

PART ONE

**DIGITAL SPATIAL INFRASTRUCTURES
IN THE HUMANITIES**

Chapter I

NORSE WORLD FROM PLAN TO ACTION: BUILDING A DIGITAL GAZETTEER OF EAST NORSE MEDIEVAL LITERATURE STEP BY STEP

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east norse medieval literature is a mine of information on how foreign lands were visualized and perceived in the Middle Ages. What places were written about and where? Are some places more popular in certain text types or at certain times? How do place-names link different texts? Is there a shared concept of spatiality? Any research aiming to uncover what pre-modern Scandinavians understood about places abroad requires as a minimum an index of foreign place-names and other spatial references in medieval manuscripts and other sources—an infrastructure that has not existed until very recently.

Norse World¹ is an interactive spatial-temporal resource for research into spatiality and worldviews in medieval fictional, non-biblical literature from Sweden and Denmark. The database comprises a large number of geocoded attestations of foreign place-names and non-proprial spatial references from a variety of East Norse texts excerpted at a manuscript level. In this chapter, we introduce the Norse World resource from the planning stages to the completion of the online platform, which enables sophisticated searches in the database of more than 6,500 attestations of spatial references. The chapter is conceived to be a guide to the what, how, and why of building a digital gazetteer² of a medieval literary corpus with an interdisciplinary user group in mind.

We have chosen to focus on three major issues. The first is how to deal with complex historical and linguistic data in a way that is compatible with simplified relational

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1 Petrulevich et al., "Norse World."

2 The term "digital gazetteer" is understood broadly in the chapter as a digital resource that provides information on named features by linking feature names, feature types and feature coordinates; see Goodchild and Hill, "Introduction to Digital Gazetteer Research," 1039.

database schemas. Despite pilot trials, it is not unusual to discover new aspects of data or new data types one or two years into the excerpting work, with a database schema in place and paid for. The chapter provides several examples of how to handle these issues and the aspects of data and database design that it is crucial to take into account. Second, successful communication between scholars and developers or research engineers is a prerequisite for every successful infrastructure project in digital humanities. The chapter presents several lessons learned by the Norse World project that we hope will help others ensure effective project management and communication in project groups. Third, the chapter deals with the problem of visualizing the unvisualizable. Contemporary approaches to geocoded humanities data per default include mapping components for illustration purposes or analysis or both. What can or cannot be mapped in a literary dataset is never a straightforward issue, however. Similarly, the question of how problematic data such as fictional places or places with uncertain identifications can be geocoded without losing the ambiguity entirely is not easy to answer. Below, we present several techniques employed by the Norse World project to visualize a variety of problematic data types.

The Project and the Planning Stage

The project “The Norse Perception of the World: A Mapping and Analysis of Foreign Place-Names in Medieval Swedish and Danish Texts”³ was conceived in 2016 to produce a spatial infrastructure platform for interdisciplinary humanities research on spatiality and worldviews in medieval East Norse⁴ literature. The main outcome of the project, the Norse World platform or digital gazetteer, is an interactive spatial-temporal research infrastructure that aggregates and visualizes thousands of geocoded attestations of spatial references in the East Norse material. At the planning stage of the project we identified two major priorities, presented and discussed in more detail below: 1) a theoretically and methodologically informed philological approach to language data underpinning the entire infrastructure building; and 2) a spatialization framework including geocoding East Norse literary material for the purposes of illustration and spatial analyses. These priorities were set up in accordance with the perceived needs of future users, philologists, historians, onomasticians, linguists, literary scholars, and researchers from any other related fields. The project that started in March 2017 is still ongoing; the Norse World resource is still being worked on and developed. We are continually adding new data, such as new attestations, texts, and sources, to the project’s database.

3 IN16-0093:1; funded by the Swedish Foundation for Humanities and Social Sciences Riksbankens Jubileumsfond from 2017 to 2022.

4 East Norse covers the two languages Old Swedish (including Old Gutnish) and Old Danish before 1530. The choice to incorporate Old Gutnish into Old Swedish might be seen as controversial. Nevertheless, it is relatively easy to filter the material for *Gutasagan* (*Gutasaga*), the only text in Old Gutnish present in the database.

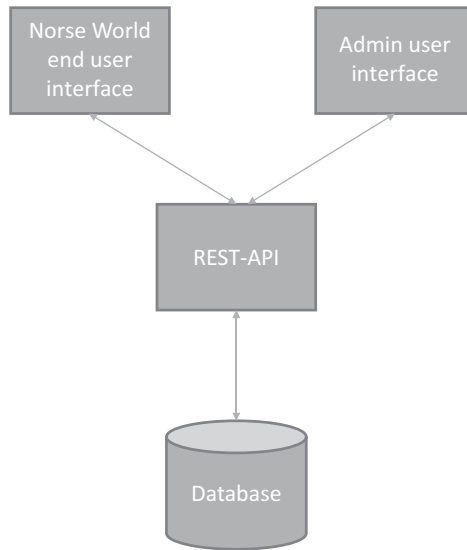


Figure 1.1. The Norse World system overview.

In technical terms, the Norse World digital spatial research infrastructure is a modular system consisting of four components: a database, a REST-API,⁵ an admin user interface, and an interactive end user interface; see Figure 1.1. The modular structure allows for the future development, scaling, and updating of each individual component without affecting the rest of the system. The Norse World data and metadata can be accessed via the project’s website or REST-API.⁶ The website offers stable links⁷ to most of the presented data items; the links can therefore be used to refer to a specific attestation of a spatial reference or text or any other structured piece of information available. The data at the website can be searched for and filtered in multiple ways.⁸ Tailored datasets can then be downloaded for further analyses in CSV format.⁹ The resource’s content is released under Creative Commons Attribution 4.0 International License,¹⁰ which allows free sharing and adapting on the condition that the Norse World resource is given appropriate credit.

⁵ An application programming interface that follows a particular type of architecture, namely REST (REpresentational State Transfer).

⁶ Petrulevich, “Infrastructure”; on the project’s employment of REST-API and linked open data, see Backman and Smith, this volume.

⁷ Uniform Resource Locators: URLs.

⁸ Backman and Petrulevich, “Search and Filters.”

⁹ Backman and Petrulevich, “Exporting the Data.”

¹⁰ See <https://creativecommons.org/licenses/by/4.0> (accessed February 16, 2023).

The project's underpinning idea is the notion of geographically rendered medieval macrospace that encompasses literary representations of foreign places outside the empirically experienced world of the medieval audience.¹¹ Consequently, aiming at exposing medieval worldviews, we have chosen to collate and aggregate foreign spatial references—i.e., place-names and other location-based data—in East Norse medieval fictional, non-biblical texts from roughly 1100 until 1530. By “foreign” we mean those areas outside the current, modern-day borders of Sweden and Denmark.¹² Although place-names constitute a clear majority of spatial information excerpted by the project, many more types of spatial references, so-called “non-names,” are included in the Norse World database.¹³

The project's raw material comprises East Norse literary texts preserved in manuscripts, fragments, and early printed books, as well as a couple of medieval runic inscriptions. We have delimited the East Norse literary corpus in accordance with the project's fundamental idea and thus excluded diplomas and charters, law texts, and biblical texts.¹⁴ The religious and secular works that we assume contain relevant foreign spatial references belong to the following genres: chronicles and histories, such as *The Chronicle of Duke Erik* in Old Swedish and *Rimkrøniken* (*The Rhymed Chronicle*) in Old Danish; devotional works, such as Old Swedish *Själens tröst* (*Consolation of the Soul*) as well as its Danish translation, *Sjælens Trøst*; encyclopaedic and didactic works comprising, for instance, the Old Swedish and the Old Danish versions of *Lucidarius*; preaching and masses, exemplified by the Old Danish *Prædikener* i Copenhagen, the Arnamagnæan Manuscript Collection, AM 76 8vo (*Sermons* in AM 76 8vo); romances, such as the Old Swedish and the Old Danish adaptations of *Floris and Blancheflour* and *Duke Frederick of Normandy*; travel tales and guides, such as *Vejleder for Pilgrimme* (*Pilgrims' Guide to the Holy Land*) in Old Danish; and visions and revelations, such as *Heliga Birgitta, Uppenbarelser* (*Birgitta of Sweden, Revelations*).¹⁵ Traditionally, the Old Swedish and the Old Danish language periods end with the sixteenth-century Bible translations, Swedish New Testament 1526 and Danish New Testament 1524

11 Harrison, *Medieval Space*, 1–7; Adams, “The Life of the Prophet Muḥammad in East Norse.” For further discussion of macrospace and how it relates to the concept of microspace, see Petrulevich, Backman, and Adams, “Medieval Macrospace through GIS.”

12 For a more detailed discussion of the project's definition of “foreign,” see Adams, Backman, and Petrulevich, “Theoretical Considerations.”

13 See the detailed presentation of non-names in the section “Reality Check: Discovering Data not Accounted for Previously”, below; see also Petrulevich, “The Multi-Layered Spatiality,” and Petrulevich, this volume, on why it is necessary to include multiple types of spatial references and spatial constructions when approaching literary spatiality.

14 For more details, see Adams, Backman, and Petrulevich, “Material.”

15 For a complete presentation of the genre taxonomy, see Petrulevich, Backman, and Adams, “Data and Metadata”; for discussion of the project's definition of genre, see Petrulevich, “The Multi-Layered Spatiality,” and Petrulevich, this volume.

respectively. In the project, the cut-off point for medieval texts in either language has been harmonized to 1515, and, in case a medieval text exists only in a copy made after 1515, to 1530.

According to the main principle of the project's data gathering and data processing, each manuscript or other iteration of a text is read and analyzed within its own textual, material, historical, and other contexts.¹⁶ The specific East Norse context accessed through close reading of texts in editions or manuscripts guides the categorization of spatial references as names or non-names as well as the identification and geographical localization of their referents. Consequently, place-names and other spatial references are attested and presented in their immediate textual context in the Norse World resource.¹⁷

The project has never had the ambition of "etymological mining"—that is, the reconstruction of name forms or restoration of the referents' type of locality or geographical whereabouts in accordance with assumed original or authoritative versions of the text.¹⁸ For instance, the place-name *Mæret* from both the Swedish and the Danish versions of *Consolation of the Soul* is not a prototypical name, since it is homonymous with the common noun *mær* (sea) in the definite form. In the context of this specific work, however, *Mæret* has only one referent, the Mediterranean Sea, and, for this reason, is interpreted as a name. Likewise, multiple place-names from the two East Norse versions of *Floris and Blancheflour* have been identified differently compared to generally accepted localizations of similar names attested in continental versions of the work.¹⁹

The principle outlined above motivated the project's choice of manual data entry, since contextually defined rather than formal properties of language items are seen as qualifying for inclusion into the database. Generally, manual data-gathering and -processing methods were then, and still are, the only possible way forward for a similar project. The rapidly developing field of named entity recognition (NER) is still in its infancy with respect to the automated geoparsing of texts in older language varieties without standardized orthographies.²⁰ Moreover, other types of philological research infrastructures necessary for the success of a project of this scope, such as electronic

¹⁶ The project's choice of theory and method has been inspired by "new," descriptive or material philology; see Petrulevich, this volume, for more information.

¹⁷ For more information, see Petrulevich, Backman, and Adams, "Data and Metadata"; and Petrulevich, Backman, and Adams, "Medieval Macrospace through GIS."

¹⁸ At the lemma level, we correct minor spelling mistakes; see Petrulevich, this volume, for more information and examples. Any additional information on other possible identifications of place-names, including references to secondary literature, can be found in notes at the attestation level or at the standard form level, such as Backman, "Apolisborgh, Aplesburgh (Apolis Castle)."

¹⁹ For more information, see Petrulevich, Backman, and Adams, "Data and Metadata"; the project's identification of place-names in *Floris and Blancheflour* is discussed in Lodén, this volume.

²⁰ For more information, discussion, and references, see Gammeltoft, Foka et al., and Petrulevich, all this volume.

manuscript catalogues, digital facsimiles, and electronic editions of East Norse manuscripts and early prints, were then and still are unavailable at a scale that makes automated approaches possible.²¹

The state-of-the-art analysis of the field of digital spatial research infrastructures in the humanities revealed a lack of comparable resources that theoretically and methodologically match the project's focus on philological aspects of language data. The main sources of inspiration available at the time, Pleiades Gazetteer of the Ancient World (Pleiades),²² Digital Atlas of the Roman Empire (DARE)²³ and the associated Pelagios project,²⁴ as well as the Icelandic Saga Map (ISM),²⁵ implement a traditional gazetteer structure that combines preferably one name, one feature type, and one set of two-dimensional coordinates. This model does not account for place-name variation in literary source material in an analytically meaningful way²⁶ or allow for quantitative analyses of variants.

The ambition to map manuscript witnesses rather than authoritative editions of pre-modern texts forced the Norse Perception of the World project to develop a name data model of its own.²⁷ The model accommodates place-name variation on several manifestation levels and introduces the terms "original form," "variant form," "lemma form," and "standard form." The project's focus on spatial references rather than places is the main reason why the Norse World platform differs from most of the resources available in the same field regarding its priorities and design. The project conducted pilot trials at an early stage of the application-writing process to test the suggested procedure for collection and categorization of spatial references and to create a database draft in an Excel worksheet.²⁸

The project's choice of spatialization framework and geocoding procedure, including authoritative sources of coordinates, is likewise motivated by the interest in literary

21 For instance, the Digital Catalogue of Medieval and Early Modern Manuscripts in Sweden, Manuscripta, www.manuscripta.se/search (accessed February 16, 2023), was not available when the Norse World project was designed.

22 See <https://pleiades.stoa.org> (accessed February 16, 2023); for more information, see Foka et al., this volume.

23 See <https://dh.gu.se/dare> (accessed February 16, 2023); for more information, see Ellis Nilsson et al., this volume.

24 See <https://pelagios.org> (accessed February 16, 2023); for more information, see Foka et al., this volume.

25 See <http://sagamap.hi.is/is> (accessed February 16, 2023); for more information, see Lethbridge, this volume.

26 That is, linking variants to relevant metadata such as, for instance, work, manuscript, specific folio in the manuscript, etc.

27 See Petrulevich, this volume, and Petrulevich, Backman, and Adams, "Data and Metadata," for a more detailed presentation, visualization, and examples.

28 For more details, see the section "Reality Check: Discovering Data not Accounted for Previously", below.

representations of spatial information as conveyed by East Norse texts.²⁹ Norse World thus maps literary places rather than actual historical or archaeological locations, which once again distinguishes the platform from the rest of the comparable resources.³⁰ Notwithstanding the general linguistic and temporal frames of the project outlined above—East Norse literary texts from before 1530—the textual and manuscript material itself often challenges any attempt to implement a relatively stable temporal and spatial frame. For instance, the Old Swedish *Consolation of the Soul* is a multi-layered compilation that encompasses a wide range of narratives from different sources, including excerpts from a biblical paraphrase as well as saints' lives. Moreover, the majority of texts and manuscripts have been in use for a long time and read for different purposes.³¹ For these reasons, the project team opted for a largely anachronistic approach to geocoding based on modern coordinates already at the planning stage. Mapping is thus seen as a short cut to an overview of large amounts of geocoded data rather than an accurate representation of historical places from a specific time period.³²

Reality Check: Discovering Data Not Accounted for Previously

The original project proposal stated that four types of spatial references were to be collected from the Old Swedish and Old Danish literary corpus: toponyms; adjectives;

²⁹ For more details, see the section “Norse World Visualization Techniques”, below.

³⁰ For instance, for Pleiades, DARE, and Mapping Lived Religion, see Ellis Nilsson et al.—and also Dam, and Karsvall—all this volume. ISM is the resource closest to Norse World with respect to material mapped. The primary focus of ISM on place-names as linguistic invocations of actual places in Iceland differs from that of Norse World, however; see Lethbridge, and Petrulevich, both this volume.

³¹ See Backman, *Handskriftens materialitet*, 60–61; for more information, see Petrulevich, Backman, and Adams, “Medieval Macrospace through GIS.”

³² Likewise, the “Norse Perception of the World” project does not collect spatial information about the artifacts containing the texts—that is manuscripts, early prints, and runic inscriptions. Too little is known about the geographical provenance of Swedish and Danish medieval manuscripts; for this reason, most of the material is catalogued as having its origin in Sweden or Denmark. The situation is thus remarkably different from what is known about geographical origins of many manuscripts in, for instance, Iceland. Geographical distributions of Icelandic manuscript data can be compared with the distribution of text versions and text redactions of the same work or spatial information within the manuscripts; see McDonald Werronen, *Popular Romance in Iceland*, 29–59, and Lethbridge, this volume. This type of analysis is impossible to perform on the corresponding East Norse material.

At present, spatial information on Old Swedish manuscripts' place of origin can, for instance, be found at Manuscripta www.manuscripta.se/search (accessed April 22, 2021), where filters and advanced search options include such alternatives as “Country of Location” or “Place-name.” This resource was not available when the Norse World platform was designed, however. Norse World includes information on Old Swedish manuscripts' repositories, datings, types of support, and places of origin, etc., derived from Manuscripta; reference links are provided to the original resource; see Norse World, “Source and Related Metadata.”

inhabitant designations; and origin designations.³³ The toponyms in particular were divided into a number of subcategories, which reflects the fact that place-names are prototypical references used to denote locations and the well-established conventional terminology used in onomastics. In the proposal, these subcategories were defined and illustrated with examples from the primary material. In total, the grant application made use of at least twelve categories, as appears from the following overview:

1. toponyms, including:
 - a) choronyms; b) hydronyms; c) hodonyms; d) oronyms; e) names of other natural features; f) names of fields; g) names of settlements; h) names of places of worship, sacral names; i) names of urban features, urban names;
2. adjectival forms of place-names;
3. inhabitant designations;
4. origin designations.

In theory, the adjectival forms of place-names were meant to be classified in the same way as the toponyms, and therefore the number of subcategories in fact was much larger: “These adjectives will be classified in the same manner as the toponyms (“fransos”, “bemisker” = choronym/country; “romersk”, “venedisk”, “hagensker” = oikonym/city).”³⁴

The project team has chosen to include non-proprial material because of perceived expectations of future users: “Although these terms are not place-names proper, they are important for our understanding of what medieval Scandinavians knew about places abroad and what associations they had with them.”³⁵ This decision proved to be of much relevance when faced with material not accounted for previously. In the end, the database ended up with eight non-name categories, because among spatial references attested in the material there were, for instance, coins such as *florin* from Florence, languages such as *greska* (Greek), and noun bynames such as the Runic *romfarari* (“traveller to Rome”). All these categories of spatial references clearly belong to location-based data.

Table 1.1 shows an overview of types of non-names in the Norse World resource. The “Adjective” category is in fact not subdivided, as was planned initially. The inclusion of adverbs, a category with only two synonymous members, *utlændis* and *utenlands* (“abroad”), mirrors a slight alteration of the editorial practice, inasmuch as attestations without precise denotation of locality were included if these expressed orientation or other kinds of geographical perception. The frequently occurring adjective Old Swedish *fræmadher* (“foreign”) as well as the noun phrase Old Swedish *Fræmadha land* (“foreign land”)—treated as a choronym—are the most prominent examples of vaguely localized places. The main argument for inclusion of these language items relates to their function—that is, that they, similarly to the excerpted traditional geographical names

³³ Adams, Backman, and Petrulevich, “Fornnordisk omvärldsuppfattning,” 6.

³⁴ Adams, Backman, and Petrulevich, “Fornnordisk omvärldsuppfattning,” 7.

³⁵ Adams, Backman, and Petrulevich, “Fornnordisk omvärldsuppfattning,” 8.

Table 1.1 Types of non-names in Norse World.

Adjective
Adverb
Coin designation
Inhabitant designation
Language designation
Noun
Noun byname
Origin designation

and non-names, exemplify medieval understanding of the world, and therefore ought to be included. Vagueness is also the main characteristic feature of another group of location-based data, namely what we in the project group refer to as fictional places—that is, spatial references without localizations or with contextually problematic localizations;³⁶ this group of spatial references partly paved the way for the inclusion of the aforementioned *utlændis*, *Fræmadha land*, etc.

The original nine place-name categories had—it turned out—to be supplemented, since fortifications in particular were considered not to fit into the category of settlement names, which resulted in the category “Name of a man-made feature.”

It was not just the linguistic categories discussed above that were supplemented in the course of the project. As the material was excerpted, it appeared that new categories of localities were needed, and at present the database includes fifty-five types of localities; see Table 1.2.

In practice, some of these categories are not yet used; for instance, no bridge, canal, marsh, or other site of Muslim worship has hitherto been found in the material.

“Larger region” is a new category of a purely administrative nature, introduced in order to support one of the project’s visualization techniques.³⁷ Six places belong to this category: the Middle East; northern Africa; eastern Europe; northern Europe; southern Europe; and western Europe—and none of these were conceptualized in the medieval material.

The fact that the material studied in various ways extends beyond the limits thought of at the planning stage of the project is probably universal to all scholarly enterprises. In a digital humanities project, however, the simultaneous building of databases and other digital resources can increase the difficulty of altering principles at a later stage. In practice, this means that the digital structure often overrules another theoretically and methodologically informed structure, which from a scholarly point of view would

36 See Petrulovich, Backman, and Adams, “Data and Metadata,” for a more detailed presentation and examples.

37 See the section “Norse World Visualization Techniques” below.

Table 1.2 Types of localities in Norse World.

Archbishopric	Bath	Bay	Beach	Bishopric
Bridge	Canal	Castle	Cave	Cemetery
Church	City	Continent	Country	Desert
Field	Fjord	Forest	Fortification	Garden
Gate	Grave	Gulf	Harbour	Hill
House	Island	Lake	Larger region	Market
Marsh	Monastery	Mosque	Mountain	Other place of worship
Other site of Jewish worship	Other site of Muslim worship	Pass	Peninsula	Region
River	Road	Sea	Shore	Spring
Strait	Street	Synagogue	Tower	Tree
Urban region	Valley	Village	Volcano	Well

be more ideal. The simple reason for that is the time and staff costs required for any larger alterations. Moreover, by changing the rules of the game several years into the project, scholars would have to return to the already analyzed material to see whether the alteration had impacted previous data entry considerations. Sometimes the benefits of alteration offset the extra effort, but, as the parsed material grows, so does the structural inertia.

At a rather late stage in the extracting of material to the Norse World resource, the project team had to deal with the Old Danish *Vejleder for Pilgrimme* (*Pilgrims' Guide to the Holy Land*), in which locations of interest for the project are quite often referred to without names. Whereas *Ioachims hws* ("House of Joachim") in this text can easily be interpreted as a place-name (probably referring to the contemporary Abbey Church of St. Anne), *Then stædh, som war fruæ giordhe sin(æ) bønær* ("The place where the Virgin Mary read her prayers") is not a name, even if the spatial reference does pinpoint a location.³⁸ Given that the *Vejleder* is a unique text that on a very concrete basis demonstrates a perception of the Middle East—especially Jerusalem and the Holy Land—as it describes these places instead of merely referring to them, it became clear that these nameless places would be sought after by the users of Norse World, and that therefore they had to be included. But, instead of introducing a new category parallel to toponyms, adjectives, inhabitant designations, and origin designations, the descriptions in *Vejleder* were treated as place-names. This practice—yielding variant forms and lemma forms as if the descriptions were names—is unfortunate from an onomastic point of view, but it meant that the places could be included in the database. In addition, by dealing with the special

38 That might be the Abbey Church of St. Mary of Mount Zion; see Skovgaard Boeck, this volume.

case of *Vejleder* in a well-defined manner, the project could avoid having to reanalyze all the other texts to find examples of analogue descriptions in them.

The lesson to learn from this example is to choose the basis for a pilot investigation wisely. The pilot trials of the project were conducted on the place-name register of Henning's edition of the Old Swedish *Consolation of the Soul*, a religious treatise.³⁹ This choice was then justified—and still is—for two reasons. First, religious texts are a core domain in the East Norse literary corpus (probably more prevalent than the widespread chronicles and literary fiction), and, as such, *Consolation of the Soul* represents a prototypical text for the project. Second, the choice is reasonable from a very practical perspective: few East Norse text editions contain registers. Indeed, to establish an index to places in the East Norse corpus was precisely one of the purposes of the Norse World project. To include *Vejleder* in the preliminaries would have meant a lot of extra work. But, in hindsight, it would have been fruitful to base the proposal on pilot studies of several texts belonging to various genres as well as to include more peripheral religious texts in addition to the core narratives.

Building Norse World

At present it is more or less mainstream practice in science to implement innovative tech approaches and tools for effective project management and communication, such as the Scrum framework or social media.⁴⁰ Effective communication is obviously a necessity in a collaborative project environment, but it becomes even more critical if the parties involved come from different sectors and have different areas of expertise. The challenge is to bridge multiple gaps with respect to sector-specific communication standards, workflows, work environment cultures, and expertise, not to mention personality traits and individual preferences. Several issues related to effective communication and the challenges outlined above affected the progress of the Norse Perception of the World project. Two of the three original members of the project team⁴¹ had never worked collaboratively before the project started in 2017. The redirection of workflow from solo projects pursued by humanists working alone to a multisectoral collaborative environment took much of the project's valuable time, partly due to the lack of support functions for digital humanities projects or effective interdisciplinary leadership within the university system where the project was placed.⁴²

³⁹ *Siælinna Thrøst*.

⁴⁰ See, for instance, Adam, "A Project-Management Tool"; Delerue and Sicotte, "Effective Communication within Project Teams"; and Perkel, "How Scientists Use Slack."

⁴¹ Principal investigator Jonathan Adams and co-proposers Agnieszka Backman and Alexandra Petrulevich.

⁴² The Centre for Digital Humanities Uppsala at Uppsala University, www.abm.uu.se/cdhu-eng (accessed February 16, 2023), was established in 2018, two years after the project was granted funding. The Centre for Integrated Research on Culture and Society (CIRCUS) in charge of interdisciplinary initiatives in the humanities at Uppsala University, www.humsam.uu.se/circus-en (accessed February 16, 2023), was established a year later.

Communication challenges of this kind should have been—and were, of course—planned for. At the planning stage the project contacted an external tech company for an overview of the programming needs and times required for completion of each of the project's individual programming tasks, such as a user-friendly admin interface for data entry, a relational database, web design of the interactive platform, etc. The budget of 465 working hours based on the overview included 110 hours for meetings. This meeting budget easily could have been doubled, however. Since pilot trials were conducted, the researcher part of the project team was confident that we knew what we were building and approximately how this building process would go. The general idea that could not have been more wrong was that the programming would be conducted more or less separately from the rest of the project activities at the initial stage. Since none of the researchers had previous experience of tech workflows or collaborative digital humanities projects, the project once again would have greatly benefited from getting feedback on the project set-up from any type of digital humanities support function.

The initial stage of getting the project off the ground took approximately three times longer than expected. One of the major unforeseen obstacles was the public procurement regulations that the project's database and platform development part adhered to, a circumstance the project team was not aware of at the planning stage. Luckily, a compromise could be reached with the university administration, to the effect that Uppsala University IT services took over the programming tasks. Another obstacle related to the working situation of the project's researcher team. Two of four project members were stationed in Denmark, which had a significant impact on project management in general and internal communication in particular. Despite the weekly online meetings and the use of an online channel-based messaging platform⁴³ and other collaboration tools, it was difficult to meet the enormous need for constant input, feedback, and overall discussion of the project's tech components and set-up in the most efficient way.

Likewise, the programming part of the project team had little previous experience of working with researchers in a joint digital humanities project. The "programming hours" were soon transformed into "meeting hours", since we sat in meetings several days a week for about a year. On the one hand, the developers were expected to grasp and make use of philological and spatial humanities theories postulating logical links between different manifestations of language data and multi-layered metadata regarding spatial information as well as information about texts, sources, language, dating, etc. On the other hand, the researchers had at times little knowledge of what at all was possible to do or not regarding, for instance, database design. Moreover, it soon became apparent that the researchers sometimes saw things differently, which meant even more meetings to find solutions to the project's theoretical and methodological problems and to "translate" these solutions into relational links or other aspects of

43 Slack: <https://slack.com/intl/en-se> (accessed February 16, 2023).

infrastructure building. The final product, the Norse World resource, shows multiple examples of compromises reached by the project team. For example, the language metadata indicating if a spatial reference is in Old Swedish or Old Danish is placed at the work level—that is, text level—rather than directly at attestation level. In this case, the developers' ambition to reduce the probability of error in the researcher team's workflow won over the researchers' standpoint that the language metadata belong with each and every attestation.

When first test versions of the interactive platform were produced, the project team organized several rounds of interdisciplinary trials by future users to collect feedback. Seminars and workshops were held for an interdisciplinary public at, for instance, the Centre for Medieval Studies, Stockholm University, and the Society for Danish Language and Literature, Copenhagen, in February and March 2018 respectively. The feedback was absolutely crucial to understand if the infrastructure under construction lived up to the audience's needs and expectations. We were particularly interested in design issues, because the project team could not reach agreement on the choice of the most adequate presentation technique of search results. It turned out that humanities researchers showed most interest in getting an overview of large quantities of data presented as a lengthy and boring table—a design choice the developer team had to accept.

To conclude, a collaborative multisectoral digital humanities project is a challenging enterprise that requires efficient project management and communication. The Norse Perception of the World project did not have the best possible conditions for executing the complex task of infrastructure building. We could not involve the tech company we originally consulted. We could not get the best website solution for the platform, because the website design associated with Uppsala University has to adhere to the university's corporate rules.⁴⁴ We could not implement the latest developments for data reuse and interoperability, so-called linked open data, in the field.⁴⁵ The university did not have any maintenance plans for humanities e-infrastructure, which made arranging the platform's sustainability far from straightforward.⁴⁶ What we needed was a general support function for digital humanities projects offering in-house consulting regarding project set-up, programming, web design, etc. Ideally, there would be developers hired by this support function in order to help researchers with their project from the planning stage until completion.⁴⁷ In this way, it would be possible to reduce the project's meeting time considerably. Another item on the wish list is dedicated consulting on leadership

⁴⁴ After many rounds of negotiations, a compromise was reached with the university administration to allow the project to use an external page for the interactive platform: <https://norseworld.nordiska.uu.se> (accessed February 16, 2023). The description of the project and other documentation are stored at another university webpage: www.uu.se/en/research/infrastructure/norseworld (accessed February 16, 2023).

⁴⁵ See Backman and Smith, this volume.

⁴⁶ See Backman and Smith, this volume.

⁴⁷ At the time of writing, the Centre for Digital Humanities Uppsala at Uppsala University is hiring several developers for this purpose.

and communication in interdisciplinary environments, including implementing tech approaches to project management, such as Scrum, in digital humanities environments.

Norse World Visualization Techniques

All historical atlases and gazetteers have to deal with the spatial and temporal discontinuity that borders and landscape change over time.⁴⁸ To construct a map visualizing the medieval world from an East Norse perspective—covering a tumultuous period of some five hundred years—would be a research project in its own right. Furthermore, such a project would have to build on the data initially collected by the Norse Perception of the World project. As there were no gazetteers matching the project's needs already available,⁴⁹ we had to make do with modern cartographic visualizations of a world utterly different from the one perceived by medieval Danes and Swedes. This of course leads to an unfortunate anachronism, but in our view the benefits of visualization outweigh the disadvantages of chronological inaccuracy. To compensate, however, the Norse World resource allows users to alter the background map to a borderless and nameless map in watercolours.

In practical terms, most locations in the Norse World database are assigned with coordinates. This is straightforward, when the location in question is known and still exists, even though—as mentioned—borders have moved over the centuries. Thus, coordinates for England, Normandy, and Rome are easily copy-pasted from a digital gazetteer, normally from GeoNames,⁵⁰ and a permalink to the gazetteer is added to the database. The information found in the gazetteer is not questioned, and locations are always visualized as points, although, for a large number of places, polygons would have been preferable. Since we have chosen to employ a Leaflet-based clustering technique that requires point data, the lack of polygons was not seen as a major issue.⁵¹ Information on the extent of a location is partly given in the database, however, where a variety of types of locality are used to distinguish between, for instance, cities, countries, regions, etc.

Problems arise only when a locality is not known today, and thus does not occur in a modern gazetteer.⁵² In most cases, it is impossible to give precise coordinates to a locality. In particular, fictional places are problematic in this respect. Since fictional places are rather frequent in the East Norse material, it was necessary to find a way to visualize them as well. The solution to this problem was to embed places in larger areas: cities within countries, and countries within regions. In the Norse World database, this information is labelled “Located in.” Based on the editor's reading of the concrete

⁴⁸ See Dam, this volume.

⁴⁹ See Petrulevich, Backman, and Adams, “Medieval Macrospace through GIS,” and Petrulevich, this volume, for more information.

⁵⁰ See www.geonames.org (accessed February 16, 2023).

⁵¹ For more information, see Petrulevich, “Data Visualisation.”

⁵² GeoNames does include some historical sites that have been used in the project.

text, it was often possible to locate a fictional place within a narrower span, and, for the sake of visualization, a “Show as” field was added to the database. For instance, the forest Asiant in the East Norse romance of *Duke Frederick of Normandy* is located in France, but visualized as Normandy, since the text “specifies that this forest is placed in Normandy,” as it is stated in a note in the database entry for the standard form “Asiant.”⁵³

This solution proved useful to visualize non-fictional places as well, making it possible, ideally, to find all localities in, for instance, a specific country. And the hierarchy was thus added to most localities in the database, so that not only is Paris explicitly located in France but also adjectives, adverbs, coins, and all other spatial entities are given “Located in” attributes, and entities that are not themselves precisely located with coordinates are given “Show as” attributes.

It is important to emphasize that the localization and visualization of places are principally based on the texts, and that this can lead to disagreement with the texts’ source texts and with our modern understanding. For instance, the fictional city Apolis in the East Norse *Floris and Blancheflor* is rendered without a visualization in the Norse World database, since relevant manuscripts do not mention a more precise location, even though some scholars argue that the form is a contamination based on the Charlemagne legend in which a fictive Spanish city, Nople or Noples, occurs.⁵⁴ Instead of locating Apolis in Spain, the notes of the database entry summarize this discussion with a reference.⁵⁵ Similarly, the city of Babylon appearing in the same text is, in the Norse World resource, identified with Babylon in present-day Iraq, mentioned in other texts as well. Even though French sources identify the Babylon of *Floris and Blancheflor* as another name for—or a suburb or part of—Egyptian Cairo, we argue—but perhaps not persuasively—that the existence of a biblical Babylon in the minds of medieval Swedes and Danes would lead them to conclude that the Babylon mentioned in *Flores and Blancheflor* was identical with this, when the text itself does not clearly point in another direction.⁵⁶

Textual interpretation was also crucial when dealing with a frequent spatial entity of other-worldly nature: Paradise. As stated in the original proposal, “‘Paradis’ when referring to the Garden of Eden and the source of the four rivers (after St. Augustine) is included, as it was believed to be somewhere around modern-day Iraq.”⁵⁷ So far, Paradise has been excerpted 134 times in the corpus. The name occurs more often than that; the spatial reference is included in the database, however, only when the source text explicitly refers to it as a physical place in the world. In such cases, the spatial reference is visualized as located in the Middle East, because biblical places without evident modern equivalents are visualized as located in this region.⁵⁸

53 Skovgaard Boeck, “Asiant.”

54 Grieve, *Floire and Blancheflor*, 47–48.

55 See, e.g., Backman, “Apolisborgh, Aplesburgh (Apolis Castle).”

56 See discussion in Lodén, this volume.

57 Adams, Backman, and Petrulevich, “Fornnordisk omvärldsuppfattning,” 7.

58 For more information, see Petrulevich, Backman, and Adams, “Data and Metadata.”

Final Remarks

The Norse Perception of the World project has built one of the first humanities digital spatial infrastructures for research focused on literary representations of spatial information in medieval literature. The Norse World resource is one of the very first examples of this type of infrastructure nationally in Sweden and locally at Uppsala University. Moreover, the project's interest in names rather than places is another reason why Norse World occupies a niche of its own among largely comparable gazetteers. Obviously, leading a pioneering multisectoral project implied multiple challenges for the project team, since no support functions or off-the-peg solutions with respect to theory, methodology, or practicalities such as plans for maintenance, updates, and further development of applications were available at the time.

In this chapter, we have shared several lessons we have learned in the project, including approaches to pilot trials and new unexpected data types that may challenge the database design and the data entry process. It is preferable to conduct pilot trials on heterogeneous source material in order to discover potentially problematic aspects of data at an early stage. Another general piece of advice is to be creative when it comes to reinterpreting the project's database schema to incorporate more peripheral data types. As long as there is sufficient documentation, the infrastructure users will be able to deal with such reinterpretations, by, for instance, excluding peripheral data via filtering techniques when conducting tailored searches. As it was stated, the prototypical spatial references in the Norse World resource, place-names, still predominate in the database. It was crucial for the project to incorporate other data types, however, to ensure the database can be used to study medieval spatiality and worldviews by as many user groups as possible.

As for successful project management and communication, it is impossible to emphasize enough how crucial overarching support functions for digital humanities and other interdisciplinary initiatives are for success in infrastructure projects. The Norse World team often felt alone in their local departmental work environment building complex, multi-layered infrastructure for the whole humanities sector. We would have benefited enormously if we had had access to consulting services and could have started drafting a relational database at a much earlier stage. In this respect, it is of much importance to have access to both scholars and developers with experience of multisectoral collaborative projects. Dedicated leadership resources, overviews, and pilot trials of collaborative tools and frameworks such as Scrum are also much needed.

Finally, the Norse Perception of the World project introduced some innovative approaches to visualization in order to incorporate and enforce contextualized readings of East Norse literature in chosen visualization techniques. We have introduced several fields such as "Located in" and "Show as" into the database structure to be able to visualize fictional places as well as non-proprial data types. The fact that the project employs only point data can be seen as problematic, but the choice of appropriate clustering technique has been decisive in this respect. After all, the major priority of the project's spatialization framework and geocoding procedure was to give Norse World users an overview of large amounts of geocoded spatial references from medieval literature rather than represent historical and archaeological data with the highest grade of precision.

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