and describes the entities and their relationships within a given domain, without any reference to the technical implementation of this model.[46] The conceptual model represents the essential aspects of the phenomena that are being studied at an abstract level. Our model was designed in the form of an Entity-Relationship diagram, following the notational conventions of Entity Relationship Modelling.[47] The conceptual model can be found as appendix A; a simplified version is presented in Fig. 1. Appendix B consists of a list with short explanations of all entities discussed below. As discussed in the previous section, the eventual PRAYER database is not only descriptive, but it also needs to enable us to perform network analyses and procure visualizations. These eventual analyses were taken into account during the designing process of the conceptual model,

44 Albert Derolez, 'Masters and Measures. A Codicological Approach to Books of Hours', in *Gatherings in Honor of Dorothy E. Miner*, eds. Ursula E. MacCracken, Lilian M.C. Randall and Dorothy Eugenia Miner (Baltimore: Walters Art Gallery, 1974), pp. 83–95, lists codicological characteristics of books of hours that can be quantified to research manuscript production.

45 Latour, *Reassembling the Social*.

46 Julia Flanders and Fotis Jannidis, 'Data Modelling', in *A New Companion to Digital Humanities*, eds. Susan Schreibman, Ray Siemens and John Unsworth (Newark: Wiley, 2023), pp. 229–38.

47 Peter Chen, 'Entity-Relationship Modeling. Historical Events, Future Trends, and Lessons Learned', in *Software pioneers*, eds. Manfred Broy and Ernst Denert (Berlin, Heidelberg: Springer-Verlag, 2002), pp. 296–310.

because they have implications for the ways quantitative and qualitative data have to be structured.[48]

The structure of the PRAYER data model has been informed by several existing databases.[49] This comparison between our data model and existing data models or databases was helpful when naming our entities, and also to determine which data the PRAYER model would in- or exclude. Keeping the feasibility of the project in mind, a balance had to be found between data that cannot be investigated in a quantitative sense but would be interesting for certain users and quantifiable data that would be useful for the eventual network analysis. Choices regarding the exclusion of data are as important as decisions on what to include.[50] Not only the structure but also the different ways in which data could be represented in the database were considered. For instance, the terminology to describe decoration (see below) is divided into multiple record fields, which is at first glance less accessible for a user, but is beneficial for PRAYER's network analysis. The paragraphs below will discuss all entities in the data model, and explain these in relation to the nature of manuscript and printed prayer books.

At the centre of the conceptual model is the entity 'Book', which describes the object as it has survived and could (potentially) be consulted in a reading room. The fields in the entity 'Book' allow for the inclusion of basic bibliographic information such as the shelf mark and the number of leaves. A link is made to the entity 'Institution' (the library, archive, or (private) collection that holds the book), and to the entity that describes the 'Binding'. This entity is only used when the medieval binding is still present. A link to the digitised copy of the book is included, if available.

48 In distinguishing the different steps in the development of the PRAYER project, we were inspired by Battershill et al., *Scholarly Adventures in Digital Humanities*, who describe developing a digital project within book history.

49 For references, see the discussion of the entities below.

50 Densitometer data to detect patterns of use (as done by, e.g., Kathryn M. Rudy, 'Dirty Books. Quantifying Patterns of Use in Medieval Manuscripts Using a Densitometer', *Journal of Historians of Netherlandish Art* 2.1–2 (2010). doi: 10.5092/jhna.2010.2.1.1), data about the thickness of the parchment or paper, information about the collation, and the description of watermarks have been left out of consideration in the current data model. It is also important to note that since the project focuses on the late medieval period (until circa 1550), any information that is post-sixteenth-century is omitted as well (except for, of course, the present location of the book).

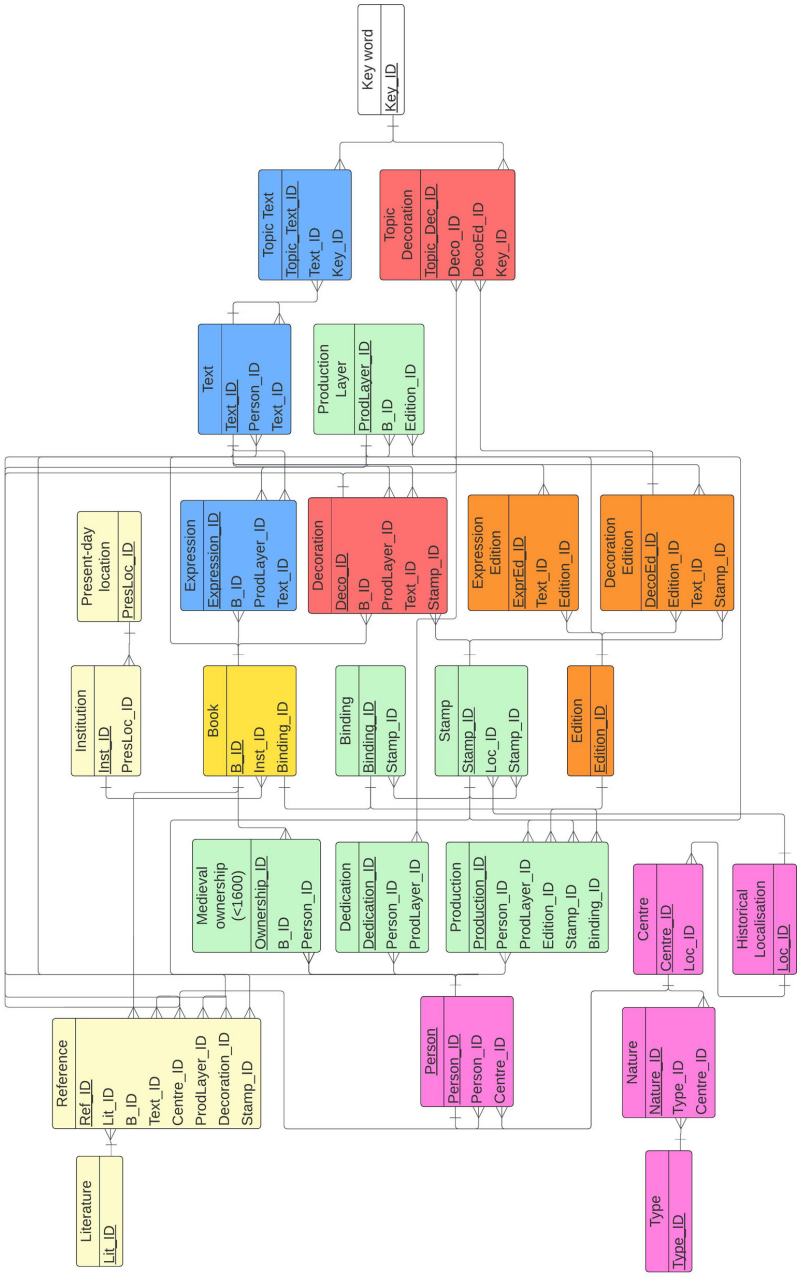


FIGURE 1 A simplified version of the conceptual data model, showing only the entities and relationships between entities. The central entity 'Book' is yellow, the entities that describe its current holding institution and the secondary literature are light yellow, the entities that are related to the book's production and ownership are green, the entities related to its localisation pink, the entities related to the texts blue, the entities related to the decoration red and the entities that are related to the edition of a printed book orange.

It is important to note that, in the PRAYER data model, information about manuscripts and printed books is marshalled within the same structure. Because of the project's attention to indications of the use and reception of prayer books, copy-specific information of printed books is given a prominent place in the data model in the entity 'Book'. The data model thus places the printed books on a par with manuscripts, and places the individual extant copies at the centre of the model in 'Book' rather than the edition, which is traditionally at the centre of the data model in databases such as ISTC (*Incunabula Short Title Catalogue*), STCN (*Short Title Catalogue Netherlands*), USTC (*Universal Short Title Catalogue*), and GW (*Gesamtkatalog der Wiegendrucke*).[51] Copy-specific information has increasingly gained the attention of researchers, and the relatively recently established database *Material Evidence in Incunabula database* (MEI) focuses exclusively on this type of evidence.[52] The information about the edition – information that, in principle, pertains to all individual copies (e.g., date and place of publication, and, of course, printer) in the data model is provided by three entities, namely 'Edition', 'Expression Edition' and 'Decoration Edition'.[53] 'Edition', 'Expression Edition' and 'Decoration Edition' help us distinguish the data that is entered for the individual copy – in which the owner could have for instance added other texts or decorations – from the content and decoration of the edition. In this way, we are able to study manuscript and print, as well as the transition between the two types of media, on a large scale without neglecting the peculiarities of both. Additionally, this way of modelling permits the incorporation of 'hybrid' books that contain both manuscript and print.

The entity 'Book' links to the entity 'Production layer', which describes the prayer book primarily from the perspective of its production, describing the (separate) production layer(s) within one 'Book'. This means that within one 'Production layer' all elements in the book that were made in the same production process are described. Each of the 'Production layers' is described in our data model by its locus in the book, its integrity, support, date of origin, number of columns and lines, the type and extent of the ruling, and the presence of rubrication, a colophon or music notation. Additionally, the average book

51 The *Incunabula Short Title Catalogue* (British Library), https://data.cerl.org/istc/, last accessed 4 December 2023; The *Universal Short Title Catalogue*, https://www.ustc.ac.uk/, last accessed 4 December 2023; The *Short-Title Catalogue Netherlands*, https://data.cerl.org/stcn/, last accessed 4 December 2023 and the *Gesamtkatalog der Wiegendrucke*, https://www.gesamtkatalogderwiegendrucke.de/, last accessed 4 December 2023. These catalogues generally only collect a list of shelf marks under 'known copies' or 'holdings'.

52 MEI is now integrated into ISTC.

53 This information can be found in ISTC, STCN, USTC, and GW.

block and text space height and width in the 'Production layer' is measured. Specifically for manuscripts, the script, number of hands, and the presence of prickings or catch words are included. In the case of printed books, the link to an edition is established. Additionally, we record whether the different texts in the 'Production layer' end and start on the same page or on the same folio. For printed books, which are often digitised per copy of an edition, a link to the digitised section is included, if available. In the modelling and structuring of the codicological characteristics of the manuscripts, the database was inspired by the databases of *Medieval Manuscripts in Flemish Collections* (MMFC) and *Medieval Manuscripts in Dutch Collections* (MMDC).[54]

Manuscript as well as printed prayer books are not always homogeneous volumes, but can sometimes be compiled out of different production layers. These various production layers are mainly created through interventions by the owner or reader. While the production process of prayer books inherently involves various sub-processes, our model does not consider these sub-processes as separate production layers. The production process of Middle Dutch prayer books was affected by their popularity. Middle Dutch manuscript prayer books were produced both in religious communities and in lay workshops.[55] The popularity of the Devotio Moderna further stimulated the production of books in the vernacular, making the readership of these prayer books more varied than in other Western European countries.[56] The large demand accelerated the commercialization of books,[57] meaning that the various tasks in the production of the book (e.g., making parchment or paper, copying, illuminating, bookbinding) would not only be executed by different production centres, but could also be divided into smaller (more standardized) tasks or modules within those centres.[58] These distinct components would not func-

54 *MMFC*, https://mmfc.be/page/home, last accessed 4 December 2023, aims to collect descriptions of all the medieval and early modern manuscripts (up to 1600) that are held in Flemish collections. *MMDC* https://www.mmdc.nl/static/site/, last accessed 4 December 2023, contains descriptions of all medieval western manuscripts up to c. 1550 written in Latin script and preserved in public and semi-public collections in the Netherlands.

55 A religious or lay person could also copy a manuscript prayer book for private use. At this stage in the project, it is not yet clear how often this occurs.

56 This varied readership does not mean that Middle Dutch prayer books could no longer function as a luxury item. The extent of the influence of the Devotio Moderna on the effective dissemination and popularity of Grote's translation until well into the sixteenth century is a question waiting to be answered. Cf. J.P. Gumbert, *The Dutch and Their Books in the Manuscript Age* (London: The British Library, 1990), pp. 53–79.

57 This does not preclude that prayer books were produced in more 'traditional', less commercialised ways (for instance when they were created for private use).

58 Rudy, *Piety in Pieces*, p. 22. Even the decorative penwork could have its own place in the

tion independently.[59] Even though the production process could involve several production centres and modules, the whole process, geared toward the creation of a prayer book, happened simultaneously and is therefore considered as a single 'Production layer' in the PRAYER data model.[60]

Printed prayer books with the translations ascribed to Grote are, to a large extent, similar to their manuscript counterparts. The lion's share of printed prayer books was produced by secular printing workshops, although there are a few notable exceptions in the Low Countries.[61] The modular, or partly modular, nature of these books appears to be an important form of continuity between manuscript and print that deserves further study. Some printers ensured that the start of individual texts coincided with the start of a quire (or – more often – a set of quires), building in a degree of flexibility for readers to shape the contents of the book. As is the case with manuscripts, however, the modular production of printed books can also be related to practical decisions or issues, for instance when a printer had only a limited amount of source mater-

production process and was not necessarily made in the workshop or community of the scribe (M. Hülsmann, 'Decorative Penwork and Book Production. Evidence for Localizing Northern Nederlandish Manuscripts', in *Making the Medieval Book. Techniques of Production*, ed. Linda L. Brownrigg (Los Altos Hills: Anderson-Lovelace and Red Gull Press, 1995), pp. 93–110, p. 108). Penwork in itself is an important and widely occurring feature of Middle Dutch prayer books that can offer information about the way a text was structured, but, equally about the region where the penwork originated. See, e.g., Gumbert, *The Dutch and Their Books*, pp. 30–51, A.S. Korteweg, *Kriezels, aubergines en takkenbossen. Randversiering in Noordnederlandse handschriften uit de vijftiende eeuw* (Zutphen: Walburg Pers, 1992), Gisela Gerritsen-Geywitz, *Het Utrechtse draakje en zijn entourage. Vijftien penwerkstijlen in Utrechtse handschriften en gedrukte boeken uit de tweede helft van de vijftiende eeuw* (Hilversum: Verloren, 2017).

59 Rudy, *Piety in Pieces*, p. 39.

60 Cf. Gumbert's 'Unity of production', J.P. Gumbert, *Codicologische eenheden – opzet voor een terminologie* (Amsterdam: Koninklijke Nederlandse Akademie van Wetenschappen, 2004), p. 13. Rudy's 'module' is in this context similar to Gumbert's 'blocks' in an articulated codicological unit, but she emphasizes that the blocks of a book of hours could be interchangeable and bound in different configurations. The term 'module' is also more broad. Rudy, *Piety in Pieces*, pp. 39–40.

In this aspect, books produced in the modular method differ from composite manuscripts, which consist of separately produced units that could circulate independently and are bound together at a later stage in their lives. For a discussion of the latter, see Erik Kwakkel, 'Towards a Terminology for the Analysis of Composite Manuscripts', *Gazette du livre médiéval* 41 (2002), pp. 12–19, and Pamela R. Robinson, 'The "Booklet". A Self-Contained Unit in Composite Manuscripts', *Codicologia*, 3 (1980), pp. 46–69.

61 For instance, the communities of Brothers of Common Life in Gouda and Brussels, and the Regular Canons at Den Hem, ran printing presses and, perhaps not surprisingly, also issued prayer books that included the translations ascribed to Grote.

ial (e.g., type) at his disposal and was thus forced to print one book in several stages. If we would consistently consider the distribution of manuscript and printed texts across different (sets) of quires as separate production layers, we would overgeneralize. At the same time, distinguishing and identifying the modules before assigning them their own production layer would require in-depth research and a level of interpretation that is not compatible with the pragmatic approach of a simplified data model.[62] The potentially modular production of manuscripts and printed books would require extensive discussion that does not fit the scope of this article, but will be considered in the research conducted in the second phase of the PRAYER project.

When new texts or decorations were added to the book at a later stage, the additions were not part of the initial production process and therefore they constitute a separate 'Production layer'. Buyers or readers had a wide range of strategies at their disposal to customize and personalize their prayer book.[63] For printed books, for instance, they could combine copies (or partial copies) of several editions, have handwritten texts added on blank pages (as shown in fig. 2) or in additional gatherings, and they could decide to have additional printed images pasted in, thus merging several production layers together in one book.

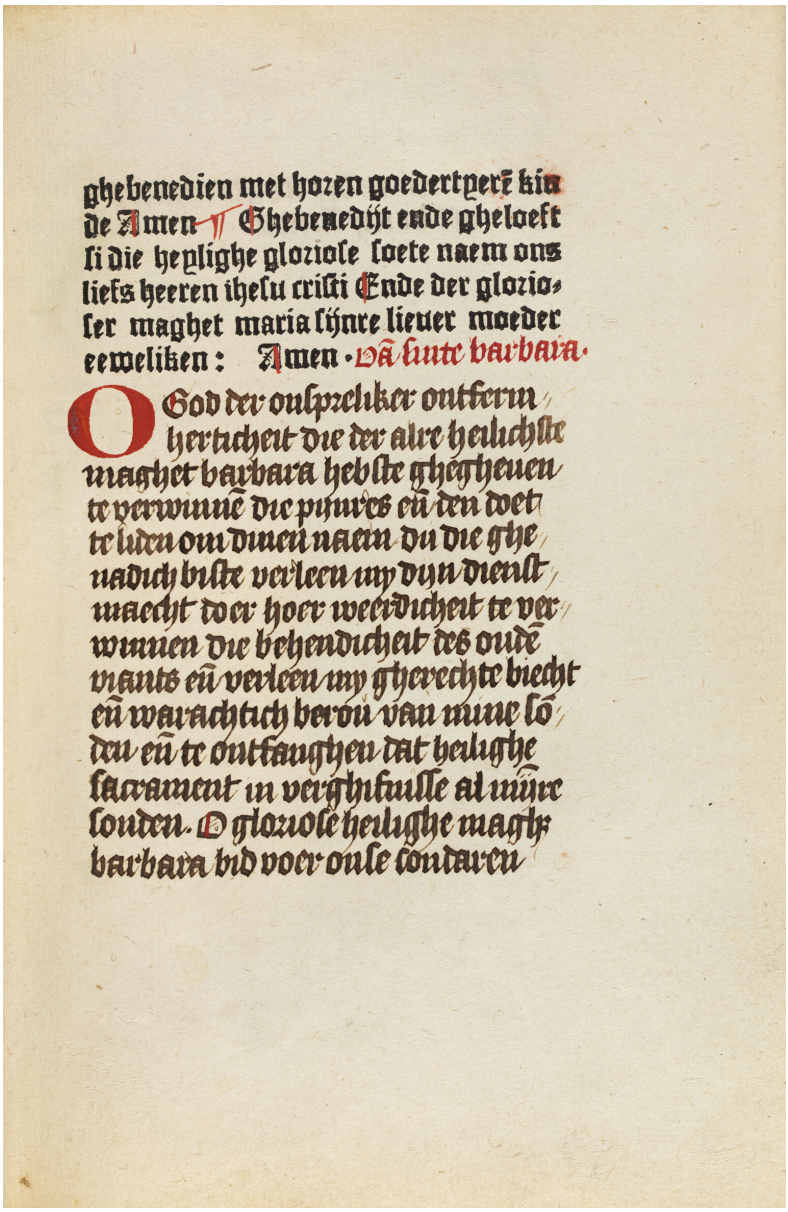
As may have become clear in this discussion, our 'Production layer' is similar to Andrist, Canart and Maniaci's 'Unité de production' in *La syntaxe du codex*.[64] They distinguished between three kinds of 'Unités de production', namely 'Unités de production "matière contenu"' 'Unités de production "contenu"', and a mixed form.[65] A 'Unité de production matière contenu' unites a content and a collection of material elements. 'Unités de production "contenu"' are additions to an existing 'Unité de production "matière contenu"', without

62 If multiple copies of one edition survived, our data model still allows us to research whether an owner had quires of that edition bound in their preferred order. We are able to compare the different copies or compare the 'Expressions' in 'Book' with those in 'Edition'.

63 See, for example, Anna Dlabačová and Andrea van Leerdam, 'Introduction', in *Vernacular Books and Their Readers in the Early Age of Print* (*c. 1450–1600*), eds. Anna Dlabačová, Andrea van Leerdam and John Thompson (Leiden: Brill, 2023), pp. 1–33.

64 Our production layer is also quite similar to Gumbert's codicological unit. What Gumbert describes as codicological unit is a 'Production layer', but also his 'guest text', a text that is added as an enrichment to an existing codicological unit, is considered a separate 'Production layer' in our data model (see Fig. 2). 'Production layers' are thus more broad than the codicological unit, as they are not exclusively distinct material units, but can also be textual and decorative additions to an existing material unit. See Gumbert, *Codicologische eenheden – opzet voor een terminologie*, p. 22.

65 Patrick Andrist, Paul Canart and Marilene Maniaci, *La syntaxe du codex. Essai de codicologie structurale* (Turnhout: Brepols, 2013), pp. 59–60.


ghebenedien met horen goedertieren kin
de Amen ℣ Ghebenedijt ende gheloeft
si die heylighe glorioſe ſoete naem ons
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eewelijken: Amen · Dā ſuute barbara ·
O God der oulpreliker outtieru
hertichеit die der alre heilichſte
maghet barbara hebste ghegheuen
te verwinnē die pijnres eū den doet
te liden ou dinen naem du die ghe
nadich biste verleen my dyn dienſt
maecht doer hoer weerdicheit te ver
winnen die behendicheit des oudē
vians eū verleen my ghierechte biecht
eū warachtich berou van mine ſō
den eū te outfanghen dat heilighe
ſacrament in verghiſſelle al mijne
ſonden. O glorioſe heilighe maghe
barbara bid voer ons ſondaren

FIGURE 2 Delft: Jacob Jacobszoon van der Meer, 19 July 1484. This leaf shows two production layers. It contains the ending of the Hours of the Virgin, to which a Prayer to the Sweet Name of Jesus has been added (both printed). This is the first production layer. The second production layer is a prayer to St. Barbara that has been added by hand.
COPY THE RARE BOOK & MANUSCRIPT LIBRARY, UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, 264.02 C28HOD1484, F. D6R

the addition of material support.[66] The latter, which includes user traces and corrections, occurs much more in Middle Dutch prayer books than the addition of the former.

However, this terminology could not be adopted in the PRAYER data model without an adaptation and a simplification. Firstly, because our model includes not only manuscripts but also printed books, and additionally because the terminology is too detailed and nuanced to adopt into the very concise structure of a data model. The main goal of the 'Production layer' entity is not to provide detailed codicological descriptions but to display the most important developments of a book throughout its lifecycle. Because we could not create separate entities for all possible types of changes and additions to the book, whether they are material, textual or decorative, we decided to collect all types under the label 'Production layer'. 'Production layers' thus incorporate all three types of 'Unités de production'.

Andrist, Canart and Maniaci also distinguish the 'Unité de circulation', (parts of) a codex that circulated independently.[67] Kwakkel similarly uses the term 'usage unit' to refer to 'the manner in which a production unit was used: separately or bound together with other production units'.[68] He applies the term 'usage phase' to express developments of the usage units throughout time.[69] The last 'usage phase' is the present one. There do not seem to be many Middle Dutch prayer books that are made up of a compilation of separate 'usage units' and the number of 'usage phases' in most Middle Dutch prayer books are limited. The majority of Middle Dutch prayer books are quite stable and few adjustments seem to be made after the 16th century. This means that most often, the book in the reading room today is in the same 'usage phase' as in the 16th century, which enables us to research the reception of the prayer books without the hurdle of needing to reconstruct the more 'original' medieval book. We decided not to include a separate entity to record the more abstract 'usage units' or 'usage phases' of a manuscript, to keep the data entry feasible. If multiple usage units are present, they would require more in-depth research to distinguish and identify. If we do suspect (or are informed by existing scholarship) that one or multiple of the production layers in a book circulated separately, we will describe this in more detail in the annotation fields. We can indicate if 'Production layers' have been rearranged or are incomplete in the 'Production layer' entity, if possible making the distinction between medieval and

66 Andrist, Canart and Maniaci, *La syntaxe du codex*, p. 60.
67 Andrist, Canart and Maniaci, *La syntaxe du codex*, p. 61.
68 Kwakkel, 'Towards a terminology for the analysis of composite manuscripts', p. 14.
69 Kwakkel, 'Towards a terminology for the analysis of composite manuscripts', p. 15.

post-medieval adjustments.[70] The 'Production layer' entity also offers an excellent possibility to indicate books that have been split up over time. If a book is now divided across codices or even libraries, and this connection has already been identified by existing scholarship or will be established through in-depth research at a later stage, we can establish one 'Production layer' across those books. The goal of the 'Production layer' entity is not to reconstruct the 'original' book, but to provide clues to gain more insight into the lifecycle of the book.

Of course, readers did not experience their (potential) compilation as separate production layers, but as a whole, so our conceptual model also establishes a direct link from the 'Book' to the content present in the book, as described in the entities 'Expression' and 'Decoration'. 'Expression' describes a text as it is written down or printed in a specific 'Book' (a manuscript or copy of an edition). These expressions can alternatively be referred to as textual witnesses. For each 'Expression', data is collected about the incipit, the prefatory and summary rubric, and presence of textual abbreviations and glosses in the text.[71] Also the dialect of the 'Expression' is described. The increasing continuum of dialects in the late medieval Low Countries, however, as well as the limited availability of detailed studies of the dialect of many of the manuscripts in our corpus makes it often hard to label a textual witness with a specific dialect at this stage of research. The texts in Middle Dutch prayer books may show features of multiple dialects. 'Expression' also includes fields that record the ways in which a reader interacted with that text, by describing the user traces. In this way, we will chart how scribes and readers interacted with certain texts, for instance by using abbreviations, including additions (scribes) or by adding annotations (users). Recording this kind of information could provide insight into how the books were used in general, which can be particularly useful if the medieval owners cannot be identified.[72]

Furthermore, each 'Expression' is linked to an authority record, namely the entity 'Text'. This entity is used to identify the individual 'Expressions'. A cru-

70 At this stage, we have not yet encountered structural adjustments like rearranging across multiple 'Production layers', but if this would be the case, this can be solved by describing the integrity on the level of the 'Book'.

71 Already Achten, 'De ontsluiting van het Middelnederlandse getijden- en gebedenboek', p. 73, pointed to the individual character of prayer rubrics and the necessity of including them.

72 Andrist and Maniaci propose a detailed categorisation of types of content that partly overlaps with ours but is linked to the codicological structure and make-up of a book. This is something that may be considered in further, more in-depth research of individual books. Patrick Andrist and Marilena Maniaci, 'The Codex's Contents. Attempt at a Codicological Approach', in *Exploring Written Artefacts: Objects, Methods, and Concepts*, ed. Jörg B. Quenzer (Berlin, Boston: De Gruyter, 2021), pp. 369–94.

cial property of 'Text' is the identifier, and the standardised title.[73] This way of modelling was inspired by the *Bibliotheca Neerlandica Manuscripta* (BNM), which also assigns standardized titles to textual witnesses.[74] This structure was similarly influenced by the work carried out in the *Patristic Sermons in the Middle Ages* (*PASSIM*) project, which studies the medieval reception of Latin sermons preached by the Early Church Fathers such as Augustine and Gregory the Great.[75] *PASSIM* also uses authority records to map the dissemination of texts. Other data that are included in the entity 'Text' are the author, translator or editor, the medieval attribution, the incipit of the text, the genre, the presence of rhyme and other languages, and the link to an online edition if available. Textual authority records will, of course, be created per text to achieve the precise description of nuances in content discussed above. This means that separate authority records will, for example, be created for the Hours of the Holy Spirit and the for the Long Hours of the Holy Spirit.

All these textual authority records are needed to develop an overview of the large variety of different texts within prayer books but, as noted, the PRAYER project also researches the relationships between these texts. One text can have multiple expressions, or textual witnesses. Instead of assessing the relationships of the text witnesses with the view towards making a critical edition, the relationships between the texts are in the PRAYER database defined by their joint physical transmission in prayer books, while relationships between versions of a text are documented through connections between authority records. The textual authority records are therefore interlinked, and the relationships are qualified: we indicate whether a text is an expanded or shortened version of another text, or whether a text is a variant or adaptation of another. For instance, the *Prayers of St. Gregory to the Arma Christi* with seven, nine and ten verses are indicated as 'expanded versions' of the *Prayer of St. Gregory to*

73 Texts are initially identified using the codes assigned in the inventory of Middle Dutch manuscripts held at the Royal Library in Brussels, compiled by Mulder and Deschamps.

74 J.A.A.M. Biemans, 'Over de *Bibliotheca Neerlandica Manuscripta* van Willem de Vreese. Drie bijdragen aan de geschiedenis van de medioneerlandistiek en de Middelnederlandse handschriftenkunde', *Tijdschrift voor Nederlandse taal- en letterkunde* 105 (1989), pp. 249–74. De Vreese's aim was to describe medieval manuscripts produced in the Netherlands, and he focused on manuscripts transmitting Middle Dutch literary and religious texts. In the 1990s, the BNM was converted into a database, maintained by Pica/OCLC. After 2013, the BNM was expanded into the BNM-I, with financial support of CLARIAH-NL and the Huygens Institute. The database is mainly focused on texts, but also contains data on production and ownership. There is a limited amount of data about decorations.

75 Riccardo Macchioro, 'The *PASSIM* Project (Patristic Sermons in the Middle Ages). Towards a Virtual Research Environment for the Study of Patristic Sermon Collections', *Classics@* 18.1 (2021).

the Arma Christi with five verses: the length of the prayer and the size of its indulgence increased over the course of the fifteenth century.[76]

Because the project aims to study the images in the prayer books (and their iconography) in relation to the texts they were adjacent to, images also have a prominent presence in the database. 'Book' also links directly to all 'Decoration' present, from initials to pasted-in woodcuts or metalcuts. In the PRAYER project, data is captured about the type, extent, and technique of the decoration, and about the frequency in which a particular type of decoration occurs within the prayer book. The presence of text within the decoration, for instance in a banderole, is also recorded. Similarly, to the textual entity 'Expression', the user traces are described. Additionally, the iconography of figurative decorations is classified, through a link with the entity 'Key word'. 'Key word' makes it possible to assign topics (for instance, 'The kiss of Judas'), not only to decorations but also to texts, and to research iconographical themes and cycles.[77] As discussed in the final section, we use standardised vocabularies as 'Key words' wherever possible.

The decoration in prayer books could be made by hand, but could also be the result of a printing process with woodblocks and with metal plates. From around 1500, the production of printed prayer books that contain Grote's Middle Dutch translation largely moved south, to Paris. Consistent with the Parisian production of books of hours, printers here employed metalcuts rather than woodcuts.[78] In a similar fashion to how 'Expressions' are linked to a 'Text'-record, a wood- or metalcut in 'Decoration' can be linked to a standardized woodblock or metal plate record. This happens through a link with the entity 'Stamp'. 'Stamp' is also an entity in which a woodblock/metal plate or a stamp used for the decoration of leather bookbindings can be identified and linked to their imprints in 'Decoration' or 'Binding'. This allows us to track the reuse of particular stamps, or in the case of stamps that were cast, the use of one mold, throughout multiple bindings and books.[79] These stamps are identified with a

76 The different versions of the prayer are discussed in Kathryn M. Rudy, *Rubrics, Images and Indulgences in Late Medieval Netherlandish Manuscripts* (Boston: Brill, 2017), pp. 108–13.

77 Data about decorations in Dutch medieval manuscripts can be found in de database which was compiled by researchers of the Alexander Willem Byvanck Foundation. It does not relate these images to specific texts, however. The database is presently being transferred to the RKD – Netherlands Institute for Art History under supervision of Anne Margreet As-Vijvers.

78 Overall, the Parisian editions became decorated much more elaborately. Some copies were printed on parchment and then enhanced through painted illumination.

79 Staffan Fogelmark, *Flemish and Related Panel-Stamped Bindings. Evidence and Principles* (New York: Bibliographical Society of America, 1990) argues that stamps used for bind-

unique number. For woodcuts until 1501 we use Kok's identification numbers; later woodblocks will be assigned new identification numbers.[80] Because decoration through woodcuts or metalcuts largely remains the same throughout an edition,[81] the illustration through 'Stamps' must be recorded – as with the textual contents – on the level of the edition as well as for individual copies.[82]

Human actors play an important part in the PRAYER project. Rather than being static objects, prayer books, like many pre-modern books, were susceptible to interventions by their owner or subsequent owners. Since an owner of a prayer book can also be a compiler or make structural adjustments, this project sees the reader not necessarily as a passive witness but as an active agent. Owners could, for instance, personalize their book, correct, change, or add text, leaves or even whole quires with texts or images.[83] Moreover, in some cases, the roles of the producer and the owner can converge. Therefore, in the data model, owners and producers are grouped in one generic category and identified as a 'Person' that can relate to a book in multiple ways. Moreover, person-to-person links can be created. We link together persons who are related by birth or marriage, but also other kinds of exchanges can be viewed and represented as relationships. Printers, for instance, could be part of networks in which they exchanged printing materials, notably woodcuts. In their book of hours, the Brothers of Common Life in Gouda for example employed woodblocks originally crafted for the Antwerp printed Govaert Bac.[84] In the 'Person' entity, we describe as much information as is available to us. We have included fields for

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ings were not engraved in metal but cast. Consequently, multiple stamps with the same images or patterns must have circulated in the late medieval Low Countries. The PRAYER project still strives to identify the stamps with the same image or pattern to map their distribution.

80 Ina Kok and Cis van Heertum, *Woodcuts in Incunabula Printed in the Low Countries*, 4 vols. (Houten: Hes & De Graaf, 2013).

81 It is important to recognise, at the same time, that the possibility of 'pictorial instability' within a single edition is real.

82 On pictorial instability see Anna Dlabačová, 'Drawn Corrections and Pictorial Instability in Devotional Books from the Workshop of Gerard Leeu', in *Printing and Misprinting: A Companion to Mistakes and In-House Corrections in Renaissance Europe (1450–1650)*, eds. Geri Della Rocca de Candal, Anthony Grafton and Paolo Sachet (Oxford: Oxford University Press, 2023), pp. 431–45.

83 Kathryn M. Rudy, *Postcards on Parchment. The Social Lives of Medieval Books* (New Haven: Yale University Press, 2015), gives an overview of the ways in which a prayer book could be adapted by its owner after the initial production process was complete, and possible reasons why.

84 The Brothers of Common Life in Gouda are also called Collaciebroeders, because of this House's specific involvement in organising reflective, inspirational meetings after Sunday service. Kok, *Woodcuts in Incunabula Printed in the Low Countries*, vol. 1, p. 528.

the name, gender, date of birth, place of birth, the marital status, the date of death, place of death, the occupation, the years in which the person was active, and the historical location where they lived and worked.

The 'Person' entity is linked to several other entities, such as 'Book' and 'Production layer', to express relationships of ownership and production. These connections lead to many-to-many relationships, in which multiple values in one table can be associated with multiple values in another table. A book could have been owned by multiple persons, and a person could have owned multiple books, for example. To avoid data redundancy, such many-to-many relationships between two entities were resolved into two separate one-to-many relationships, by adding an extra table in between the two entities, to which both entities refer. This extra table is called a junction table.[85] The 'Person' entity is thus linked to 'Book' through the junction table 'Medieval ownership', and 'Person' is linked to the 'Production layer' through the junction tables 'Production', and 'Dedication'.

The PRAYER conceptual model also offers the possibility to link a 'Person', 'Edition' or 'Production layer' to a 'Centre', group or style. This can be a religious community, a lay workshop, but also a style of decoration that makes locating a manuscript in a specific region possible. These centres and styles are divided into several types (the broadest typology, for instance, is whether the centre is religious or lay). Often a community had a changeable nature, and could be labelled in several ways, and thus linked to several 'Types'. This means that one 'Centre' can have multiple 'Types' and, because one 'Type' of course applies to multiple 'Centres', the addition of a junction table between 'Centre' and 'Type' called 'Nature' is necessary. An example of a community with multiple 'Types' would be the centre Lopsen near Leiden. Originally a tertiary community, it joined the chapter of Windesheim and adopted the Rule of Saint Augustine in 1460. Lopsen is therefore linked to the subtype 'Third Order of Saint Francis' and type 'religious community male' until 1460, and to the subtype 'Augustinian canons regular' and type 'religious community male' after 1460.[86] The 'Centres',

85 Many-to-many relationships can cause a number of difficulties. The multiplicity might be described either by storing multiple values in a single cell, or by creating new records for each available value, but both of these approaches are inefficient, and they may lead to redundancy. Problems such as these can be avoided by adding a new junction table, in which the single many-to-many relationship is resolved into two separate one-to-many relationships. These junction tables should contain references to the two connected tables in the form of foreign keys. Stephen Ramsay, 'Databases', in *A Companion to Digital Humanities*, eds. Susan Schreibman, Ray Siemens and John Unsworth (Malden: Blackwell, 2004), pp. 177–97, pp. 183–5.

86 Hildo van Engen, *De derde orde van Sint-Franciscus in het middeleeuwse bisdom Utrecht.*

along with several other entities, are also linked to the entity 'Historical Localisation', which provides information about the location and region. Finally, 'Literature' and 'Reference', to which many entities are linked, make capturing references to secondary literature and previous research possible. Each entity in the data model also contains the space to add annotations, to record information that cannot be quantified or information that does not have its own designated space within the conceptual model.

The Implementation of the Conceptual Data Model in *Heurist* and PRAYER's Data Management

After the modelling phase the initial conceptual data model was implemented in *Heurist*, an online database management system specifically targeted at studying multimodal relational structures.[87] This section discusses the practical realisation of the data model into the structure of the PRAYER database in the *Heurist* database platform. Because of the specific features of the platform, in certain aspects a translation of the conceptual data model had to be made into the database management system. Finally, we discuss PRAYER's data management and how it is in line with FAIR-principles.

Heurist is an open-source database management system currently maintained within the Faculty of Arts and Social Sciences at the University of Sydney. *Heurist* was originally designed by Ian Johnson, to enable humanities researchers to implement, manage and populate databases. The system offers a range of standard record types that can easily be customised. *Heurist* also offers several possibilities to create relationships between entities. Relationships between entities can be implemented, firstly, as record pointer fields (one field referring to another record, for instance a field in 'Book' referring to its 'Binding'-record).[88] Secondly, *Heurist* can replace junction tables with so-called relationship markers. This is a link between two entities that can be defined with a vocabulary (see below), and to which different characteristics can be attributed. For all person-related relationships in the PRAYER database, the junction tables present in the conceptual model ('Production', 'Medieval ownership', 'Dedication') were converted into these relationship markers.

Een bijdrage tot de institutionele geschiedenis van de Moderne Devotie (Hilversum: Verloren, 2006), p. 278.

87 *Heurist*, https://heuristnetwork.org/, last accessed 4 December 2023.

88 These fields are equivalent to a Foreign Key in a relational database (a column of data in one table that refers to unique data values in another table).

This creates a more direct link between 'Person' and book-related entities. For instance, the relationship between *Jacob Jacobszoon van der Meer* [a person] and *Horae* [*Dutch*] *Getijdenboek Delft* [an edition] is defined as 'is printer of'. A characteristic that can be attributed to this relationship is the date on which this relationship took place, namely *8 April 1480*. A description of the evidence that proves this relationship can also be attributed to the relationship.[89] The relationship between textual authority records (as discussed above) is also established through relationship markers, as well as the relationship between 'Centre' and 'Type'.

Another very useful tool in *Heurist* is the possibility to create new and incorporate existing vocabularies. Values of specific fields can be standardised by working with a vocabulary. More concretely, this means that only a limited number of options can be chosen during the data entry process. For instance, a list of all regions is included in the entity 'Place', avoiding possible spelling variations. Or the ways to describe ruling in 'Production layer' are already listed (dry-point, ink, lead-point), so that alternative, more specific or more general terms cannot be entered by the users of the database.

The database's content is based on input of the PRAYER team and data that has been imported from other databases, primarily from the BNM and library catalogues. The PRAYER project tries to break bias patterns within research, for instance the favouring of lavishly decorated books over plain ones, but will likely create new biases, since the scope of the project will not allow us to consider the full corpus of prayer books. The aim is to include a significant number of manuscripts (approximately 600) and all printed editions and copies. However, this database is not a final result of the PRAYER project, but will stay editable and open for further corrections and additions. The corpus can easily be expanded to include any prayer book in Middle Dutch, without the precondition that it must include one of the texts in the translation ascribed to Grote. Many texts transmitted together with Grote's translation were also included in other (types of) prayer books without Grote's texts. These books would therefore form a valuable addition when mapping the prayer book ecosystem in the Low Countries. The same goes for prayer books in other languages, especially Latin and French.[90]

89 The attributions differ according to which relationship is being qualified. For instance, in the case of medieval ownership, one of the attributions made to the relationship is the acquisition method.

90 Whenever texts in the latter languages occur in a prayer book containing one of Grote's translations, these are of course included in the PRAYER database.

To encourage the reuse of the database and dataset, we constructed both in line with FAIR-data principles. FAIR is an acronym for Findable, Accessible, Interoperable and Reusable. These principles are guidelines for storing, processing and publishing scientific data. The findability of the data will be enhanced by submitting an export of the database to a searchable repository along with rich metadata. To ensure accessibility, the data will be made available as CSV files. *Heurist* makes use of a number of widely used ontologies, such as Dublin Core, Bio and FOAF, and this helps to improve the interoperability of the data. The interoperability of the PRAYER data can be increased further through the addition of existing persistent identifiers. Our key words incorporate ICONCLASS codes to describe decorations, and authors, translators and illustrators are identified using persistent identifiers found in VIAF or WikiData, whenever possible. The books themselves are identified via unique shelfmarks assigned the institutions which hold the books. When no persistent identifiers are available, the PRAYER database refers to identification numbers in existing literature. The option to reference secondary literature is, as indicated above, always present. The opportunity to create vocabularies in *Heurist* makes integration with other data sets easier. All of these measures are intended to stimulate the reuse of the data. Data can be exported from *Heurist* as CSV, JSon, XML, KML, GeoJSon files, among other formats. Finally, a front-user interface will be designed to permit browsing of the database's content.

We realise that, despite meeting FAIR-principles, digital projects often have a short lifespan, being prone to technological change and needing continuous technological support. We aim for the PRAYER project to transcend the lifespan of its database by sharing our acquired knowledge, not only by publishing our findings, but also our strategies. The structure of the PRAYER data model can provide inspiration for, or can be partly reused, by other projects that deal with large numbers of texts transmitted jointly in 'text carriers' in various constellations.

Conclusions

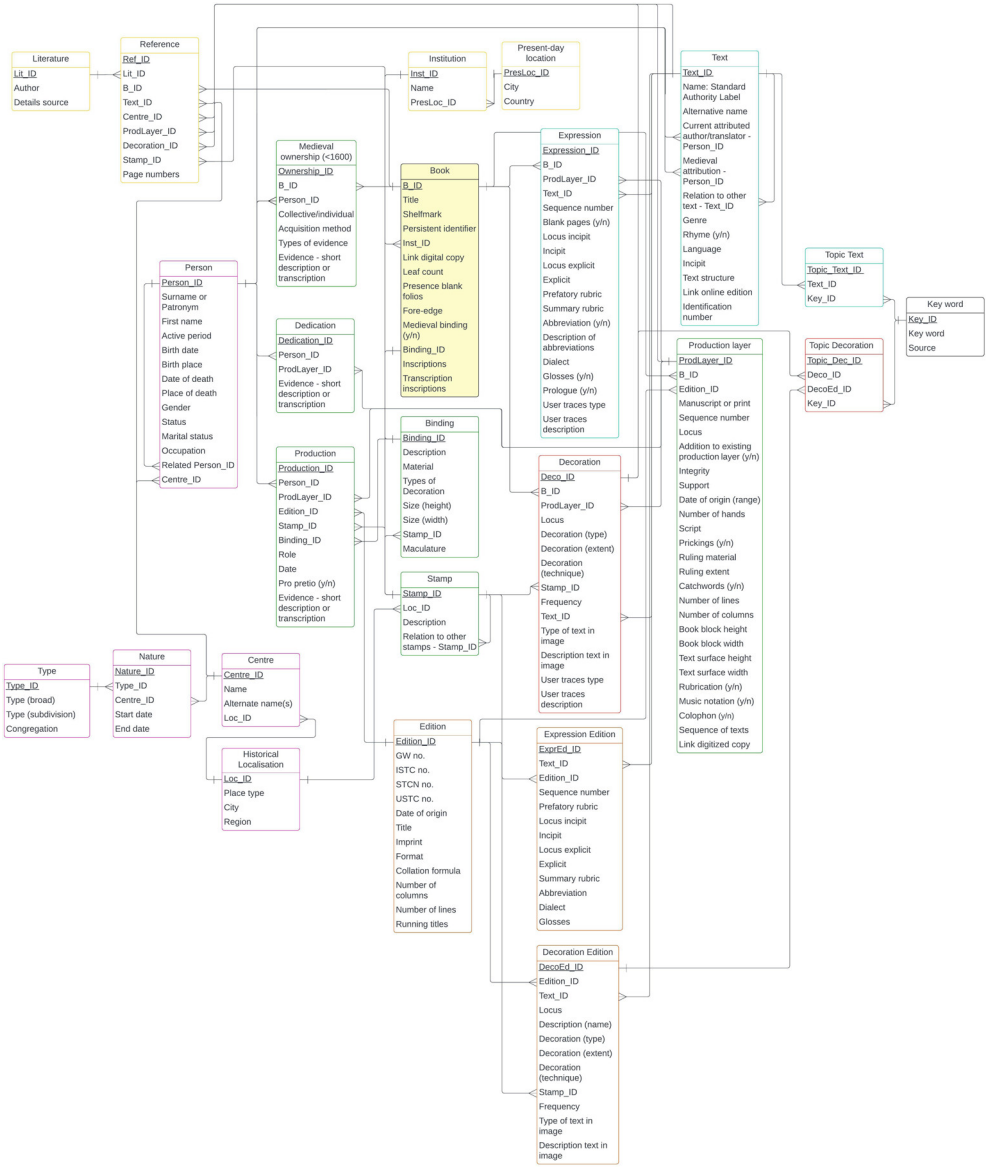
The way in which Middle Dutch prayer books are approached in the PRAYER project, as collections of texts created and consumed in the context of an ecosystem, is inspired and, in a sense, even defined by the specific features of these books and the texts contained within them. While the size and diversity of and diversity within the corpus were long viewed as impediments to further research beyond individual codices, smaller book collections or single texts, the data model that underlies the PRAYER database defines relationships

between texts through their shared dissemination, but also maps their relations to objects (or non-human actors), human actors, as well as to more abstract entities. The modelling of the data is a necessary step that helps us to re-think the study of prayer books specifically, and more broadly the methodological boundaries of manuscript studies and book history. How do we effectively include and relate the many kinds of data connected to prayer books – or any kind of manuscripts and early printed books – in such a way that they will help us understand the dynamics within what we might call the 'ecosystem' of a certain type of book? Through the design of the data model, prayer books are approached as places where the producer(s) and the reader(s) converge. Consequently, this will allow for analyses that can focus on both the practices of production as well as the reader's involvement with the book (practices of reading and prayer) and in shaping (or re-shaping) the book. The data model equally relates material features of the books to texts, for example by linking text and image. The data model is also crucially different from previous models in that it allows us to fully integrate the analysis of manuscripts and printed books in the – digital – analysis of the data.

Once the data on prayer books has been collected the structure of the data model will aid us to analyse the development and diversification of prayer books in Middle Dutch from various perspectives, in terms of one or more texts, images, producers, owners and readers, or influence of changes in media. Visualisations of, for example, the grouping of the translations ascribed to Grote with other texts in both manuscript and printed books may show either an increasing or diminishing – possibly after the texts became available in print – diversification of prayer books in Middle Dutch. Ultimately, the data model underlying the database will help us to explain the expansion and unequalled popularity of the prayer book in Middle Dutch.

Finally, as indicated in the section on the project's data management, both the conceptual model as well as its practical translation into *Heurist* may serve as an example for research into other, similar text corpora with a high degree of interconnectedness between texts attained through collective transmission.

Appendix A: The PRAYER Data Model



Appendix B: Alphabetical List of Entities in the PRAYER Data Model

Note that the junction tables (see section 'The PRAYER Data Model' for an elaborate explanation) are in bold.

Binding	Describes the medieval binding of the book (if present).
Book	Describes the object as it has survived and could (potentially) be consulted in a reading room.
Centre	Describes a centre, a group or a style of illumination to which a person or book can be linked. This can be a religious community, a confraternity, a lay workshop, but also a style of decoration that makes locating a manuscript in a specific region possible.
Decoration	Describes all types of decoration present in the book.
Decoration edition	Describes all types of decoration in the edition.
Dedication	Junction table between 'Production Layer' and 'Person', that gives evidence and information about the dedication of the 'Production Layer'.
Edition	Lists data that pertains to all copies of an edition, such as the date and place of publication, and, of course, the printer.
Expression	Describes a text as it is written down or printed in a specific book. These (material) expressions can alternatively be referred to as textual witnesses.
Expression edition	Describes a text as it is printed in a specific edition.
Historical localisation	Provides information about the city and region in which a book or person can be located.
Institution	Records the current institution in which the book is preserved.
Key word	Records all key words that describe the topics of texts and decorations.
Literature	Records the authors, titles and other relevant information of secondary literature to make referencing to sources possible.
Medieval ownership	Junction table between 'Book' and 'Person', that gives evidence and information about the medieval ownership of the book.
Nature	Junction table between 'Centre' and 'Type', necessary due to the changeable nature of communities.

Person	Describes persons that can interact with other entities in various ways (primarily in terms of authorship, ownership, and/or production).
Present-day location	Records the locations of the institutions in which the books are kept.
Production	Junction table between 'Production layer' and 'Person', that gives evidence and information about the production of the 'Production layer'.
Production layer	Describes the separate production layers of a book. This means that within one 'Production layer' all elements in the book that were made in the same production process are described.
Reference	Junction table between 'Literature' and other entities. In this entity, the page numbers relevant to the entity to which 'Literature' is linked can be recorded.
Stamp	Records the identified objects that make decorative (im)prints, such as woodcuts or panel stamps.
Text	Is an authority record, used to identify the individual 'Expressions' and describes the text in its abstract form.
Topic decoration	Junction table between 'Key word' and 'Decoration'.
Topic text	Junction table between 'Key word' and 'Text'.
Type	'Centres' are categorized into several types and subtypes, for instance 'religious community male' (type) and 'Augustinian canons regular' (subtype).