

# Changing Practices

## Practices of Historians

In considering historical scholarship, I have focused on what it is that historians do. I have thereby taken a social perspective of historical scholarship, analysing how historians construct their research through practices that render them recognisable and legitimate as historians. This stands in contrast with an epistemic perspective of historical scholarship consisting of what makes particular research questions historical questions or certain knowledge contributions to historiography. I thereby follow what has been called the “practice turn” in studies of scholarship and science.<sup>393</sup> While this so-called turn originated in studies of natural sciences and laboratory experiments, the conceptualisation of science as a set of mutually recognised practices rather than a highly specific type of knowledge renders this lens useful for studying historical scholarship as well.<sup>394</sup>

What practices then make a historian recognisable as practicing historical scholarship? In some cases, such practices may concern seemingly quaint details that strongly signify the presence of lack of historical practices, for example in the use of footnotes.<sup>395</sup> A full review of all such historical practices is beyond the scope of this book, but in the literature several fundamental practices become apparent.

Historical scholarship arguably fundamentally centralises practices surrounding the primary sources that are analysed. It is for this reason that the history of historical research is commonly traced back to Leopold van Ranke (1795–1886) who set ambitions for historical scholarship as the rigorous study of archival source material.<sup>396</sup> A first fundamental practice of historians then is archival research, as repeated by the professor in history in quote Q63 in the previous

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**393** Andrew Pickering, ed., *Science as Practice and Culture* (The University of Chicago Press, 1991); Theodore R. Schatzki, Karin Knorr-Cetina and Eike von Savigny, eds., *The Practice Turn in Contemporary Theory* (New York: Routledge, 2001).

**394** Hans-Jörg Rheinberger, “Culture and Nature in the Prism of Knowledge,” *History of Humanities* 1, no. 1 (2016): 155–81, <https://doi.org/10.1086/685064>.

**395** Anthony Grafton, *The Footnote: A Curious History* (Cambridge, Mass: Harvard University Press, 1999).

**396** Iggers, “The Professionalization of Historical Studies and the Guiding Assumptions of Modern Historical Thought”; Iggers, “The Crisis of the Rankean Paradigm in the Nineteenth Century.”

chapter.<sup>397</sup> Wilhelm Dilthey (1833–1911) furthermore argued that a historian should interpret a document by placing it in its historical context and try to read it through a historical viewpoint, rather than seeing sources as direct reflections of the past. A second fundamental practice of historians then is hermeneutics. Finally, following the arguments of Von Ranke, Dilthey and Johann Gustav Droysen (1808–1884), a third fundamental practice is source criticism.<sup>398</sup> Source criticism consists of the analysis of sources through external criticism, verification of the authenticity of a source and internal criticism, interpretation of what was written and why.<sup>399</sup> The philosopher Hans-Georg Gadamer summarised the fundamental practice of hermeneutical interpretation of sources as follows:

[I]n Dilthey's grounding of the human sciences hermeneutics is more than a means. It is the universal medium of the historical consciousness, for which there no longer exists any knowledge of truth other than the understanding of expression and, through expression, life. Everything in history is intelligible, for everything is text. "Life and history make sense like the letters of a word." Thus Dilthey ultimately conceives inquiring into the historical past as deciphering and not as historical experience.<sup>400</sup>

In studying the practices of digital history, a matter of concern becomes to what extent these practices of deciphering the past through sources are transformed or perhaps even replaced. With respect to archival research, historians such as Lara Putnam and Julia Laite show how the vastly improved accessibility and findability of source material alters the questions that can be asked and answered, since sources can easily be collected from multiple archives across the globe.<sup>401</sup> Historians such as Gerben Zaagsma and Helle Strandgaard Jensen as well as digital library experts such as Trevor Owens and Thomas Padilla argue that this change in archival research demands changing practices of source criticism, especially with regard to external source criticism in reflecting on the politics

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**397** Eskildsen, "Leopold Ranke's Archival Turn: Location and Evidence in Modern Historiography"; Kasper Risbjerg Eskildsen, "Inventing the Archive," *History of the Human Sciences* 26, no. 4 (2013): 8–26, <https://doi.org/10.1177/0952695113496094>.

**398** Philipp Müller, "Understanding History: Hermeneutics and Source-Criticism in Historical Scholarship," in *Reading Primary Sources: The Interpretation of Texts from Nineteenth- and Twentieth-Century History*, ed. Miriam Dobson and Benjamin Ziemann (Routledge, 2009), 21–36; Fickers, "Update Für Die Hermeneutik."

**399** John Tosh, *The Pursuit of History: Aims, Methods and New Directions in the Study of History*, 6th ed. (Routledge, 2015).

**400** Gadamer, *Truth and Method*, 243, emphasis in original.

**401** Putnam, "The Transnational and the Text-Searchable: Digitized Sources and the Shadows They Cast"; Laite, "The Emmet's Inch."

of digitisation, adding questions such as why a source was digitised.<sup>402</sup> Internal criticism moreover demands new practices as well, insofar as the ability to understand the importance of a document is hindered due to the loss of materiality, where size, smell, fingerprints or other damages might indicate the importance or use of a document.<sup>403</sup> In addition, the historian Mats Fridlund writes of digital resource criticism as the critical reflection on the tools and software used to consult digital sources.<sup>404</sup> Finally, the historian Andreas Fickers argues that such changes in (digital) source criticism demand a new digital hermeneutics to reflect on how a source can be interpreted when it is consulted via a user interface or is aggregated and analysed as data.<sup>405</sup>

As I argued in Chapter 2, such descriptions of changing practices arguably present digital history as disconnected-asymmetric-homogeneous (subversive) trading zones. That is, historians are presented as passive users of technology, engaging with tools and systems designed by others without the means or control to change those technologies. It is the technologies that are presented as shaping historical practices, insofar as digital objects, OCR or user interfaces enable and confine how historians can conduct their scholarship. In this book, however, I look at the digital history that is produced when historians engage with computational experts during the development of technologies. In this final chapter, I consider the extent to which practices of historians engaged in cross-disciplinary collaborations change. This chapter thereby explores the third and final dimension of trading zones, namely that of changing practices.

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**402** Helle Strandgaard Jensen, “Digital Archival Literacy for (All) Historians,” *Media History* (2020), 1–15, <https://doi.org/10.1080/13688804.2020.1779047>; Zaagsma, “On Digital History”; Trevor Owens and Thomas Padilla, “Digital Sources and Digital Archives: Historical Evidence in the Digital Age,” *International Journal of Digital Humanities* (2020), <https://doi.org/10.1007/s42803-020-00028-7>; see also Thylstrup, *The Politics of Mass Digitization*.

**403** See also the exploration by the digital humanist Alan Liu on how digital media affects our sense of history: *Friending the Past: The Sense of History in the Digital Age* (Chicago ; London: The University of Chicago Press, 2018).

**404** Mats Fridlund, “Digital History 1.5: A Middle Way between Normal and Paradigmatic Digital Historical Research,” in *Digital Histories: Emergent Approaches within the New Digital History*, ed. Mats Fridlund, Mila Oiva and Petri Paju (Helsinki University Press, 2020), 69–87, <https://doi.org/10.33134/HUP-5-4>.

**405** Fickers, “Update Für Die Hermeneutik.”

## Changing and Exchanging Practices in Trading Zones

The studies described in the previous two chapters provide insight into the changing practices of historians in digital history collaborations. In Chapter 3, I described how the University of Luxembourg institutionalised digital history through the establishment of the Centre for Contemporary and Digital History (C<sup>2</sup>DH) and the Digital History Lab. I found that some historians indeed exemplified changing practices where they adopted computational technologies for their scholarship. For example, a few scholars, mainly in PhD positions, tried digital experiments of distant reading in the Digital History Lab, digitising collections and using the available computers for their experiments. Two PhD candidates explored 3D scanning, using the available 3D scanners for objects outside of the lab. Yet the Digital History Lab required efforts in communication and hiring procedures to attract historians to engage with the facilities.

Likewise, as part of the C<sup>2</sup>DH, several historians adopted digital methods or conducted digital experiments such as publishing digital collections on websites or distant reading documents or born-digital sources (notably using LDA topic modelling).<sup>406</sup> A Digital Research Infrastructure (DRI) unit was established to support such digital projects. Yet a significant decision by the DRI unit was to provide tools tailored to each project, rather than a standardised infrastructure on which historical projects could or should be implemented. Historians were moreover not pushed to adopt digital methods.

In Chapter 4, I described several case studies of digital history collaborations in which historians collaborated with cross-disciplinary partners from computational disciplines. Within these collaborations, incentives emerged that were indeed new for historians, notably incentives around tool development, tool usage and the production of a transformed dataset. Research included tasks and practices not towards the production of a monograph or article, but towards the development of digital tools and datasets for adoption in the historical community.

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**406** For more elaborate discussions of the potential of LDA topic modelling for historical research, see René Brauer and Mats Fridlund, “Historicizing Topic Models. A Distant Reading of Topic Modeling Texts within Historical Studies,” in *Cultural Research in the Context of “Digital Humanities”: Proceedings of International Conference 3–5 October 2013, St Petersburg*, ed. L.V. Nikiforova and N.V. Nikiforova (2013), 152–63; Jo Guldi, “Critical Search: A Procedure for Guided Reading in Large-Scale Textual Corpora,” *Journal of Cultural Analytics* (2018), <https://doi.org/10.22148/16.030>; Simon Hengchen, “When Does It Mean: Detecting Semantic Change in Historical Texts” (PhD thesis, Université Libre de Bruxelles, 2017); Glenn Roe, Clovis Gladstone and Robert Morrissey, “Discourses and Disciplines in the Enlightenment: Topic Modeling the French Encyclopédie,” *Frontiers in Digital Humanities* 2 (2016), <https://doi.org/10.3389/fdigh.2015.00008>.

The use of tools was an incentive to demonstrate the utility of the developed tools, as well as the promise of digital history. Yet not all historians in the collaborations subscribed to these incentives. Rather, these incentives were largely limited to the coordinator and the professor in history as PI of the collaboration. Other historians instead exemplified detachment, detaching their historical research from the collaboration to ensure that their work could continue and remain recognisable as contributing to historical scholarship.

I furthermore found several changes in practices that were, however, arguably not the result of engagement with computational experts. The boundaries between the C<sup>2</sup>DH and the Institute for History were significantly influenced by political and institutional interventions, rather than practices of digital history. While the historians in the centre did change their practices and formed a group identity, this was not necessarily in the direction of computational practices.

Similarly, the collaborations in Chapter 4 were shaped by external parties in ways not necessarily in the direction of computational practices. Funders shaped the practices of collaboration instigators by setting boundaries of what should be delivered in order to remain eligible for future funding. Perhaps even more significantly, funders set deadlines for when collaboration results needed to be delivered, imposing limitations on the time historians could spend on acquiring additional sources or the further development of digital tools. Cultural heritage institutes, in the role of external data providers, shaped collaborations through limitations of what could be done with data and the time required to transform data to suitable forms for the technologies under development.

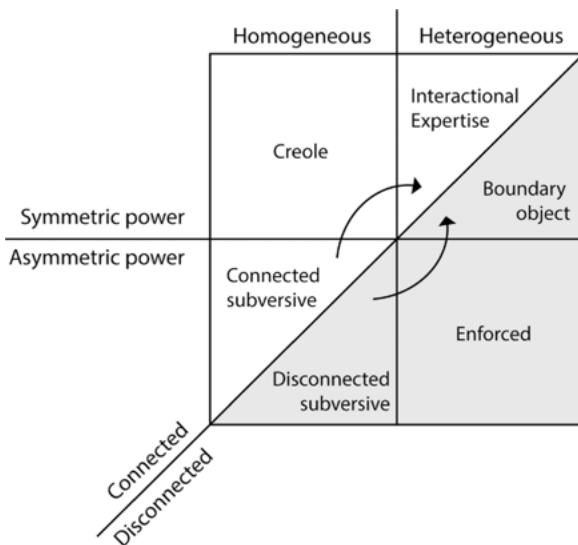
Such examples of changing practices could be interpreted as constituting disconnected-asymmetric-homogeneous (subversive) trading zones, in the sense that historians did not continuously engage with funders or data providers to negotiate what needed to be done. Yet this lack of continuous engagement enabled collaborations to recontextualise and reimagine demands or datasets, thereby remaining in control to shape their own practices. I argue that the professors in history as PIs of the collaborations therefore pushed the trading zones towards disconnected-symmetric-heterogeneous (boundary object) trading zones, in the sense that requirements and datasets could mean different things to different communities of people. Rather than align all collaborators around a singular understanding, the project and dataset were used as boundary objects to enable engagement were needed.

In Chapter 4 I furthermore identified connected-asymmetric-homogeneous (subversive) trading zones, where historians engaged and negotiated with computational experts yet remained unable to ensure the tools and systems met historical requirements. Historians were dependent on computational experts for the development of technologies that would facilitate historical research. Yet they

lacked knowledge of how computational experts conducted their work and were consequently unable to shape the practices of computational experts. In these cases, professors in history as PIs emphasised the need to develop know-how to ensure better control in future collaborations. I argue that they thereby aimed to steer these trading zones towards connected-symmetric-heterogeneous (interactional expertise) trading zones where historians would possess the knowledge to ensure they could protect their historical practices in mutual negotiation with computational experts.

In short, professors in history actively pushed toward trading zones of interactional expertise and boundary objects, as represented in Figure 7. The resulting trading zones correspond to the characterisation of digital humanities by Patrik Svensson as a heterogeneous space of collaborative (symmetric) negotiation.<sup>407</sup> Yet my findings expand Svensson's characterisation in two notable ways.

First, that digital history largely consists of symmetric-heterogeneous trading zones is not by nature. What the professors in history across the different



**Figure 7:** Pushing asymmetric-homogeneous (subversive) trading zones into symmetric-heterogeneous (fractioned) trading zones. Note that in this process trading zones are not necessarily pushed from connected to disconnected or vice versa.

<sup>407</sup> Svensson, “The Digital Humanities as a Humanities Project.”

digital history trading zones shared was their mutual objective to actively push collaborations towards symmetric-heterogeneous trading zones. Their goal was to enable collaboration between historians and computational experts without demanding historians become homogeneous with computational experts. Instead, they ensured that their historical collaborators would remain in control of their own research. They allowed their historical collaborators to detach the historical work from the goals of the collaborations when and where necessary. Digital history collaborations did not organically grow into symmetric-heterogeneous trading zones but were the product of deliberate design and continuous negotiation.

Second, Svensson arguably characterises digital humanities more specifically as disconnected-symmetric-heterogeneous trading zones when he identifies “the digital” as the boundary object around which these trading zones emerge. Yet my findings demonstrate that perhaps even more important are the connected-symmetric-heterogeneous trading zones of interactional expertise. It is this development of interactional expertise, or “know-how” as my interviewees called it, that enabled and sustained the digital history trading zones.

### Interactional Expertise and Brokerage

Throughout this book I describe multiple examples of scholars engaging in cross-boundary practices, developing know-how and adopting practices not originating from historical scholarship. In Chapter 3, I describe the professor of digital history and director of the centre, who initiated and managed cross-disciplinary collaborations as well as political negotiations. In Chapter 4, I discuss the role of professors in history connecting the incentives in collaborations between collaboration instigators, historians and technologists, and enabling collaborations by receiving grants from funders. Bridging practices and incentives between distinct communities, these professors acted as what Étienne Wenger calls “brokers”. Brokers are actors that are able to introduce aspects of one community of practice into another, connecting the two communities and enabling coordination. Brokers do so by “processes of translation, coordination, and alignment between perspectives”, acts that are exemplified by the professors in history that I describe in the previous chapters.<sup>408</sup>

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408 Wenger, *Communities of Practice*, 109.

To better understand what brokerage entails, the sociologists Katherine Stovel and Lynette Shaw in their review of this practice describe two dimensions.<sup>409</sup> First, bias refers to the extent to which a broker is closer to one community than the other. For example, a broker might know more individuals from one community than the other or have better knowledge of their individual research projects. A broker might have a background in history and thereby have more affinity with other historians, even when not conducting historical research within a collaboration themselves. Leaders of digital history collaborations tended to come from history. The bias of brokers was thus towards history. Yet this bias did not necessarily mean that brokers prioritised historical incentives and practices over computational ones.

The second dimension is cohesion, referring to the extent to which one or both sides are cohesive groups or loose individuals. Cohesion is linked to group identity, where a cohesive community could be more likely to reject a broker as not part of their group. Some historians described in the previous preferred to collaborate with individual software developers rather than computer scientists, as this made it easier to set the agenda of development. Computer scientists formed a cohesive group sharing incentives and practices, and as such they could secure and protect their practices during negotiations. Software developers instead were hired on an individual basis and were much more dependent on the requirements posed by the collaboration instigators. In Chapter 3, it was institutionalisation that shaped cohesion. While historians and computational researchers together formed a group in the Luxembourg Centre for Contemporary and Digital History (C<sup>2</sup>DH), historians from the Institute for History formed another group. Brokerage between historians and computational researchers within the centre or brokerage between historians of the two units proved fairly fruitful, since in both cases there was a shared group identity, respectively institutional and disciplinary. Brokerage between the historians of the institute and computational researchers of the centre was, however, much more difficult.

Furthermore, Stovel and Shaw describe an incentive for brokerage in the ability to gain profits or power by being central to interactions between separate communities. The interacting communities are dependent on the broker, so that the broker can exploit their central position. The broker moreover has an information advantage with respect to the separate communities, being able to act on or emphasise the information that is to their advantage. It could be argued that the brokers in my investigations had an advantage for funding applications, being

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**409** Katherine Stovel and Lynette Shaw, “Brokerage,” *Annual Review of Sociology* 38, no. 1 (2012): 139–58, <https://doi.org/10.1146/annurev-soc-081309-150054>.



able to draw upon a network of collaborators and synthesise perspectives. However, within a collaboration, I found brokers were mainly dependent on their collaborators to fulfil their tasks (e.g., quote Q40 in the previous chapter). This indicates that brokers did not gain a power advantage as a result of their brokering within the collaboration.

The exploitation of brokerage is related to the role the broker takes in the connection. Stovel and Shaw distinguish between brokers as intermediaries or as catalysts. As intermediary, all information between the historians and computational experts has to pass through the broker, providing a power advantage. This is the model that is invoked with Jennifer Edmond's concept of "digital humanities intermediary", who should be someone "at an early point in the value chain who has a broad knowledge of computing and research and a *mandate* to disseminate this information".<sup>410</sup> In contrast, as catalyst, the broker only makes the connection by introducing the historians and computational experts, after which the broker is no longer required or mainly serves to solve problems of interactions. This is the model argued by the software developer Tracey Berg-Fulton and her collaborators, who write that the catalyst in digital art history collaborations "serves as the collaborative glue, creating the critical, translational linkages needed between all of these skill-sets, ensuring that communication and progress are systematically made".<sup>411</sup> Here too, the catalyst requires some power mechanism to make final decisions when historians and computational experts disagree and to keep the collaboration aligned towards a common goal. The need for a power advantage explains why the professors in history were more likely to serve as broker rather than the envisioned collaboration coordinators who were regularly in junior or non-research positions. This suggests that a power advantage is a precondition for rather than a result of cross-disciplinary brokerage. Since brokers may opt to act as intermediary or catalyst depending on local contexts, I employ the broader term digital history broker.

A difficulty of brokerage is that brokers need to preserve the balance of not becoming full members of any one community nor be rejected.<sup>412</sup> Despite their bias towards history, brokers would not always align with the historians in a collaboration, sometimes prioritising technological over historical goals. Instead, brokers

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**410** Edmond, "The Role of the Professional Intermediary in Expanding the Humanities Computing Base," 373, emphasis mine.

**411** Tracey Berg-Fulton et al., "A Role-Based Model for Successful Collaboration in Digital Art History," *International Journal for Digital Art History*, no. 3 (2018): 159, <https://doi.org/10.11588/dah.2018.3.34297>.

**412** Wenger, *Communities of Practice*, 110.

embodied the vision of digital history as “dual citizenship” or “in-betweenness”.<sup>413</sup> From this position, brokers recognise the “existence of a problem space shared by a technological and a historical question”.<sup>414</sup> In other words, digital history brokers are able to recognise both the historical and the technological research problems to draw connections and possible synergies between them.<sup>415</sup>

Besides social connections to collaborators from both history and computational domains, digital history brokers need to have an understanding of the practices and discourses of both sides. In the trading zones model, these brokers are called interactional experts: “in order to broker trades, interactional experts will have to understand not only the content of another domain but also its perspective – the way it frames the problem”.<sup>416</sup> Digital history brokers are, therefore, those who can recognise a common research problem by considering it from both the historical and the computational perspectives. The ability to act as broker consequently depends on a scholar possessing interactional expertise.

Harry Collins and Robert Evans, who coined the term, distinguish three levels of expertise: no expertise, interactional expertise and contributory expertise.<sup>417</sup> Contributory expertise is what one holds in their own discipline, enabling them to contribute to research, publish and apply for jobs. When PhD candidates in history learned from professors in history how to do research, they learned how to write a historical thesis that contributes to the historiography and learned how to act as historians. Interactional expertise is instead defined as being able to interact interestingly with contributory experts. As such, interactional expertise is proposed to be the ability to participate in the language of one community, but not

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**413** Svensson, “The Digital Humanities as a Humanities Project”; Patrik Svensson, “Envisioning the Digital Humanities,” *Digital Humanities Quarterly* 6, no. 1 (2012).

**414** Berg-Fulton et al., “A Role-Based Model for Successful Collaboration in Digital Art History,” 159.

**415** An interesting avenue for future research that I did not investigate is whether digital history brokers are able to solve the paradox of digital history. This paradox is a classic problem of the chicken or the egg, asking what comes first; digital history research questions using future methods or digital history methods facilitating future questions? Historians need to come up with the research questions that benefit from computational approaches, while computational experts need to develop the computational approaches to facilitate those research questions; see Boonstra, Breure and Doorn, “Past, Present and Future of Historical Information Science.”

**416** Michael Gorman and Jim Spohrer, “Service Science: A New Expertise for Managing Socio-technical Systems,” in *Trading Zones and Interactional Expertise: Creating New Kinds of Collaboration*, ed. Michael Gorman (MIT Press, 2010), 84.

**417** Harry Collins and Robert Evans, “The Third Wave of Science Studies: Studies of Expertise and Experience,” *Social Studies of Science* 32, no. 2 (2002): 235–96, <https://doi.org/10.1177/0306312702032002003>.

their practices. For example, a professor in history might be able to discuss with a computational expert the nature of an algorithm, without the ability to write code themselves. Interactional experts to that end develop an inter-language, a language between languages.

In the previous chapter I described that brokers were actively learning in digital history collaborations, developing know-how. Through the interactions between historians and technologists, brokers learned how to understand the technology, the data and how to conduct project management. This development of know-how was even seen as a key outcome of digital history collaborations. In cases where knowledge asymmetry led to power asymmetry, the development of interactional expertise was emphasised to improve brokerage in future collaborations, in order to restore symmetric power relations.

The importance of the concept of interactional expertise becomes clear when Harry Collins and his collaborators write that:

Could it be that the growth of [creole trading zones] is the unusual case? It may be that, when examined closely, what appear to be integrated networks of scientists are really conglomerations of small groups bound together by rich interactional expertises. [. . .] The interactional expertise trading zone seems so widespread that it might be argued that this, rather than the [creole trading zone] model, it is the norm for new interdisciplinary work.<sup>418</sup>

When analysing interdisciplinary work such as digital history, we might therefore expect to find networks of interactional experts, rather than a homogeneous community of practice. Pidgins or jargons as inter-languages employed by interactional experts may thus prove to be the norm for interdisciplinary collaborations, rather than creole as trading zone. The inter-language of interactional expertise is developed through social interactions and enculturation within another community, thereby coming to understand both explicit linguistic and tacit knowledge of a discipline. A broker consequently possesses the discursive proficiency to translate between the two communities.<sup>419</sup> It is, therefore, argued that interdisciplinary collaborations require an interactional expert to enable translation and coordination.<sup>420</sup>

An important difference, however, is in the individual nature of interactional expertise. Every broker might develop their own inter-language as required during the collaboration to ensure interactions between the historians, technologists

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**418** Collins, Evans and Gorman, “Trading Zones and Interactional Expertise,” 661–62.

**419** Robert Evans and Harry Collins, “Interactional Expertise and the Imitation Game,” in *Trading Zones and Interactional Expertise: Creating New Kinds of Collaboration*, ed. Michael Gorman (MIT Press, 2010), 53–70.

**420** Collins and Evans, “The Third Wave of Science Studies.”

and collaboration instigators remain fruitful and interesting. There is thus not necessarily a collective inter-language of digital history, since brokers come from different backgrounds and encounter different problems. Furthermore, with a collective inter-language there would no longer be a necessity to translate back into one's discipline, since the inter-language acts as a new discipline by itself.<sup>421</sup> If digital history or digital humanities (DH) more broadly would indeed constitute a discipline in itself, members of this discipline would no longer need to translate back into other disciplines such as English or history. Instead, members of the DH discipline could develop contributory expertise to publish in DH journals, contribute to DH debates and apply for DH jobs.

I find participants instead emphasised the need to maintain ties to their disciplinary cultures of origin and communicated more often with disciplinary peers than with cross-disciplinary collaborators. The role of a digital history broker was thereby context dependent. While in one situation a broker might stand in-between two communities of practice, emphasising matters not related to traditionally historical interests, in another situation the broker might instead act like a traditional historian. While historians as part of collaborations might indeed contribute to DH journals and conferences, they still emphasised the need to make contributions to the historical discipline (e.g., quote Q9 from the previous chapter).

The historians in digital history collaborations were not supposed to unlearn practices from history. A lack of contribution to the historiography was deemed a research failure. Historians were, however, incentivised to engage with computational experts and learn how computational approaches might aid historical research. I argue that brokers thereby actively prevented the formation of connected-symmetric-homogeneous (creole) trading zones, where there is no longer a difference in contributory expertise between what once were historians and computational experts. At the very least, brokers did not push towards such trading zones. Instead, brokers emphasised the need for digital history to provide benefit to historical scholarship.

## Infrastructuring

Throughout this book, I encountered digital history collaborations involved in the development of infrastructures promising to support and innovate historical scholarship. As I argued in the introductory chapter, the design of digital infrastructures

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<sup>421</sup> Galison, *Image and Logic*.

directly influences what questions can be asked, what analyses can be conducted and what historical knowledge can be generated. Digital research infrastructures therefore demand deep engagement between historians and computational experts to ensure they can adequately facilitate historical research.

In Chapter 3 I analysed interviews with two experts in infrastructural roles at the C<sup>2</sup>DH, supporting historians by providing digital as well as physical infrastructures. For both experts, their role was negotiated with historians to contextualise the digital and physical infrastructures in historical practices. In Chapter 4, I analysed interviews with historians collaborating towards the development of systems and technologies without users but envisioned to be applicable beyond the scope of the project (e.g., quotes Q15 and Q16). In all cases, efforts towards infrastructures were met with some form of resistance: boundary construction between the centre and the institute, historians not appropriating infrastructures or transforming these into something else than envisioned, and detachment by historians and computational experts in order to preserve their individual objectives within collaborations.

The development of infrastructures thus concerned as much technological feasibility as social readiness for appropriation and embedding in practices. In the introductory chapter, I described this as the two-sided uncertainty of digital history: historians are uncertain how they as historians should use digital methods and computational experts are uncertain how digital methods should work with historical datasets. In order to capture practices related to both sides of this uncertainty, the term “infrastructuring” has been used by scholars building on the works of Susan Leigh Star and her collaborators. They argue that infrastructures are defined not by their technological aspects but by their appropriation in communities of practice.<sup>422</sup> Infrastructuring has been defined as follows:

[I]nfrastructuring can be seen as an ongoing process and should not be seen as being delimited to a design project phase in the development of a freestanding system. Infrastructuring entangles and intertwines potentially controversial “a priori infrastructure activities” (like selection, design, development, deployment, and enactment), with “everyday design activities in actual use” (like mediation, interpretation and articulation), as well as “design in use” (like adaptation, appropriation, tailoring, re-design and maintenance).<sup>423</sup>

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**422** Susan Leigh Star and Geoffrey C. Bowker, “How to Infrastructure,” in *Handbook of New Media: Social Shaping and Social Consequences of ICTs*, ed. Leah A. Lievrouw and Sonia Livingstone (SAGE Publications, 2006), 230–46; Star and Ruhleder, “Steps Toward an Ecology of Infrastructure.”

**423** Erling Björgvinsson, Pelle Ehn and Per-Anders Hillgren, “Participatory Design and ‘Democratizing Innovation,’” in *Proceedings of the 11th Biennial Participatory Design Conference*

Infrastructuring thereby concerns both the activities before an infrastructure is implemented, as well as the ongoing work during appropriation and renegotiation of practices. As such, the boundaries between infrastructure designers and users are crossed to negotiate and contextualise technologies in work practices.<sup>424</sup> The act of designing is, therefore, no longer limited to the practices of infrastructure developers, but is performed through interactions between historians as users, computational experts and technology.<sup>425</sup> Infrastructures are thereby no longer conceptualised as static entities that intervene in the practices of scholars, the frame commonly used in references to cyberinfrastructures.<sup>426</sup> Instead, infrastructures are ever-changing socio-technical systems, forever under development and maintenance.<sup>427</sup> This seems especially true for digital infrastructures, which are much more malleable than physical infrastructures, following the “permanent extendibility” of software.<sup>428</sup>

When infrastructures are truly successful, they become invisible to the people who use them.<sup>429</sup> For example, much of the work of archivists and librarians or the organisational structures of archives and libraries overall remains invisible to historians.<sup>430</sup> Historians do not need to relearn how to use an archive or library every time they enter one, but learn the conventions of how to use these infrastructures as part of their disciplinary community of practice.<sup>431</sup> In contrast,

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on – PDC '10 (New York, New York, USA: ACM Press, 2010), 43, <https://doi.org/10.1145/1900441.1900448>.

**424** Lucy Suchman, “Located Accountabilities in Technology Production,” *Scandinavian Journal of Information Systems* 14, no. 2 (2002): 91–105.

**425** Helena Karasti, Volkmar Pipek and Geoffrey C. Bowker, “An Afterword to ‘Infrastructuring and Collaborative Design,’” *Computer Supported Cooperative Work* 27, no. 2 (2018): 267–89, <https://doi.org/10.1007/s10606-017-9305-x>.

**426** Daniel E. Atkins et al., “Revolutionizing Science and Engineering Through Cyberinfrastructure: Report of the National Science Foundation Blue-Ribbon Advisory Panel on Cyberinfrastructure” (National Science Foundation, 2003); Paul N. Courant et al., “Our Cultural Commonwealth: The Report of the American Council of Learned Societies Commission on Cyberinfrastructure for the Humanities and Social Sciences” (American Council of Learned Societies, 2006).

**427** Karasti and Blomberg, “Studying Infrastructuring Ethnographically.”

**428** Volkmar Pipek and Volker Wulf, “Infrastructuring: Toward an Integrated Perspective on the Design and Use of Information Technology,” *Journal of the Association for Information Systems* 10, no. 5 (2009): 447–73, <https://doi.org/10.17705/1jais.00195>; Manovich, *Software Takes Command*, 337.

**429** Star and Ruhleder, “Steps Toward an Ecology of Infrastructure.”

**430** Sammie L. Morris and Shirley K. Rose, “Invisible Hands: Recognizing Archivists’ Work to Make Records Accessible,” in *Working in the Archives: Practical Research Methods for Rhetoric and Composition*, ed. Alexis E. Ramsay et al. (Southern Illinois University Press, 2010), 51–78.

**431** Arlette Farge, *The Allure of the Archives*, trans. Thomas Scott-Railton and Natalie Zemon Davis (1989; repr., Yale University Press, 2013).

I do not assume that these digital infrastructures are already in place, invisibly supporting the practices of historians, appropriated as a disciplinary practice. Infrastructures can take decades to form.<sup>432</sup> The work in this book should thus not be seen as an ethnography of infrastructure.<sup>433</sup> Instead, by employing this concept, I wish to bring to light the work done on infrastructures in the making, before appropriation by users, as well as during contextualisation of experimental systems.<sup>434</sup> That is, before digital infrastructures finally become invisible to historians.

Infrastructuring aims to resolve the infrastructural tensions that emerge when historians experiment with interventions in historical practice by means of digital technologies.<sup>435</sup> Such tensions arise because infrastructures have distributional consequences; they improve or emphasise certain practices, aspects or even people, while obscuring or demoting others. In this book, I have described several controversies that can be understood as infrastructural tensions. With respect to the distributional consequences of infrastructures, the historians Petri Paju, Mila Oiva and Mats Fridlund warn that digital history may lead to uneven competition between history departments, resulting in “more divisions among historians”.<sup>436</sup> Indeed, Chapter 3 showed how investments in a new research unit related to digital history affects the sustainability of existing research institutes. Professors moving from the institute to the centre were not replaced, leaving the institute in a weaker position than before. When a new professorship was in discussion, the two research units found themselves in competition for resources to attract people in senior positions.

One way in which digital history brokers have acquired investments is by aligning with political agendas related to economic growth. The centre was in part guided by alignment with Digital Luxembourg, the government’s initiative to coordinate the nation’s digital strategy. Such alignment can also be found in the European Commission report on the digital strategy for cultural heritage, which included how digitisation provides both cultural and economic benefits

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**432** Karasti, Pipek and Bowker, “An Afterword to ‘Infrastructuring and Collaborative Design.’”

**433** C.f. Susan Leigh Star, “The Ethnography of Infrastructure,” *American Behavioral Scientist* 43, no. 3 (1999): 377–91, <https://doi.org/10.1177/00027649921955326>.

**434** Laura J. Neumann and Susan Leigh Star, “Making Infrastructure: The Dream of a Common Language,” in *Proceedings of the Participatory Design Conference* (Cambridge, USA, 1996), 231–40; Suchman, “Located Accountabilities in Technology Production.”

**435** Steven J. Jackson et al., “Understanding Infrastructure: History, Heuristics and Cyberinfrastructure Policy,” *First Monday* (2007), <https://doi.org/10.5210/fm.v12i6.1904>.

**436** Petri Paju, Mila Oiva and Mats Fridlund, “Digital and Distant Histories: Emergent Approaches within the New Digital History,” in *Digital Histories: Emergent Approaches within the New Digital History*, ed. Mats Fridlund, Mila Oiva and Petri Paju (Helsinki University Press, 2020), 15, <https://doi.org/10.33134/HUP-5-1>.

as key themes.<sup>437</sup> The then European Commissioner for Digital Agenda, Neelie Kroes, received this report saying “[b]ringing our museums’ and libraries’ collections online not only shows Europe’s rich history and culture but can also usher in new benefits for education, for innovation and for generating new economic activities”.<sup>438</sup> Likewise, the European Time Machine project proposal for the European FET Flagship grant up to one billion euro described the economic opportunity of cultural heritage as “rather than being a cost, cultural heritage investment will actually be an important economic driver across industries”.<sup>439</sup> A recent DARIAH position paper on cultural heritage data instead aligned their arguments for digital cultural heritage with political incentives such as increased investments in Artificial Intelligence and the demand for digital literacy.<sup>440</sup>

Such alignments, however, may lead to resistance from peers who see such acts as neoliberal, rendering digital history an economic rather than scholarly enterprise. Brokers thus have to balance their arguments towards policymakers, in order to attract funds, as well as towards their peers, to remain recognisable as historical scholarship. Furthermore, brokers have to defend how redistribution of funding from traditional historical scholarship to digital history benefits the historical community.

Another distributional consequence is that emerging infrastructures render some research practices easier, while other practices become harder or even impossible. Following from the previous tension, Chapter 3 showed that a strong research centre related to contemporary history led to concerns that students would more often choose a contemporary historical topic for their theses. In Chapter 4, a fundamental concern around digital infrastructures was how some sources become very accessible and easily findable, while other disappear from view. Historians raised concerns that uneven quality of OCR between sources might bias historians to analyse those sources, while others are never found. Historians should at least be aware of such biases to critically reflect on their own research practice. This problem becomes especially urgent when using

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**437** Elisabeth Niggemann, Jacques De Decker and Maurice Levy, “The New Renaissance: Report of the ‘Comité Des Sages’” (Luxembourg: European Commission, 2011).

**438** “Digital Agenda: “Comité des Sages” calls for a “New Renaissance” by bringing Europe’s cultural heritage online”, European Commission Press Release, January 10, 2011, [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_11\\_17](https://ec.europa.eu/commission/presscorner/detail/en/IP_11_17).

**439** “Unleashing Big Data of the Past – Europe Builds a Time Machine”, Time Machine, March 1, 2019, <https://www.timemachine.eu/unleashing-big-data-of-the-past-europe-builds-a-time-machine/>.

**440** Toma Tasovac, Sally Chambers and Erzsébet Tóth-Czifra, “Cultural Heritage Data from a Humanities Research Perspective: A DARIAH Position Paper” (2020).



infrastructures developed by enterprises, such as the Google Books corpus and the Google Ngram Viewer described in Chapter 1.

The above distributional consequence is at least in part caused by another infrastructural tension of digital history, namely that the promise of digital history is largely confined by the limitations of the available data. The uneven quality of OCR is not simply a technological limitation, solved by improving a set of algorithms. Very often, the quality of the source material itself, whether it was printed on expensive high-quality paper or on cheap low-quality paper, confines the possibilities of OCR. At the same time, important and well-preserved sources may not be fit for methods of mass-digitisation, thereby staying behind in prioritisation of large-scale datasets.<sup>441</sup> The analytical power of digital history is thereby limited by a set of dependencies that run down to the actual physical material of sources. Furthermore, while more recent sources may in principle be more easily available technologically, copyright and privacy laws limit what periods can be sufficiently facilitated using digital infrastructures. For example, while web archives as born-digital data are not limited by issues of OCR, websites contain copyrighted or privacy-sensitive material that render many sources inaccessible for historical analysis.<sup>442</sup> For brokers it therefore remains important to recognise how digital research infrastructures may complement physical research infrastructures, rather than replace them.

Another tension to the potential of digital history is the limited sustainability of systems as they require continuous funding and attention.<sup>443</sup> While this issue is beyond the scope of this book, it was noted in quote Q73 by the history coordinator who found it difficult to attract funding for continuous development and maintenance, rather than innovations. This problem is however not specific to digital history, insofar as digital research infrastructures from other disciplines have likewise been confronted with limitations to sustainability.<sup>444</sup> Yet digital history brokers may provide synergies between their knowledge of digital

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**441** Prescott and Hughes, “Why Do We Digitize?”

**442** Milligan, *History in the Age of Abundance?*

**443** For a more elaborate discussion of sustainability see Christine Barats, Valérie Schafer and Andreas Fickers, “Fading Away . . . The Challenge of Sustainability in Digital Studies,” *Digital Humanities Quarterly* 14, no. 3 (2020); James Smithies et al., “Managing 100 Digital Humanities Projects: Digital Scholarship and Archiving in King’s Digital Lab,” *Digital Humanities Quarterly* 13, no. 1 (2019).

**444** European Commission. Directorate General for Research and Innovation, *Sustainable European Research Infrastructures: A Call for Action* (LU: Publications Office, 2017), <https://data.europa.eu/doi/10.2777/76269>; Giorgio Rossi et al., “Supporting the Transformative Impact of Research Infrastructures on European Research” (European Commission, 2020).

research infrastructure and of historical research infrastructures such as archives and libraries which have proven sustainable for the last centuries.

Finally, a tension that may arise during infrastructuring is when people are confronted with double binds. A double bind occurs when people are given two conflicting messages simultaneously.<sup>445</sup> This is perhaps most apparent in my discussion of PhD candidates, who despite being part of a cross-disciplinary collaboration were evaluated on individual disciplinary works. Another double bind is arguably found in project funding for digital history, where projects should develop innovative technologies as well as conduct historical research, without space to take one step after another.

This final tension of double binds may be most fundamental to infrastructuring, since it concerns the question of how to evaluate cross-disciplinary collaborative works according to disciplinary values of what constitutes valid research, particularly in a discipline that has traditionally emphasised solitary scholarship. Susan Leigh Star and Karen Ruhleder provide two recommendations for addressing double binds.<sup>446</sup> First, the development of a shared understanding of both communities building and appropriating infrastructures. I suggest that this is what digital history brokers do when they develop interactional expertise in the context of digital history. Second, the development of institutional mechanisms for education and legitimisation of appropriate skills. Multiple professors actively sought to include digital methods in the university curriculum:

If you consider this department, we are investing in a lecturer of digital humanities to be part of faculty staff. In the first year we will introduce digital humanities in the bachelor. We already have a minor of digital humanities in our faculty, which is very successful. The research master is next, we will introduce aspects of digital humanities there as well. All of that is new, those are developments of the last year or two. And that won't disappear soon. That means that you are educating a new generation of students who already have that link [with digital methods] by nature. (professor in history, Q75)

Yet substantially including digital methods in the curriculum proved difficult. The above statement was made in an interview in 2015. When I interviewed this professor again in 2020, he disappointedly admitted that they had not been able to embed digital history in the curriculum. A problem was that introducing a new subject would mean removing other subjects, which was met with resistance since other lecturers did not want to cancel their own courses. Another problem was that many lecturers simply did not want to learn digital methods themselves in order to be able to teach digital methods in their courses. This

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<sup>445</sup> Star and Ruhleder, “Steps Toward an Ecology of Infrastructure.”

<sup>446</sup> Star and Ruhleder.

was the critique by another professor in history when trying to embed digital history in the curriculum:

We should invest much more in the level of faculty, in training the trainers. We need this generation of people who can use digital tools, or at least are not afraid of learning to play with them. We need people who do not say that this is no longer for their generation, but a matter for future generations. We have colleagues who will be here for another ten, twenty years who already have that mentality. I find it hard to accept that.

(professor in history, Q76)

Beyond education, legitimisation was developed by creating institutional mechanisms to recognise and evaluate contributions of digital history. Yet in contrast with the local negotiation in trading zones, institutional and political tensions such as legitimisation “resist local resolution”.<sup>447</sup> Instead, they are negotiated broader, in the wider complex of (historical) scholarship including peer review systems, hiring committees, publishers and funders.<sup>448</sup> To this end, several reports have provided recommendations for improving evaluation and recognition of digital history scholarship. One significant attempt has been the Guidelines for the Professional Evaluation of Digital Scholarship in History by the American History Association committee chaired by Edward Ayers.<sup>449</sup> The committee argued that departments should recognise the opportunities of the digital environment and develop expertise and methods to evaluate digital scholarship. At the same time, they argued that historians pursuing digital scholarship should engage their non-digitally inclined peers by explaining or demonstrating how their research contributes to historical scholarship.

In line with this final recommendation, another significant attempt was the report by the Arguing with Digital History working group convened by the Roy Rosenzweig Center for History and New Media.<sup>450</sup> This working group recommended that digital historical scholarship should be based in historical argumentation, and that vice versa the historical community should learn how to recognise arguments in their new digital forms. For example, the working group noted that in publishing a digital collection “historians construct an argument by making choices about which metadata schema to employ, which categories of information

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**447** Star and Ruhleder, 126.

**448** Julie Thompson Klein and Holly J. Falk-Krzesinski, “Interdisciplinary and Collaborative Work: Framing Promotion and Tenure Practices and Policies,” *Research Policy* 46, no. 6 (2017): 1055–61, <https://doi.org/10.1016/j.respol.2017.03.001>.

**449** Edward L. Ayers et al., “Guidelines for the Professional Evaluation of Digital Scholarship in History” (American Historical Association, 2015).

**450** Arguing with Digital History working group, “Digital History and Argument” (Roy Rosenzweig Center for History and New Media, 2017).

to include, which controlled vocabularies to deploy, and even the language and word choices used to describe the item”.<sup>451</sup> The task for a digital history broker may then be to ensure that even technical matters such as metadata schemas are decided by historical argumentation and that this consideration is described in recognisable historical form.

Note that both recommendations indeed point to the necessity of interactional expertise trading zones, consisting of historians who can negotiate and coordinate digital methods and tools while remaining embedded in their historical communities. Yet the practice of infrastructuring itself does not fit within such recommendations, since it does not lead to historical arguments that fit within the frame of peer review. Furthermore, brokering occurs across the boundaries of communities of practice, thereby not fitting traditional forms of assessment.<sup>452</sup> The infrastructural work in digital history and digital humanities more broadly has consequently been criticised for lacking intellectual contributions to scholarship.<sup>453</sup> For example, the digital humanist Willard McCarty has criticised the focus on infrastructure as to “surrender the discipline to servitude”.<sup>454</sup> He fears that developing infrastructures for the research agendas of historical scholarship (or other humanities subjects in the wider digital humanities) renders the digital humanities unable to develop a research agenda of its own. In this context it is important to note that McCarty speaks of the digital humanities as a discipline in itself. This entails that the digital humanities (or digital history) should constitute a connected-symmetric-homogeneous (creole) trading zone, as I showed in chapter 2. Yet digital history brokers pushed towards symmetric-heterogeneous (fractioned) trading zones, thereby not defining digital history as a discipline with its own research agenda. In that sense, the agenda of the historical discipline is the agenda for digital history.

The digital humanist Jennifer Edmond notes that the success of digital humanities thus far has been in implementing research infrastructures that have reached large audiences.<sup>455</sup> She agrees, however, that focusing on infrastructure carries a risk, namely that digital humanities scholars become preoccupied

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451 Arguing with Digital History working group, 5.

452 Wenger, *Communities of Practice*, 110.

453 Sheila Anderson, “What Are Research Infrastructures?,” *International Journal of Humanities and Arts Computing* 7, no. 1–2 (2013): 4–23, <https://doi.org/10.3366/ijhac.2013.0078>; Willard McCarty, “The Residue of Uniqueness,” *Historical Social Research/Historische Sozialforschung* 37, no. 3 (2012): 24–45.

454 McCarty, “The Residue of Uniqueness,” 37.

455 Jennifer Edmond, “Collaboration and Infrastructure,” in *A New Companion to Digital Humanities*, ed. Susan Schreibman, Ray Siemens and John Unsworth (Wiley-Blackwell, 2016), 54–65.

with infrastructure as a goal in itself rather than as a means towards research. In contrast with McCarty, the risk identified by Edmond is not that the agenda of digital humanities is set by scholars from other fields, but that the agenda is filled entirely by operational matters of maintenance and continuous development.

The digital humanist Martin Paul Eve notes that one strategy for escaping the problem of disciplinary evaluation misunderstanding digital history contributions is the establishment of specific departments.<sup>456</sup> The C<sup>2</sup>DH could be seen as an example of such a specific institute where procedures are developed to hire and promote scholars based on their digital works. Institutional units such as the C<sup>2</sup>DH and King's Digital Lab furthermore provide the means and resources to manage both infrastructures as well as conduct scholarship.<sup>457</sup> The C<sup>2</sup>DH furthermore promotes digital history works beyond its own premises in launching and sustaining a journal for digital history.<sup>458</sup> Eve warns however that “the banishment of DH to its own departmental area is a problematic move”.<sup>459</sup> Digital history confined to its own institutional space risks developing infrastructures without anyone who will use them for their own disciplinary purposes. Yet this is arguably what digital history brokers prevent by pushing digital history trading zones towards symmetric-heterogeneous trading zones to ensure that research infrastructures remain relevant to historical scholarship.

However, a limitation of such debates about legitimisation of digital history practices and work on infrastructures is that they present these issues in the context of digital history and digital humanities. Following the argument from Susan Leigh Star and Karen Ruhleder that infrastructural tensions “resist local resolution”, digital history brokers should look beyond such community boundaries. Arguably, none of the infrastructural tensions discussed above is exclusive to digital history and it would be hubris to assume that the digital history community can resolve these tensions by itself. Improving the recognition and evaluation of practices and activities not directly leading to disciplinary contributions in the form of publications is a topic increasingly discussed in science policy. Multiple reports discuss the importance of methods of evaluation that take into account contributions to collaborations, interdisciplinary practices, as

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<sup>456</sup> Martin Paul Eve, “Violins in the Subway: Scarcity Correlations, Evaluative Cultures, and Disciplinary Authority in the Digital Humanities,” in *Digital Technology and the Practices of Humanities Research*, ed. Jennifer Edmond (Open Book Publishers, 2020), 105–22, <https://doi.org/10.11647/obp.0192.05>.

<sup>457</sup> Smithies et al., “Managing 100 Digital Humanities Projects.”

<sup>458</sup> “Journal of Digital History”, accessed May 12, 2021, <https://journalofdigitalhistory.org/>.

<sup>459</sup> Eve, “5. Violins in the Subway,” 29.

well as societal impact.<sup>460</sup> Beyond the digital humanities, the evaluation of brokering in scholarship has received much attention in literature.<sup>461</sup>

To address infrastructural tensions thus requires local solutions to engage with and diffuse to national or even global communities of practice and programs. By acquiring interactional expertise, digital history brokers are able to develop local approaches to the methodological and epistemological tensions introduced by the interactions between computational practices and historical scholarship. Yet by implementing these approaches in education and developing guidelines for legitimisation, brokers are at the forefront to integrate local approaches in the global community of practice. Once these infrastructural tensions are resolved or mitigated, infrastructures can be properly appropriated:

An infrastructure occurs when the tension between local and global is resolved. That is, an infrastructure occurs when local practices are afforded by a larger-scale technology, which can then be used in a natural, ready-to-hand fashion.<sup>462</sup>

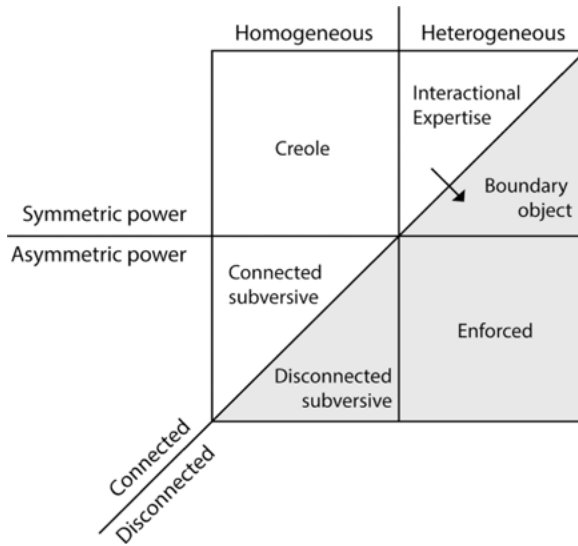
When a digital history broker then succeeds in mitigating infrastructural tensions, infrastructures no longer demand continuous efforts of infrastructuring. It is at this point that the connected-symmetric-heterogeneous (interactional expertise) trading zones of digital history depending on these brokers can shift towards disconnected-symmetric-heterogeneous (boundary object) trading zones (see Figure 8). In these trading zones, it is the infrastructures themselves that function as boundary objects, robust enough to remain recognisable across different trading zones and sites of scholarship, while plastic enough to adapt to the heterogeneous needs of historians. The information scientists Geoffrey Bowker and Susan Leigh Star hereto introduced the concept of boundary infrastructures as systems of boundary objects that are appropriated across communities at a

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**460** Ingrid Bauer et al., “Next Generation Metrics” (2020), <https://doi.org/10.5281/ZENODO.3874801>. In the Netherlands, a position paper authored by the institutional representatives of universities, funders and scholarly institutes argued for more diverse evaluation methods, see VSNU et al., “Ruimte voor ieders talent: naar een nieuwe balans in het erkennen en waarderen van wetenschappers” (2019).

**461** E.g. Simon Maag et al., “Indicators for Measuring the Contributions of Individual Knowledge Brokers,” *Environmental Science & Policy* 89 (2018): 1–9, <https://doi.org/10.1016/j.envsci.2018.06.002>; Julie Thompson Klein, “Evaluation of Interdisciplinary and Transdisciplinary Research: A Literature Review,” *American Journal of Preventive Medicine* 35, no. 2 (2008): S116–23, <https://doi.org/10.1016/j.amepre.2008.05.010>; Daniel Stokols et al., “The Ecology of Team Science,” *American Journal of Preventive Medicine* 35, no. 2 (August 2008): S96–115, <https://doi.org/10.1016/j.amepre.2008.05.003>; Daniel Stokols et al., “Evaluating Transdisciplinary Science,” *Nicotine & Tobacco Research* 5, no. Suppl\_1 (2003): S21–39.

**462** Star and Ruhleder, “Steps Toward an Ecology of Infrastructure,” 114.



**Figure 8:** Resolving infrastructural tensions by scaling local solutions for symmetric-heterogeneous digital history to globally accessible infrastructures of boundary objects. Digital history brokers thereby push trading zones from connected to disconnected in order to scale beyond the locally negotiated collaboration.

larger scale.<sup>463</sup> Boundary infrastructures offer the structure to enable the full range of necessary tools necessary for research, while still providing sufficient flexibility for local variations of practices. They argue that this concept thereby explicitly recognises the heterogeneity and ambiguity of practices conducted by varying communities of practice. Digital history research infrastructures should then provide sufficient structure to enable recognisable historical research for differing communities of practice, while offering sufficient flexibility to move between more traditional and more digital methods and between close and distant reading.

### Practices of Digital History Brokering

Digital history brokers thereby exemplify significant shifts in practices. Brokers conduct project management; coordinate practices from archival and library domains such as data collection, transformation and description; learn about the

<sup>463</sup> Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things out: Classification and Its Consequences*, Inside Technology (Cambridge, Mass: MIT Press, 1999), 285–318.

potential and limitations of computational technologies and where to apply these; employ inter-languages to translate between the different collaborating communities; and finally transform historical questions into infrastructural problems. This final aspect might be the most significant shift for historians, which requires them not just to engage in hermeneutics of sources found through archival research, but to consider the range of possible practices, hermeneutical or otherwise, enabled by embedding sources in digital infrastructures.

Since infrastructural tensions have not yet been resolved, digital history brokers might prove central in shaping the practices of future historians through infrastructuring. Insofar as the advancement of technology prompts digital history collaborations, as exemplified by quote Q8 in the previous chapter, digital history brokers play a central role in deciding future avenues of technology for historical research. Brokers thereby not only developed interactional expertise to collaborate with computational experts. They furthermore developed political proficiency to negotiate the socio-economic potential of digital history strategies with politics, university administrators and funding agencies.

The development of technology consists of a continuous variation and selection of decisions and interpretations; a developing technology can therefore take many directions, but stabilises in form and utility through negotiation. Once a technology stabilises, surrounding problems disappear, its characteristics become assumed as essential and the meaning of the technology is shared by the community.<sup>464</sup> By brokering the negotiation of this shared meaning, digital history brokers are “seeding ideas and work practices” to be enabled by future infrastructures.<sup>465</sup> Yet brokers do this while remaining aligned with the values of historical scholarship. They thus aim to enable future methods of historical scholarship, without altering what it means to be a historian.

In conclusion, digital history brokers transform their own practices, so that other historians do not have to but can employ digitised sources and digital methodology through infrastructures in a fashion that naturally fits into their practices as historians. It is for this reason that digital history does not occupy a singular position between the digital and the historical, for this position is continuously negotiated on the level of institutes, collaborations and individuals. Notably, by engaging with computational practices while simultaneously protecting

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**464** Trevor J. Pinch and Wiebe E. Bijker, “The Social Construction of Facts and Artefacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other,” *Social Studies of Science* 14, no. 3 (1984): 399–441, <https://doi.org/10.1177/030631284014003004>.

**465** Paul N. Edwards et al., “Understanding Infrastructure: Dynamics, Tensions, and Design. Report of a Workshop on “History and Theory of Infrastructures: Lessons for New Scientific Infrastructures”” (2007), 19.



historical practices, digital history brokers continuously move along this dimension to meet what is demanded at that place and point in time. The result of these activities are the boundary infrastructures, which likewise do not occupy a single position between the digital and the historical but offer sufficient flexibility for historians to move across this spectrum.

## Towards the Digital History Future

It is without question that the digital turn has affected and will continue to affect historical practices, even if perhaps not necessarily transforming the disciplinary culture. The infrastructures for historical scholarship are now both physical and digital, encompassing increasingly digitised and born-digital sources. Historians are therefore indeed increasingly using computers for historical research, answering the challenges that have been raised for as long as there have been computers. Yet historians do so in diverging ways, and adoption of computers does not entail that all historians become programmers, as was argued by Emmanuel Le Roy Ladurie.

Instead, I argue that recognising the boundary practices of historians in trading zones that incorporate strategies along the dimensions of engagement, power relations and changing practices raises awareness of a number of issues. First, not all historians engage equally, but some will be more active in engagement and adoption of practices than others. Second, all historians aim to preserve control over their own fields of actions, otherwise disconnecting engagement. Third, sharing of practices can be shallow, or historians may indeed strive to become computational experts themselves. My findings suggest that connected-symmetric-heterogeneous (interactional expertise) trading zones are the most fruitful in negotiating practices. The value of digital history brokers is that they enable the negotiation of computational practices on behalf of their disciplinary peers. The historical community is thereby able to import and adapt methods and tools without losing its disciplinary values. When infrastructural tensions are resolved, these trading zones may become disconnected-symmetric-heterogeneous trading zones of boundary infrastructures.

Just as infrastructures are no longer fully analogue or digital, neither should historians be fully analogue or digital. Rather than a dichotomy of practices, I see the historical community of practice evolving towards a spectrum of analogue to digital. The methods and tools that are being negotiated towards historical values will then be available for use as needed; distant reading supplementing rather than displacing close reading. It is then that computational methods can become infrastructural, aiding historical research, learned as part of membership and embedded among the spectrum of practices available to historians.

