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Reflexive inertia : reinventing scholarship through digital practices

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Chapter 4

Infrastructural inversion as a generative resource in digital scholarship⁵¹

Parenthesis – relation conceptual framework

In the preceding chapters I have argued that the characteristic tensions that arise in the conduct of digital scholarship can only be resolved through reflexive solutions, since these potentially create compatibility between novel technological affordances and the historically developed, disciplinary organization of research. There is no reason to assume, however, that such solutions will be singular. Taking seriously the notion that infrastructure develops in an evolutionary fashion, the mutual adaptation of novel technology and established user practices is more likely to resemble a process of variation and selection. Different actors will propose numerous solutions to infrastructural conflicts, but only some of them will ultimately persist and thereby become part of the infrastructure themselves.

My aim in the following chapter is to theorize and empirically investigate the systemic function of reflexivity in the historical development of the scholarly knowledge machine. To do so, I will adapt a more expansive focus than in the previous case studies. Rather than taking an empirical look at individual projects, I focus on the role of reflexivity in the discourse and practice of digital humanities as such. Bruno Latour (1993) has famously argued that the practice of science has traditionally involved a process of purification, i.e. an effort to retrospectively delete the contingency and messiness of everyday scientific work when circulating research findings. The resulting, purified image has historically served as a source of legitimacy for scientific knowledge, which can thereby claim to be distinct from the less sophisticated and biased opinions of other societal actors, for example in politics or business. Purification has also provided the foundational motivation for ethnographic work in STS – if scientists strive for presenting an idealized account of their research, then anthropologists should try to study scientific work as it unfolds and before its original messiness is deleted (Latour & Woolgar, 1979; Knorr Cetina, 1981). The

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digital humanities initially seem to subvert this logic. Rather than making invisible the uncertain and contingent practices through which they were generated, digital scholars often use their publications to highlight the very infrastructural conflicts that arise in the everyday conduct of digital project work – for example, difficulties in trying to combine collaborative tool development with a traditional academic career (Flanders, 2011; THATCampCHNM, 2011), or diverging expectations towards data in different scholarly practices (Drucker, 2009). While rarely drawing on STS literature or the sociology of science, the topics and reflexive style of scholarly publications in digital humanities thus often parallel the arguments I present in this thesis.

A critical move I will make in theorizing this phenomenon is to abandon a commonsensical dichotomy of visibility, or, transparency, on the one hand, and invisibility, on the other. Rather than positing the reflexivity in the discourse of digital humanities as the opposite of traditional purification practices in science, I will actually argue that reflexivity itself always entails selectivity in fore- and backgrounding particular elements. Digital scholars draw selective attention to instances of friction that are not routinely discussed in more traditional academic discourse. By putting up for discussion certain infrastructural conventions that pose an obstacle to digital project work, they also destabilize them. This potentially affects the historical development of the scholarly knowledge machine at large. However, insofar as there are many distinct ways of identifying and resolving infrastructural conflicts, the discursive reflexivity in digital humanities can also be analyzed as a site where very different viewpoints on the very purpose of digital scholarship clash. These conflicts are simultaneously intellectual and political, touching for example on questions of desirable research methods, competing views of the function of the humanities in society, as well as the meaning and implications of 'efficiency' in the practical conduct of everyday research. In short, they are conflicts between different ways of reimagining the scholarly infrastructure, and thus ultimately about what forms of knowledge should become possible in the future.

Introduction

Digital humanities (DH) is an emerging field whose practitioners apply digital technology to humanistic research problems. Its manifestations are diverse: from the use of digital annotation tools in the collaborative study of empirical sources (WordHoard, 2004–13), the computational analysis of large corpora of textual data (Michel et al., 2011), to the use of provocative digital performances for exploring the twists and turns of poststructuralist theory (Hansen, 2012). DH has attracted considerable public attention over the last decade. Regular readers of the *New York Times*, for example, will have come across an extensive feature report on DH (Cohen, 2010), or they may have encountered a critical interpretation of the DH in the “Opiniator” column of controversial literary scholar Fish (2012). Characteristically, DH here is referred to as “humanities 2.0”, which reflects a general tendency of both observers and practitioners to discuss digital research practices in terms of their implications for how scholarship at large will be conducted in the future.

Indeed, much digital scholarship poses a challenge to defining features of academic life in the humanities. For example, the collaborative practice of most DH work is at odds with the single-author, monograph-oriented research model dominant in many disciplines. Some DH projects, moreover, aim to demonstrate that publications can take the shape not only of articles and books, but also of datasets and digital applications (Hansen, 2012). Strikingly, digital scholars often present such projects in explicitly reflexive accounts. A highly publicized monograph by Kathleen Fitzpatrick, for example, presents an experiment with a new form of online peer review in the format of a deliberately polemical, revisionist account of how the conventional model of peer review came to be seen as the distinctive feature of modern knowledge production. Similarly, the virtual platform alt-academy offers a number of very personal essays in which DH practitioners comment on the relation between academic employment modalities and the historical development of digital scholarship. Such contributions, I suggest, can be considered instances of what Bowker & Star (2000) have called infrastructural inversion, that is, a systematic defamiliarization of routinized academic work that exposes the otherwise invisible inner workings of knowledge production.

In this paper, however, I do not consider the job of the science and technology studies (STS) analyst to be done with the infrastructural inversions that digital scholars perform themselves. Instead, I make those reflexive accounts an object of study in their own right. Rather than

picturing the adoption of digital technology by scholars as a sweeping revolution, I argue that the humanities constitute a socio-material infrastructure that develops in a reflexive process. Specific technological affordances—that is, hypothetical uses of technology, such as computational analysis and digital publishing formats—are not automatically realized, but have to be implemented by actors who are themselves enmeshed in the existing configuration of infrastructure. This often means going against the grain of established routines. Reflexive representations of digital scholarly work, circulated by practitioners, can serve to highlight and problematize such routines, and thus play a role in the evolutionary development of infrastructure. However, since different forms of reflexivity likely open up different paths for development, they also constitute a potential site of controversy. All this makes them a topic relevant to STS research, and to anybody interested in the implications of digital research technology for humanities scholarship as such.

I empirically base my argument on an investigation of four case studies where practitioners of DH circulate reflexive representations of their work settings. This involves the discursive analysis of a variety of online and print sources, such as scholarly monographs, internet forums frequented by digital humanists, and new types of outlets for the publication of digital scholarly applications. My analysis aims to answer the following research questions:

- (1) How do actors use infrastructural inversions to promote changes in key aspects of humanities infrastructure, such as peer review, output formats, and the organization of research projects?
- (2) How do different ways of defamiliarizing the status quo of infrastructure relate to each other?
- (3) What does it mean, theoretically, to think about a defamiliarization of infrastructure as a generative resource for actors?

Infrastructural Inversion as Articulation Work

The adoption of digital technologies in the humanities is related to new ways of funding and organizing research (Borgman, 2007; Gold, 2012; Wouters et al., 2013). DH predominantly takes place in collaborative, grant-funded projects, where scholars team up with professionals from very different backgrounds, such as designers, programmers, and data workers. This implies new ways of bringing research to closure. For example, appropriately funded collaborations can encompass substantial amounts of

data work, thus scaling up the potential empirical scope of research (Kaltenbrunner, 2014). Alternatively, such collaborations allow to present research in provocative digital formats that would be difficult for any single academic to realize (Drucker, 2009). DH thus poses new challenges when compared to traditional modes of scholarly work: it requires managing a collaborative overhead, dealing with different forms and unequal distributions of knowledge in the context of a single project, and worrying about follow-up funding to keep collaborative relations from dissolving.

A concept that is particularly suited to analyze these challenges is articulation work. Originally coined by grounded theory pioneer Anselm Strauss, the term designates the situated activity of meshing distributed elements of labor in cooperative work settings (Strauss, 1985, 1988; Schmidt & Bannon, 1992). As Schmidt & Simone (1996: 4) point out, “to articulate” here means “to put together by joints”. Articulation work is distinct from the production tasks in particular work contexts, which are more routinized. The production task of, say, a historian would be to do archival research, and then write a monograph or paper. Articulation work includes everything that is necessary to manage that scholarly process: survey published literature, manage the contingencies of archival work in the face of resource and time constraints, and of course circulating scholarly arguments. Coordinating these tasks can, for example, involve changing one’s research question, if it turns out that there are insufficient archival sources to sustain a particular scholarly claim. The need for articulation work thus arises from the necessary underspecification of situated action through formal organizational schemes (Suchman, 1996).

Articulation work is necessary both within and between different levels of work organization. Tasks must be meshed not only on the individual project level, but also between that individual level and the wider community of scholars, as well as the academic (or other) institution hosting the project (Fujimura, 1987). Articulation work between levels includes, for example, the networking among researchers at conferences, which serves to align one’s research with the research interests of others. Scholars must also align their work with the interests of employers and/or funding bodies, thus requiring them to promote and justify their ongoing research, and to stay up to date on calls for funding. Given the collaborative organization of much digital scholarship and its almost exclusive reliance on temporary grants, the complexity of articulation work in DH will only tend to increase.

STS scholars have used the concept of articulation work to analyze how researchers in both the humanities and natural sciences manage

inherently uncertain, collaborative processes (Fujimura, 1987; Antonijević et al., 2013). At the same time, insofar as articulation work is constituted by the ad hoc activities that are necessary to “get the job done”, it is usually taken to imply only a basic degree of reflexivity of the working individuals with respect to their infrastructural work settings (Strauss, 1988). While actors experienced in a given work setting routinely perform articulation work, thus the argument, it is only in moments in which a disruption to the regular work flow of a project occurs that this work becomes explicitly visible to both observers and actors. Fujimura (1987) suggests that actors are so much concerned with what they consider their production task that they tend to disregard the numerous elements of articulation work as important activities in their own right.

The notion that routinized articulation processes tend to become invisible to actors over time has been further developed by infrastructure studies, inaugurated by Geoff Bowker, Karen Ruhleder, and Leigh Star, herself a PhD student of Strauss (Star & Ruhleder, 1996; Bowker & Star, 2000). The term infrastructure here has a specific theoretical meaning: infrastructure is not a specific thing such as tubes and wires, but a relational state that obtains when actors working in different parts of a historically grown, cooperative work setting achieve a smooth coordination of their individual activities. Particularly important in achieving such coordination are various sorts of classifications, for example, divisions of labor between groups of professionals and standardized ways of exchanging information. These allow for alignment of heterogeneous practices without the need for a singular, hierarchical management structure. Infrastructure, we could say, is the crystallized accumulation of historical articulation work. By implication, infrastructure tends to become transparent over time, precisely because actors interact with and reproduce infrastructure through their daily routines. Bowker & Star argue that to disentangle how technological instruments, conceptual frameworks, and social order in a given infrastructure make possible specific forms of living and knowing, one must interrupt this transparency. There are two ways of achieving such an analytical opportunity: one can systematically defamiliarize particular elements of infrastructure, or one can study it in moments of breakdown. Bowker & Star (2000) call this method infrastructural inversion.

How, then, should we think about the relation between articulation work and inversion? When reading the foundational publications on articulation work and infrastructural inversion cited in the above, one could get the impression that articulation work and inversion are opposites. The

articulation work done by actors in particular work settings, one could reason, is what produces and maintains infrastructure in its relational transparency, while it is the prerogative of an objective ethnographic observer—who is not subject to the professional blindness of the implicated actors—to defamiliarize infrastructure and make articulation work visible in its *real* form and function. This would also mean that infrastructural inversion is something essentially different from the basic reflexivity that is involved in all articulation work in the first place. To be sure, Bowker & Star (2000: 310–311) also discuss cases of infrastructural anomaly, in which actors are forced to develop a particular reflexivity for survival. For example, some actors are marginalized by existing classifications schemes (think of classification by race or gender), or they are simultaneously part of multiple classification schemes that do not properly map onto each other. Maneuvering such anomalous situations requires actors to “juggle” their different memberships, and to find workarounds to infrastructural arrangements geared to exclude them. Bowker & Star propose that attending to such activities is a particularly good starting point for infrastructural inversion by STS researchers, since they require an implicit ability to defamiliarize infrastructure on the part of the studied actors. However, they abstain from defining the reflexivity of actors as a form of inversion.

In this paper, I pick up this line of thinking, and I supplement it with a theoretical clarification. My argument is that we should resist the temptation to think about infrastructural inversion and articulation work in terms of a dichotomy. Instead, inversion should be conceptualized *as a specific form* of articulation work. Such an approach takes seriously the notion that no instance of inversion—including those performed by STS analysts—uncovers infrastructure as it really is, but always constitutes a situated effort to reconstruct infrastructure. The inverter always selectively highlights certain aspects of infrastructure, and the particular emphasis of a given inversion will often reflect local concerns and individual strategic purposes. Collapsing inversion and articulation work emphasizes that the reflexivity of actors in everyday work settings is not essentially different from the reflexivity of inverting analysts, a notion that resonates well with recent methodological writing on the epistemological status of STS ethnography (Beaulieu et al., 2007; Zuiderent-Jerak, 2007), as well as with an older line of STS research on the role of reflexivity in knowledge production (Woolgar, 1988; Ashmore, 1989). Infrastructural inversion can then be conceptualized as a generative resource actors themselves draw on in developing infrastructure. While some recent scholarship has pointed in a

similar direction (Edwards, 2010: 20–23; Mayernik et al., 2013), the exact mechanisms by which inversions unfold a generative potential have, to my knowledge, not yet been explicitly theorized.

To better understand how actors in digital scholarship wield infrastructural inversion as a generative resource, I analyze four cases of reflexive communication among practitioners of DH, in which they grant a selective look behind the scenes of their everyday work. I will argue that by circulating documents in which they systematically defamiliarize their work contexts—by performing inversions—researchers can promote new ways of meshing efforts of individuals as well as tasks and task areas. As Fujimura (1987) points out, circulating scholarly publications and other kinds of documents, such as letters or email, is a way of aligning the activities on the work level of individual projects with that of the wider community of scholars, employers, and funders. Through such alignment, individual research projects become “doable” economically and in terms of being acknowledged by scholarly peers. The documents analyzed in the following fulfil these functions, but they also carry the additional implication that they are deliberately crafted, reflexive representations of research settings. Not only does the circulation of these documents thus *constitute* a form of articulation work, but the content of the documents itself is explicitly *about* articulation work.

The function of the documents can be illustrated in relation to Fujimura’s (1987) concept of packaging. This denotes the practice of compressing unorganized articulation tasks into standardized sequences of standard tasks, which are then assigned as someone’s production work. Fujimura provides two examples. A first one is technological instruments that “black-box” certain tasks, which allows a wide variety of (non-specialist) users to accomplish them. Another instance of packaging is the dissemination of manuals describing standardized techniques for particular tasks in a given setting; for example, molecular cloning in oncological lab work. Such manuals enable users with some basic field knowledge to master those techniques by themselves. Packages thus reduce the effort individuals would otherwise need to spend on organizing and coordinating their work autonomously and ad hoc.

I would extend the range of packages to include other ways of reducing the complexity of articulation work in the conduct of scholarship, such as the established form of peer review and the use of conventional ways of framing scholarly arguments and empirical material. Peer review essentially is a widely accepted protocol regulating quality control and the

reproduction of intellectual standards in a field. This absolves individual researchers from having to figure out solutions to these tasks every time they wish to publish a paper. Similarly, the use of conventions of representation in circulating scholarly arguments and empirical material makes it easier for the individual researcher to establish common ground with other actors. Framing a set of spatio-temporal information in Aristotelian–Euclidean categories, for example, facilitates data-sharing with an audience who can be expected to immediately relate to these conventions. In turn, publishing an intellectual argument as a monograph with a prestigious university press makes that argument immediately recognizable as a valid scholarly contribution for peers and employers. Lastly, I would consider it an instance of packaging when a set of articulation tasks is compressed into the responsibility of a single group of actors. Star & Strauss (1999) have described this move as a “disembedding of background work”, and they give the job profile of nurses, a classical service profession, as an example.

In most of the cases I analyze, practitioners of DH use inversions to highlight and “untie” existing packages in scholarly infrastructure, which inevitably means releasing the complexity of articulation work that the packages allow to contain. Simultaneously, however, these inversions promote alternative ways of streamlining that articulation work. A particular form of reflexivity may in fact establish new ways of packaging over time, thereby segmenting research practice by re-drawing the boundaries between the visible and the invisible. This again will have implications for the power relations within the academic labor ecology, and ultimately for the forms of knowledge that can be produced in a field (Kaltenbrunner, 2014). An analysis of different forms of reflexivity, therefore, is also a specific method for highlighting the perpetual conflicts through which actors try to shape their shared socio-material environment according to their individual priorities and visions (Bowker & Star, 2000). These conflicts tend to become particularly consequential in times of major infrastructural change, as afforded by the current investments in digital infrastructure and e-science (Edwards et al., 2009).

Here, it is important to take into account the wider context of articulation work. While all inversions are subversive in that they challenge some aspect of field-specific common sense, different inversions will not be equally compatible with the interests of relevant actors beyond the disciplinary domain, such as policy makers or funding bodies. The latter two often see the diffusion of computational methods as an opportunity for

“helping” the humanities to become empirically more robust (Williford & Henry, 2012) and in line with “inevitable” technological developments (Waters, 2013), as well as a solution to the perceived problem of “organizational fragmentation” of the scholarly landscape (ESFRI, 2008). Practitioners can choose to align their vision of DH with these interests, or they may mobilize existing resentment of scholars toward exactly such attempts by research policy to intervene in disciplinary self-governance. These dynamics will affect the likelihood of a given form of reflexivity to establish new, hegemonic ways of packaging articulation work. While not aiming for a comprehensive sociological analysis of DH-internal politics, I will therefore try to situate the inversions I analyze with respect to the political alliances they pursue.

Four Case Studies of Inversion in Digital Scholarship

Methodology and Case Selection

In the following, I investigate four cases in which practitioners of DH perform an infrastructural inversion as a form articulation work. This analysis is based on the discursive study of various types of sources that actors use to communicate and relate with each other: scholarly monographs, blogs, a scholarly journal that only publishes digital applications (*Vectors*), an internet forum for digital humanists employed in non-research positions (alt-academy), as well as a mediaCommons website where scholars can publish and review monograph manuscripts digitally.

I have selected those four cases because they touch on aspects of articulation work that are currently the topic of intense discussions within the community of DH, thus highlighting the nexus between infrastructural organization and disciplinary identity. The significant attention these particular arguments have attracted allow me to make representative statements about the recent development of the field.

The first case study addresses the problematic distinction of “technical” and “intellectual” labor. Digital scholarship involves a manifold of activities that would previously have been considered to lie outside the core business of a scholar, such as coding, data work, and ICT maintenance (The Virtual Knowledge Studio, 2008). The question as to what constitutes scholarly authorship in digitally mediated research, and what proper modalities of employment—two aspects with important consequences for how task areas in the scholarly process are meshed—consequently has occupied an important role in discussions among digital scholars. This is

illustrated in an exemplary fashion by Julia Flanders' contribution to the virtual platform alt-academy (case #1).

Secondly, in contrast to monograph-oriented forms of research, DH usually takes place in collaborative, grant-funded projects. Digital scholars thus face the twofold challenge of a new collaborative overhead in the primary research process, and the need to align their projects with the interests of funding bodies and potential partner institutions such as archives and libraries. However, we can observe the recent emergence of a new type of reflexive organizational literature, namely guidelines and "best practices" in which digital scholars exchange strategies for dealing with the new complexity of articulation work (case #2).

Thirdly, there is a discussion about the role of theory in digital scholarship. Theory plays a role in coordinating and integrating individual contributions to the scholarly knowledge produced by a disciplinary community (Whitley, 2000), thus making it a key element of articulation work. Prominent scholars have argued that DH have been too much concerned with creating digital artifacts such as tools and analytical applications, and not enough with underpinning these activities theoretically (Ramsay & Rockwell, 2012). As a side effect of this neglect of theory, critics such as Johanna Drucker suggest, the DH risk buying into a new form of digital positivism that is tacitly imported together with data-centric methods and tools for quantitative analysis (case #3).

Fourthly, another key theme in the discussions among practitioners of digital scholarship is peer review. The conventional form of peer review has come under critical scrutiny in many fields of research (Campbell, 2006), and DH practitioners have been particularly proactive in exploring digitally mediated alternatives for the provision of scholarly quality control. As an example, I analyse Fitzpatrick's (2011) experiment in peer-to-peer review (case #4).

Julia Flanders: Inverting Divisions of Labor

My first case study draws on an essay by digital humanist Julia Flanders (2011), well known for her work in Brown University's longstanding Women Writers Project. The essay has been published on the internet forum alt-academy. Started as a traditional book project in 2010, alt-academy has developed into a virtual meeting point for humanities-trained individuals in "para-academic" employment (university libraries, ICT service departments, DH centers...). Alt-academics usually work outside the tenure structure and have a professional concern with the development of digital research tools.

Although frequently engaged in cutting edge digital scholarship, many alt-academics feel that due to its “technical” orientation, their work is insufficiently appreciated by university administrators and peers in traditional research positions. Many prominent digital humanists in fact have started their careers in “para-academic” positions, which would imply that these personal histories have shaped the identity of DH as a field (Nyhan, 2012).

An important theme of Flanders’ essay is how the deeply cooperative nature of any kind of humanities scholarship makes itself felt once researchers are stripped of their infrastructural embedding. Flanders recounts how her first employer, Brown University’s Scholarly Technology Group (STG), was run as a “cost center”. This meant that the university covered some expenses, while STG also was expected to attract its own funding through grants and contracts. STG moreover was required to autonomously cover various support activities, such as administration and server maintenance, that enable its actual work. Many of these usually invisible tasks thus became explicitly visible to STG employees for the first time. This experience made Flanders particularly aware of the conventional divisions of labor that are normally used to mesh and coordinate the countless tasks and task areas in the academic labor ecology.

A particularly tricky distinction is that between technical and scholarly work, as Flanders continues to argue in a reflection on her many years of experience as a consultant for various DH projects, such as digitization initiatives in libraries, or digital scholarly editions for university presses. In such consulting relationships, Flanders utilizes expertise in digital technologies as well as substantive scholarly domain knowledge. Both skill sets are required in order to tailor technical solutions to the needs of scholars, managers, and editors. Nonetheless, the consultant must demarcate her services as sufficiently different from the client’s own scholarly knowledge, in order to carve out a professional niche for herself. Flanders’ strategy as a consultant lies in emphasizing her technical expertise, so as to have a commodity that is interesting for the clients. The latter, in turn, are usually quite happy about not having to bother with “anything digital”.

I suggest that there are at least two forms of valuable knowledge in play. The first is the knowledge that the client values because they are glad they don’t have it (or have responsibility for it): they value it in the consultant because it represents what they think they are

buying. Technical knowledge falls into this category: (...) knowledge of XML, databases, electronic publication systems, digital project management. The second, more problematic category is the knowledge that makes the first type usable to the client—namely, the meta-knowledge through which the consultant grasps the client's subject area. In my case, this includes familiarity with scholarly editing and with methods of literary scholarship, and despite the fact that my technical knowledge would be unusable without it, this knowledge also constitutes a kind of subtle structural irritant in the consulting relationship. Precisely because of its potential value (if I were being considered as a colleague), it must be explicitly devalued here to show that I am not so considered: it creates a necessity for gestures of demarcation by which the boundaries of my role can be drawn, with technical knowledge on the inside and subject knowledge on the outside. (Flanders, 2011).

Ironically, the intervention of the digital consultant into the scholarly process, although framed as merely technical, can bring about a rather consequential reconceptualization of the research object. In the case of the digitization of the New Variorum Shakespeare edition, the consulting work by Flanders resulted in a newly privileged role of XML in the editorial process, which in turn brought to the fore certain features of the Shakespearean text that were not visible before.

Where in the print production process the editorial manuscript was taken as the most informationally rich artifact in the ecology (...), in the digital process the editorial manuscript is a precursor to that state: the XML encoding brings information structures which are latent or implicit in the manuscript into formal visibility. (Flanders, 2011)

Flanders thus portrays a professional hierarchy between the editor, who is formally in charge of the intellectual content of the edition, and the DH consultant, who is hired for a seemingly subordinate task, namely to provide technical advice. This division of labor also means that editor and consultant relate to the scholarly infrastructure in different ways. Precisely because of her formal prestige, the editor is one degree removed from technical responsibilities. The consultant on the other hand is responsible for "anything digital". A whole task area here is packaged into the

responsibility of a single actor group, thus constituting an example of “disembedded background work” (Star & Strauss, 1999). This reduces the complexity of articulation work the editor would otherwise have to deal with, that is, acquire relevant knowledge of digital editing techniques, and manage the contingencies and organizational overhead their application entails (Fujimura, 1987). However, Flanders suggests that such packaging is problematic, since digital technology effectively alters the power relation between editor and digital consultant. An editor familiar only with traditional methods will not have a good understanding of the affordances of digital technology. Therefore, by ceding responsibility for digital techniques to the consultant, the editor also cedes potentially important design choices.

Flanders’ infrastructural inversion serves to highlight and problematize how digital consultants are forced to reproduce an established way of packaging articulation work in digitization initiatives, if they mean to find paying customers. While her experiences are common among her peers, the recent policy and media interest in DH has arguably created a particular strategic opportunity for initiating a broader discussion about academic employment modalities and the valuation of specialist labor. Flanders implies that for digital research technology to unfold its full potential, it must go along with a change in the academic labor hierarchy that currently prevents digital skills from wider diffusion. Her inversion thus rhetorically ties the success of digital scholarship—currently high on the agenda of many policy makers and funding bodies (Williford and Henry, 2012)—to the need for upgrading the professional status of alt-academics.

Tom Scheinfeldt: Infrastructural Inversion as a Management Technique

As pointed out, digital scholarship is usually organized in collaborative, grant-funded projects that involve professionals with different specializations and accountabilities. This requires practitioners to constantly look out for supplementing and follow-up grants, so as to sustain often fragile, inter-institutional collaborations. Not least, digital research projects frequently depend on other academic actors such as archives, libraries, and heritage institutions for access to digitized source materials and metadata. Collaborative digital scholarship thus presents its practitioners with a bewildering complexity of articulation work, not only on the level of individual projects, but also between the project level and external actors such as funding bodies and potential partner institutions. Degree programs

in the humanities teach students to perform sorts of articulation work required in established formats of scholarship: students learn how to do archival and field work, to survey literature, to produce a clearly defined form of output, and to present at scholarly conferences. This education is not geared toward disseminating skills for dealing with the overhead of articulation work in DH.

However, there is a growing amount of instructional materials on how to go about DH project work available online. An example is a guideline collaboratively assembled by the participants of *one week/one tool 2011*, a workshop on digital project planning and management taught by the director of Georgetown University's Center for History and New Media, Tom Scheinfeldt. The assembled notes compress Scheinfeldt's key lessons, and they have since been circulating among digital scholars as one of the go-to sources for DH project management knowledge (French, 2013).

The function of this guideline is similar to Fujimura's (1987) example of packaging through the dissemination of manuals. Specifically, she refers to a manual describing techniques of molecular cloning, a document so widely used in the field of cancer research that it became known as "the bible". But while this latter document was meant to reduce the time and effort required to teach individuals lower-level skills in well-defined task areas, Scheinfeldt's guideline promotes the establishment of a new class of professionals, the DH project manager. The responsibility of the project manager is to completely absolve the other participants from articulation work that exceeds what is necessary to fulfill their specific production task within a project.

Project Manager's job is to protect the staff from the PM's job. They shouldn't have to interface with admin, deans, budgets, etc. Not because there's secrecy involved, but because staff should be able to do what they do best: their work. (THATCampCHNM, 2011)

According to Scheinfeldt, the distinctive feature of such managers must be the habit of systematic reflexivity with respect to the work processes they coordinate, and with respect to the wider infrastructural context in which those processes are embedded. This sort of managerial reflexivity cannot be clearly distinguished from infrastructural inversion. In fact, the abstract that precedes the guideline is rather reminiscent of Fujimura's (1987) own analysis, insofar as it highlights the importance of articulating tasks and task areas, and of aligning those articulation efforts between different levels of

work organization.

This session will consider both the practical, day-to-day work and intangible aspects of managing digital projects in the humanities. Pragmatic lessons will include picking a project, building partnerships and engaging stakeholders, attracting funding, budgeting and staffing, setting milestones and meeting deliverables, managing staff, publicity and marketing, user support, sustainability (...). The session will also consider several intangible, but no less important, aspects of project management, including communication, decision making, and leadership. (THATCampCHNM, 2011)

A crucial aspect of several topics discussed in the manual is the need to “read” the preferences and accountabilities of project-external actors to make a project “doable”. This includes, for example, the volatile interests of funding bodies.

- a. Pick something that is interesting to you, but that’s not enough of a reason to pick a project. There are other questions you need to ask yourself.
- b. It needs to be something that is fundable. (...)
- c. If it’s not fundable, is there a way to modify it so that it is fundable? What adjustments can you make to your grand vision? You need to be flexible (like the willow). (THATCampCHNM, 2011)

Another group of important external actors consists of libraries, archives, and heritage institutions, who often can provide access to digitized collections. At the same time, these institutions are themselves in a process of adapting their function in light of new technological possibilities for storage and dissemination. A key advice by Scheinfeldt is to be aware of the possible new needs of such institutions, which might allow for an individual digital project to engage in a form of trading with much larger partners.

- d. Partnerships are a way to build up your data.
- e. Shoot big in your external partnerships. Do not go thinking, “Library of Congress won’t partner with me.” You might be part of a more nimble organization than they are. (...) There are some things that they cannot manage to get done on their own. Just because you

are small does not mean that you do not have something to offer that could be valuable to them. (THATCampCHNM, 2011)

Not least, Scheinfeldt provides some hard-and-fast advice for how to coordinate work on the level of the individual project. His recommendations reflect a strong sense of pragmatism:

f. Leadership is momentum making. Make sure everyone is always moving forward. If they are not moving forward, you are not leading. (...)

g. Leaders are first doers. Best collaborations are not about shared decision making, it is about shared doing. (THATCampCHNM, 2011)

Scheinfeldt's guideline promotes an emphatically pragmatic way of dealing with the new complexity of articulation work in digital scholarship. It encourages prospective managers to defamiliarize academic infrastructure in such a way as to see their projects as actors in a larger ecology, which in itself is undergoing change. This entails acknowledging and adapting to the power of funding bodies, and reflecting on individual projects in terms of their instrumental relations with other actors, such as libraries and heritage institutions.

However, the pragmatic managerial style in which Scheinfeldt defamiliarizes the conduct of collaborative digital research, and the readiness by which he accepts key changes in the academic organization, such as the new importance of grants, alienates many traditionally trained scholars. A panel at the Modern Language Association's (MLA) 2013 conference, for example, was entitled *The Dark Side of the Digital Humanities*. It featured a number of renowned scholars who argued that there is a problematic tendency in DH to frame the discussion on the future of research and higher education in an uncritical entrepreneurial discourse. Flush with money from short-term digital project grants, thus the speakers, the DH tends to be complicit with neo-liberal approaches to university governance, thereby sacrificing the critical edge that has characterized much late 20th century scholarship (e.g. Grusin, 2013).

Johanna Drucker/Mark Hansen: Inverting Representational Conventions

There are also instances of digital scholarship, however, that explicitly position themselves in opposition to the entrepreneurial pragmatism of

digital humanists such as Scheinfeldt. An example is the influential work of Johanna Drucker, one of the primary representatives of critical theory in DH. In her book *SpecLab*, Drucker narrates the history of several projects in what she calls speculative computing, undertaken at the University of Virginia in the early 2000s. The label “speculative computing” is meant as a challenge to DH, which Drucker argues is oblivious of the crucial theoretical legacy of poststructuralism and deconstruction. Specifically, she criticizes the notion that the practical constraints of digital scholarship also require epistemological pragmatism.

Time after time, we saw theoretical understandings subordinated to the practical “requirements of computational protocols”. As one of my digital humanities colleagues used to remark, we would go into the technical discussions as deconstructed relativists and come out as empirically oriented pragmatists. (Drucker, 2009: xiv)

A key concern of Drucker is to criticize the conception of data that the humanities in her view tend to import from the natural sciences as they adopt digital technologies for visualization (cf. Drucker, 2011). Drucker argues that such approaches often have the structuralist tendency to treat data as self-identical signifiers. This new form of digital positivism, she suggests, is in fact an ideology that strives to align situated meaning-making in a functionalist way—in Fujimura’s (1987) terminology, a specific strategy for packaging articulation work. Her argument moreover recalls Bowker & Star’s (2000) well-known infrastructural inversion of representational categories and classification systems: the use of Euclidian geometry and of the Aristotelian definition of time as chronology, Drucker suggests, allows to establish common ground between data-sharing individuals who can be expected to immediately relate to such conventions. This reduces “friction” in the process of exchanging data (Edwards et al., 2011), but at the cost of a creeping reification of those representational categories over time.

Instead, Drucker associates SpecLab philosophically with surrealist “pataphysics”, a parody of nineteenth century positivism, and she approaches the challenge of complex articulation work through the lens of poststructuralist literary theory. In the poststructuralist perspective, reading of a sign necessarily entails a creative distortion. Drucker suggests that this distortion should be celebrated, rather than framing it as a problem that hampers distributed collaboration. As a concrete example of this approach, Drucker introduces the project Temporal Modeling, in which she and her

collaborators developed a graphical language to express subjective perceptions of time (Drucker, 2009: 37–64). Standard software for data visualization, she argues, usually comes with certain Aristotelian–Euclidean conventions of representation built into it. The SpecLab team instead started out with conceptualizing ways to represent subjective perceptions of time *before* developing a data structure. Eventually, the team came up with features such as a now-slider, timelines warped by anticipation or anxiety, and special markers to denote emotional inflection of time. While not all of these could be implemented, it is characteristic of the spirit of SpecLab to experiment with new approaches to classifying data, rather than adopting existing ones from information or computer science. The idea here is to emphasize theoretical complexity and open-endedness of research problems. The resulting application intentionally resists easy appropriation by prospective users through shared assumptions about data, instead relegating complexity back to the audience. Drucker recounts the often baffled reactions to SpecLab projects:

The spirit of play with which we imagined these projects is an essential generative insight. Around conference tables or in public presentations, our projects often provoked the query “Are they serious?” (Drucker, 2009: xix)

This is not to say that Drucker may not in practice apply articulation strategies comparable to those of Scheinfeldt, but she does not foreground any of that in her public presentation of the project. What she does explicitly foreground is poststructuralism and deconstruction as a principle of aligning her work with the work of other scholars. While Temporal Modeling emphatically ignores expectations toward positivist conceptions of data, and thus excludes potential calls for funding that presuppose such an expectation, it clearly seeks to establish common ground with colleagues who share familiarity with this theoretical framework.

Temporal Modeling is an early example of a sort of inversion/articulation in DH that has been further facilitated by the possibility to publish non-discursive digital output. In several ways comparable to Drucker’s work is Hansen’s (2012) digital application *Shi Jian: time*. The project was published in the journal *Vectors*, an experimental, peer-reviewed scholarly outlet that only accepts digital output. *Shi Jian* is based on the 1,200 photos and 103 videos created by Hansen during a writing sabbatical in Beijing. While the material on display thus is the stuff from

which typical touristic appropriations of visited sights are made, the presentation is geared to undermine such a reception. The application offers an interface through which users can sort the audiovisual material according to a number of different criteria, such as place, time, color shades, and point of view from which a photo was taken. The interface principally allows to explore the collection according to a linear chronological and spatial order, but the multiple alternative ways of displaying the material, which moreover can be overlaid onto each other, encourage users to acknowledge that this is just one out of a spectrum of possibilities. In a discursive introduction, Hansen declares that his goal has been to encourage “experimentation with the ‘reference frame’ of time”, which he hopes “will open up an important conceptual and aesthetic space around questions of how we in the West live time” (Hansen, 2012). Similarly to Drucker, Hansen’s project means to “untie” the packaging of articulation work through the use of Aristotelian conventions of representing time, and instead emphasizes how digital technology can be used to multiply ways of framing data conceptually. Again, much like Drucker, this does not mean that there is no attempt to preemptively reduce the complexity of articulation work in the presentation of the project. Hansen manifestly means to establish common ground with his audience through shared understanding of the theoretical framework of poststructuralism and deconstruction, which is referenced in the discursive introduction.

The particular reflexivity advanced by Drucker and Hansen thus creates a contrast to Scheinfeldt’s managerial concern with adaptation and efficiency. Combining established frameworks of theoretical critique with digital methods, their inversions outline a vision of digital scholarship more likely to appeal to the apparently numerous humanists who are suspicious of the affinity between DH and the “projectification” of academic life.

Kathleen Fitzpatrick: Inverting Traditional Peer Review

While most digital scholarship takes the shape of collaborative projects, there are also instances that remain closer to traditional formats. An example is the monograph *Planned Obsolescence* by Kathleen Fitzpatrick. Currently the director of Scholarly Communication at the MLA, Fitzpatrick is in an important strategic position for promoting new ways of disseminating scholarly knowledge.

At the heart of Fitzpatrick’s argument is an inversion that problematizes traditional peer review and scholarly publishing models as elements of the academic infrastructure. Fitzpatrick (2011: 13-14) argues that

print monographs, as the primary form of scholarly output, are no longer sustainable in light of diminishing budgets even at major academic publishers. To illustrate this point, Fitzpatrick relates how the University of California libraries have switched to purchasing only a single copy of new scholarly monographs, which is then sent around via interlibrary loan. This poses a particular problem for younger scholars, since publishing the works of junior academics is particularly risky for university presses. Moreover, Fitzpatrick argues that the traditional monograph model fails to acknowledge a fact of recent media history, namely a shift in the relation between information and its users from a filter-then-publish approach, characteristic of book production (where editors select manuscripts for publication), to a publish-then-filter approach, characteristic of the Internet (where content is published and only later selected as deserving particular attention). This change, she argues, has caused a shift in the generally accepted definition of epistemic authority, which no longer is with institutionally appointed gatekeepers, but an emergent property of user crowds who sift through large amounts of information. By clinging to the established system of peer review, the humanities allegedly “risk becoming increasingly irrelevant to contemporary culture’s dominant ways of knowing” (Fitzpatrick, 2011: 17). Fitzpatrick combines her argument with a revisionist account of the historical foundation of scholarly peer review in the eighteenth century. Citing the historian Biagioli (2002), she emphasizes that modern peer review has its roots in state censorship and in the interest of the Royal Society to protect the privileges of its members. Only later on, peer review was rationalized as the unique quality control mechanism in scholarly knowledge production. The academic elite defending the status quo, Fitzpatrick polemically suggests, may in fact primarily be motivated by the impulse to protect its current position of power. She goes on to discuss evidence of manifest failure of peer review, for example, the influential study by Zuckerman & Merton (1971), in which the institutional affiliation of authors was shown to influence the likelihood that journal editors would accept their submissions.

Peer review and the traditional print monograph, the targets of Fitzpatrick’s inversion, can themselves be seen as institutionalized instances of what Fujimura (1987) calls packages. Both serve to reduce the complexity of specific aspects of scholarly articulation work: the former regulates the mechanism of scholarly quality control, and the latter stipulates what scholarly expression must look like in order to be immediately recognizable as a valid contribution to disciplinary knowledge by colleagues and tenure

committees.

Yet Fitzpatrick offers an alternative for containing the complexity of articulation work that is released if conventional forms of quality control and publishing are discarded. *Planned Obsolescence* in fact is an experiment in digital publishing, meant to demonstrate the potential of what she calls peer-to-peer review. Parallel to the formal, anonymous peer review provided by NYU Press, a draft of the book was published in chapter-long postings to a website hosted by mediaCommons, with the possibility for anybody to create an account and comment on the text. In an introductory note to the digital draft, Fitzpatrick (2009) explains that this online conversation between herself and the peers will be “key to [her] revision process”. Digital technology was instrumental to this form of quality control in two ways: the open peer review of *Planned Obsolescence* was heavily advertised on Twitter, thus making up for the formal protocol that normally orders the communication between scholars, editors and referees. Moreover, the mediaCommons website has a graphical user interface allowing readers to post publicly visible comments directly next to the text.

However, “untying” an established package of articulation work, and trying to create another one, did not go without some friction. A first shortcoming Fitzpatrick (2011: 191) notes herself in a reflection on the online review experiment is the unequally distributed attention of the referees. Some passages of the online draft received a lot of comments, while others were largely ignored. Moreover, a number of comments primarily consist in enthusiastic applause for a well-put insight, or they digress into longer exchanges among commenters. This communicative register is at odds with Fitzpatrick’s explicit request for review-type feedback that can provide the basis for revising the manuscript. Not least, some comments are visibly informed by a certain sense of confusion with respect to the status of the online draft. In the following quote, a commenter preemptively limits the scope of her proposed revisions, since she is unsure about the extent to which Fitzpatrick can even change the draft. The commenter apparently thinks of the online draft as a more or less finished product, rather than a trace of an unfolding writing process.

I’d like to (. . .) suggest moving what seems to me the key conclusion out of footnote 1.8 and into the body of the text. (I’m assuming, Kathleen, that you can make changes before this goes to hard covers?). (Rowe, 2009)

The reason for such confusion, I suggest, is that peer-to-peer review is still in the process of being defined. Establishing a new protocol for regulating scholarly quality control requires an effort at standardizing chunks of articulation work, a process that will be cumbersome and potentially contested. It is far from obvious that all scholars who declare themselves as advocates of peer-to-peer review share a consensus on its proper modalities. Koh (2013), for example, has recently attacked the editors of the *Journal of Digital Humanities*, who claim to adhere to the goals of peer-to-review. The journal collates and formally publishes existing DH work (applications, tools, discursive arguments) that was previously accessible only online. Koh argues, however, that this specific interpretation of publish-then-filter creates new opportunities for gate-keeping *within* digital scholarship, since it is again the journal editors who fulfil the function of filtering pre-existing “content”.

Conclusion

I have introduced my argument by theorizing the relation between the concepts articulation work (Strauss, 1985, 1988) and infrastructural inversion (Bowker & Star, 2000). Articulation work denotes the activities necessary to manage the contingencies that occur in the everyday practice of scholarship. Infrastructural inversion is an analytical shift in perspective that foregrounds the normally taken-for-granted elements that invisibly enable distributed cooperative work. At first sight, the concepts might seem to constitute a dichotomy: articulation work after all is what sustains everyday work routines in their transparent infrastructural-ness, while inversion is a defamiliarizing move performed to interrupt this transparency. I have suggested that it is more useful to think of inversion as a specific modality of articulation work. The particular reflexive perspective that is such a characteristic feature of much writing by digital humanists can then be theorized as a generative resource. Inversions performed by DH practitioners defamiliarize scholarly infrastructure in such a way as to highlight and critique existing traditions of organizing articulation work, while simultaneously promoting alternatives for how to handle that work.

I have provided four cases studies to illustrate this argument empirically. In three of these, actors use inversion to problematize existing ways of streamlining articulation work by sequencing it into standardized packages (Fujimura, 1987). Fitzpatrick (2011) “unties” the package of peer review, which is essentially an established protocol that regulates the communication between scholars/referees. She polemically depicts that

protocol as a suboptimal historical accident, while offering digitally mediated “peer-to-peer review” as an alternative means to streamline the articulation work required for scholarly quality control.

Flanders’ (2011) contribution to alt-academy systematically defamiliarizes the division of labor between traditionally trained scholars and digital humanists. Her inversion suggests that this division of labor is not only artificial, but also increasingly problematic: the wholesale packaging and delegation of “anything digital” to DH consultants may be a convenient way of reducing the complexity of articulation work for traditionally trained scholars, but it also means delegating intellectually significant design choices.

The inversions of Drucker (2009) and Hansen (2012) draw attention to how conventional ways of framing empirical material reduce complexity through shared expectations toward data, and they ask whether such reduction is desirable in the first place. Instead they propose theory as a primary interface for aligning individual contributions to scholarly knowledge, and their digital applications intentionally relegate larger bits of that complexity to the audience.

In the case of Scheinfeldt, inversion is a means of tackling aspects of articulation work that have no precedent in more traditional formats of scholarship, namely the organizational challenges presented by grant-funded, collaborative digital projects (THATCampCHNM, 2011). In his view, this requires the creation of a new job profile: that of the DH project manager. A distinctive feature of this new class of professionals according to Scheinfeldt’s guidelines is a pragmatic reflexivity with respect to the embedding of DHprojects in a changing academic work ecology.

Through performing and circulating inversions, actors reinterpret the status of quo of infrastructure in light of potentialities, thus paving the way for embedding new tools in particular ways. Yet individual forms of reflexivity express different and sometimes competing visions of digital scholarship. The most obvious faultline in my sample is that between Scheinfeldt and Drucker. While the former’s inversion is informed by a strong sense of managerial pragmatism, that of the latter explicitly opposes such pragmatism as an ordering principle. Moreover, while inversions are instrumental in highlighting concrete opportunities for altering specific infrastructural features, the process of containing the complexity of articulation work that is released when existing packages are “untied” prompts substantial, and potentially competing, efforts at creating new standards. Fitzpatrick’s experiment, for example, represents not so much a

showcase of a ready-made new form of digital peer review, but rather an ongoing process in which scholars renegotiate the modalities of academic quality control.

Such instances of competition and negotiation draw attention to an aspect that I have only hinted at in this paper, namely the fact that not all inversions are equally opportune politically. Different forms of reflexivity imply distinct possibilities for mobilizing the support of other actors and developments in their environment, thus affecting their chance to establish new hegemonic ways of organizing articulation work. Scheinfeldt's guidelines are geared to reinvent the organization of scholarship in a way that makes it more compatible with broader changes in the organization and governance of academic research, such as the increasing importance of funding bodies and other partners. However, many scholars feel alienated by this prospect, since they perceive it as undermining the critical ambitions of humanistic inquiry. The inversions of Drucker and Hansen accommodate exactly these sensibilities. For them, digital scholarship is not simply a matter of "improving" research by integrating new tools, but also an opportunity for raising questions about the political and epistemological implications of seemingly neutral values such as organizational efficiency.

More research would be desirable to investigate how such alignments affect the restructuring of scholarly knowledge production over time. For example, will the dissemination of guidelines for digital project management indeed promote wider diffusion of digital practices across the humanities? Or will the often polemical call to adapt to new organizational and technological circumstances rather prompt the resistance of traditionally trained humanists, thus keeping digital scholarship a specialist endeavor? Alternatively, will we witness a fragmentation of digital scholarship into distinct theoretical and methodological approaches, a trend that is perhaps foreshadowed by Drucker's critique of "mainstream" DH?

Postscript to chapter 4

In the preceding case studies of the COST Action and Elite Network Shifts project, I have given empirical examples how reflexivity is critical to overcoming instances of infrastructural conflicts. In the case of the COST Action, applied reflexivity has meant experimenting with the size of collaborative project formats. In a field characterized by strong diversity of research questions and intellectual approaches, smaller projects make it easier to identify packageable sequences of work. In the Elite Network Shifts project, it has meant acknowledgment of the different role data play across disciplinary cultures, thus opening up new possibilities of organizing the division of labor between computer scientists and scholars of Indonesian studies. However, to counter a simplistic idea of reflexivity as a panacea that can provide universally accepted solutions, I have in this chapter attempted to study reflexivity itself as an element in the evolutionary development of infrastructure.

Conceptually, I view disciplinary conventions of knowledge production as the result of historical packaging of research work (Fujimura, 1987, 1992; Law, 2004). Disciplinary criteria for what counts as valid questions, methods, and forms of output thus can be seen as the result of particular practices that have been repeated over generations, thereby crystallizing into a scholarly infrastructure (Bowker & Star, 2000; Edwards, 2010; Star & Ruhleder, 1996). Following such conventions makes research more easily feasible economically, in that it allows to draw on the work of one's predecessors without having to reinvent organizational modalities every time anew. At the same time, established conventions make it challenging to engage in radically different research practices. Difficulty in embedding novel tools in the humanities can thus actually be seen as an incongruence between the affordances of digital scholarship on the one hand, and established disciplinary models of organizing scholarly work on the other. In this chapter I have argued that reflexivity in the discourse of digital humanists serves as a means of 'untying' the standardized packages that constitute disciplinary cultures. This allows to reimagine established forms of knowledge production, for example by showing how it is possible to create novel forms of output and conduct collaborative project work in an infrastructure geared towards single-author, monograph-oriented research. Reflexivity thus is not merely the act of creating representations. Instead, this reflexivity also does something, insofar as it creates legitimacy for nascent modes of scholarship as well as disseminating practical knowledge of how to realize them in spite of an inert disciplinary organization. Such

proposed solutions may gradually turn into new conventions in their own right, thereby reshaping the organizational conditions of digital knowledge production for future generations of academics. It is in this sense no exaggeration to say that reflexivity fulfills an evolutionary function in the development of scholarly infrastructure.

At the same time, my focus on the contentious nature of reflexivity has shown that the selection of novel formats of scholarship cannot be thought of as an inevitable survival of the fittest. Different actors in digital humanities propose very different ways of framing and resolving infrastructural friction. Establishing new conventions is thus a matter of active knowledge politics by human actors. These findings also supplement my argument about the instrumental value of reflexivity, as presented in chapters 2 and 3. Each way of framing and tackling infrastructural conflicts - also the ones suggested in this thesis - may become a blueprint for the common practice of digital scholarship in the future. Precisely for this reason, we are well advised to remember the perspectivity of our reflexive thinking, and thus the fact that any solution we now choose may marginalize a host of alternative ways of reengineering the scholarly knowledge machine.

