# Academic librarians' Twitter practices and the production of knowledge infrastructures in higher education

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This thesis results entirely from my own work and has not been offered previously for any other degree or diploma.

The word-length of 49,733 (51,678 after corrections) conforms to the permitted maximum.

Signature: *Margaret Westbury*

# Abstract

In recent years, academic librarians' roles have increasingly encompassed practices of knowledge production, spurred in part by their role in supporting the creation and dissemination of university research outputs. Shifts in institutional trends have also seen librarians' widespread adoption of Twitter to share information and encourage collaboration. There is little research, however, about relationships between knowledge production in HE and librarians' Twitter practices. The few existing studies about librarians and Twitter tend to trivialise such work as promotional.

This thesis investigates the mundane work and practical politics animating academic librarians' practices of knowledge production via Twitter. Guided by a theoretical framework about knowledge infrastructures that posits that designing and maintaining infrastructure has concomitant effects on knowledge production, this multi-sited ethnography was informed by six librarians from one UK research-intensive university. Empirical data was generated from two rounds of interviews, Twitter activity diaries, Twitter Analytics data, a focus group and written follow-up questions.

Research outcomes suggest that as academic librarians negotiate the promises (i.e., the perceived potential or possibilities) of Twitter, they engage in practices of knowledge production. Four main practices of librarians implicated in their knowledge production via Twitter include justifying Twitter work as efforts to contest stereotypes of librarians (*Invisibility*); grounding Twitter work in modern interpretations of librarian's 'traditional' values (*Roots*); managing the multiple scales and ambiguous engagement of Twitter (*Scale*); and troubling institutional hierarchies to foster scholarly community, whilst spurring new vocational identities for librarians (*Culturality*).

By building a holistic picture of librarians' practices, the thesis contributes insights into new and devolved practices of knowledge production in HE, thus complicating depictions of university professional groups in the scholarly literature. The study furthermore suggests that drawing attention to quiet areas of work in the university helps demonstrate the fragility and contingency of practices in HE considered static or unassailable.

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# Abbreviations

HE      Higher education

KI       Knowledge infrastructure

STS    Science and Technology Studies

# Publications derived from work on the doctoral programme

- Presentation at the Networked Learning Conference (Kolding, Denmark, May 2020): "Academic librarians' Twitter practices and the production of knowledge infrastructures in higher education."

- Article for *Studies in Technology Enhanced Learning* (forthcoming): "Implications of infrastructural theory for technology-enhanced learning: Context, agency and multiplicity."

# Chapter 1: Introduction

*To be modern is to live within and by means of infrastructures: basic systems and services that are reliable, standardized, and widely accessible, at least within a community. For us, infrastructures reside in a naturalized background, as ordinary and unremarkable as trees, daylight, and dirt. Our civilizations fundamentally depend on them, yet we notice them mainly when they fail. They are the connective tissues and the circulatory systems of modernity.* (Edwards, 2010, p. 8)

*Libraries will face an important choice over the next several years as an institution – whether or not they want to continue to build their prestige around the size of their acquisitions budget, in which case their prestige will significantly decline in centrality and importance… or whether they want to position themselves as important to the knowledge-creating task of the university in different ways.* (Participant quote from Pinfield et al., 2017, p. 26)

*The more we do to make access quick, seamless and easy, the more invisible we make ourselves.* (Librarian quote from RIN/RLUK Report, 2011, p. 7)

## 1.1: Prologue

### 1.1.1: Setting the scene

Studies into the nature of knowledge production in higher education (HE) have traditionally taken disciplinary perspectives, placing faculty at the centre of knowledge work (Bleiklie & Byrkjeflot, 2002; P. Trowler, 2012a). More recent perspectives, however, identify new forms of knowledge production not directly tied to disciplines in HE such as those enabled by social media (C. Lang & Lemon, 2014; Tusting et al., 2019), diverse teams of academics and university professionals (Heath, 2014; Simpson & Fitzgerald, 2014) and governmental accountability agendas for research (Leysdesdorff, 2012; Nowotny et al., 2003). In an era of algorithmic control of information (Noble, 2018) and reliance on networked technologies for conducting research (Meyer et al., 2016), the matter of *how* knowledge is produced in HE seems urgent. Indeed, Fenwick and Edwards (2014), in their study of quiet but consequential forms of knowledge production in HE, argue that "we tend not to see the networks that are continually assembling and reassembling to bring forth and to sustain what we authorize as knowledge" (p. 39). Therefore, following Tight's (2012) appeal for studies on "the differential impact on parts of the university of changes in the ways knowledge is developed and used" (p. 175), this study explores emerging and relatively unnoticed practices of HE knowledge production by academic librarians.

Academic librarians[1] have long played a role in shaping the information landscape of HE in terms of digital libraries and classification schemes (Borgman, 2003). Continuing this trend in recent years, librarians' roles have evolved in tandem with changing patterns of digital scholarship to support the creation and discoverability of university research outputs (Dempsey, 2017). Indeed, such evolving patterns are manifest today in discussions about academic librarians' roles in supporting or subverting the algorithmic systems underlying modern scholarly communications (Lloyd, 2019). Thus, as the responsibilities of academic librarians continue to move increasingly towards knowledge production and away from traditional activities of collection and curation of physical resources (Dempsey, 2017; Pinfield et al., 2017), it is fruitful to consider academic librarians' contributions to knowledge production in modern HE contexts.

A burgeoning area of knowledge production in HE is via social media platforms (Kjellberg et al., 2016). Like many faculty members, academic librarians were early adopters of social media, particularly Twitter (Collins & Quan-Haase 2014). However, whereas the productive possibilities of Twitter for research and scholarly community are well described for university faculty (C. Lang & Lemon, 2014; Marsland & Lazarus, 2018; Nicholas & Rowlands, 2011; Tusting et al., 2019; Weller & Strohmaier, 2014), research about academic librarians' knowledge production via Twitter is comparatively quiet. The aim of my thesis, therefore, is to explore whether and how academic librarians produce knowledge via Twitter for HE. Using tenets from infrastructural theory that argue for understanding the values and ethical principles at the heart of infrastructure (Star, 2002), my study explores academic librarians' efforts to design and maintain information systems of use to researchers. Positioned at the confluence of four areas of research – HE, library and information science, Science and Technology Studies (STS) and social media – it is hoped that my thesis will add to discussions about new modes of knowledge production in academia and draw attention to the people and invisible labour involved in systems of knowledge that are often black boxed or viewed as remotely shaped by monolithic systems of politics.

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[1] Academic librarians are employed in HE and provide access to information that academic staff and students need for research and learning. Academic librarians typically have post-graduate qualifications in librarianship (Chartered Institute of Library and Information Professionals, n.d.).

In the remaining sections of this chapter, I explain the aim of my thesis by first describing my personal motivations for conducting the study and my approach to social research, as well as outlining some relevant definitions of knowledge and knowledge production. I next describe the context for the thesis and gaps in proximate areas of scholarly literature. Based on the specific problem I set out to solve, I then introduce the study's theoretical framework, research questions and research design and, finally, conclude the chapter with a discussion of the significance of the study and an overview of the remaining chapters. In organising Chapter 1 this way, I hope to show concordance between my personal beliefs and the arc of my study (cf. O'Reilly & Kiyimba, 2015, pp. 68-69).

### 1.1.2: Position of the researcher

I was awarded a master's degree in Library and Information Science (from the University of Washington in the United States) in 1998 and am currently a librarian at the University of Cambridge. In the late-1990s, the future of libraries seemed to lie in networked technologies, and I was encouraged to study computer programming and database design as part of my degree. At the time, the burgeoning Internet sparked debates in the library community about the quality of online information and librarians' role as information mediators (Rice-Lively & Racine, 1997). This context generated a personal interest in the use of technology in library settings, and my identity as a librarian today is tied closely to technology use. I therefore tend to see libraries through a technological lens. Amongst academic librarians of my generation, this is a popular posture, but I observe younger librarians, influenced by trends in 21st-century librarianship, emphasising teaching and/or (meta)data as their guiding perspectives.

I also have a grievance common to many academic librarians about the (real and perceived) invisibility of the benefits we bring to the university – alongside the enduring stereotype and association of librarians with book collections – despite the many complicated ways academic librarians' roles have evolved  (J. Cox, 2018). My study, therefore, is an effort to illuminate some of the widespread, but quieter and under-recognised, new forms of work.

In terms of how I approach research, PhD work (never completed) in cultural anthropology in the 1990s has left me with an inclination to see people as creative, improvisational and agential, and not as mechanical followers of social rules (see Ortner, 1984, for a synopsis of this zeitgeist). For this reason, I am inclined to study individuals' practices and to view such practices as constellations of values, historical context and material considerations (cf. Feldman & Orlikowski, 2011). My previous PhD work also inclines me to consider ethnography – the bedrock approach of cultural anthropology – as the best tool to highlight individuals' situated and evolving practices and tell the stories of silenced and marginalised people.

It thus follows that my beliefs about the relationship between technology and social organisation are that individuals' technology use is negotiated and dynamic and that technology does not mechanically or unidirectionally alter individuals' practices or identities. This belief was reinforced by an empirical study I undertook in my second year of the Lancaster PhD programme that explored how undergraduate students in HE negotiate the text-matching software Turnitin™. I found that students make choices about their use and interpretation of Turnitin based on personal values and the socio-political context of their discipline. Instead of viewing Turnitin as technology imposed on students – a logical concern in this era of the platformisation and dataveillance of HE (Komljenovic, 2019; Williamson, 2018, 2019) – I came to see Turnitin as a springboard for students' creative negotiations of personal identity. This emphasis on individuals' lived experiences with technology (Hine, 2020), and the agency with which they interact with – and often alter – the infrastructural aspects of their lives, set the priorities of my PhD thesis to focus on the values and politics (Berg & Jacobs, 2016) that librarians bring to their work of designing and maintaining infrastructural systems in HE.

In sum, my prior conceptual beliefs, library-technology interests and desire to advocate for librarians have directly influenced my thesis topic, design and interpretations. Though all studies are, to an extent, autobiographical (Knowles & Cole, 2008), and grievances are common starting points for ethnographies (Van Maanen, 2010), I am aware that such reflective disclosures can appear superficial and confessional (Pillow, 2003). I will therefore strive in my thesis to acknowledge how such inclinations influenced the concerns, analysis

and conclusions of my study while also being aware of, and open to, other possible interpretations.

### 1.1.3: Knowledge production

Space limitations of this study preclude a synopsis of major theories of knowledge (Bawden & Robinson, 2012, have a good overview). Therefore, in my thesis, I define *knowledge* simply as:

> Data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity. (Rainer & Turban, 2009, p. 24)

The reason for highlighting this definition is to emphasise that in my study I am not principally concerned with acts of *knowing,* i.e., cognition, or the inherent veracity of knowledge. Though mental processes and truth are at the heart of many definitions of knowledge, they are beyond the scope of my study. My thesis is primarily concerned with *how* knowledge is produced or, rather, *practices* of knowledge production.

My conceptualisation of *knowledge production*, therefore, is rooted in constructivist approaches to knowledge (Weinberg, 2009). Broadly speaking, knowledge production in constructivist approaches occurs via individuals' practices and is, therefore, agential and contingent:

> The inclination to adopt what can loosely be described as a constructivist perspective is characterized by a concern for the processes by which outcomes are brought about through the *mundane transactions of participants*. ... This constructivist approach to the production of scientific culture and action is closely allied to, and dependent on, the detailed microsociological study of scientists' *routine practices and discourse*. (Knorr Cetina & Mulkay, 1983, pp. 8-9 [emphasis added])

From this perspective, what counts as 'knowledge' is historically situated and shaped by entanglements of values, social exigencies, tools to hand and standards of evaluation (Roosth & Silbey, 2009). Metaphors for knowledge in this conceptualisation emphasise dynamism and confluences – indeed 'oceans' of knowledge (Manathunga & Brew, 2012) – not *a priori* reified and bounded areas of knowledge.

Three studies encountered early in my doctoral research sharpened my approach to knowledge production. Firstly, Sköld's (2017) study on the production of knowledge in digital-gaming wikis describes practices that create knowledge for online communities, such as editing articles and managing files. Sköld's practice-oriented approach appealed to me and aligned with my personal position as set forth above. Constructivist approaches to knowledge therefore, seemed fruitful to pursue for this study. As will be described in Section 1.5 below, the notion of knowledge infrastructures, which theoretically undergirds my thesis, is rooted in constructivist notions of knowledge production.

Secondly, Fenwick and Edwards (2014) argue that knowledge production in HE is an effect of relationships between people, material conditions and situated contexts. In their essay, the authors assert that seemingly entrenched knowledge in HE is, despite appearances, fluid and fragile with ever-shifting boundaries. Fenwick and Edwards' conceptualisation of knowledge production as quiet, unnoticed and often originating from unexpected corners of academia bolstered my interest in exploring the possibility of academic librarians' knowledge contributions.

Finally, Seaver's (2018) study of the computer programmers who design algorithmic-based recommender systems (such as for online music platforms), and his appeal for anthropological studies that attend to "the ordinary life of algorithmic systems" (p. 381), spoke to my concern that erasing the invisible labour behind digital systems grants such systems more power, homogeneity and permanence than perhaps they are due (cf. Jackson, 2015; Johanes & Thille, 2019). Seaver's assertion that we find "the people *within* these systems" (p. 382, emphasis in original) formed a rallying cry and guiding principle of my thesis.

## 1.2: Background and context

### 1.2.1: Libraries and universities

All universities in the United Kingdom (UK) have libraries[2] (Davies, 1982; Hoare, 2006; Mowat, 2006; Ratcliffe, 2006). Built to support the teaching and research of their parent institutions and historically centred on the collection of print resources (Roberts, 1977), academic libraries are often powerful symbols – the "physical manifestation of the core values and activities of academic life" (Kuh & Gonyea, 2003, p. 256). Indeed, the importance of academic libraries for their institutions is illustrated by a quote from a 1921 report of the University Grants Committee, repeated in the influential Parry Report of 1967, which called for greater funding of academic libraries:

> The character and efficiency of a university may be gauged by its treatment of its central organ – the library. We regard the fullest provision for library maintenance as the primary and most vital need in the equipment of a university. (University Grants Committee, 1967, p. 9)

Framed by this perspective, the contemporary library-practitioner literature argues that academic libraries significantly benefit the university in terms of improving student outcomes (Stemmer & Mahan, 2016; Stone & Ramsden, 2013), bolstering student engagement and retention (Haddow 2013; Oliveira, 2018; Soria et al., 2013) and supporting research faculty (J. M. Brown & Tucker, 2013; Delaney & Bates, 2015; Garritano & Carlson, 2009).

However, despite sanguine case studies of benefits, researchers have also noted that the position of academic libraries within HE is fraught with tensions related to technological and institutional dynamics (J. Cox, 2018) such as changing patterns of digital scholarship (Meyer & Schroeder, 2009), use of the Internet for scholarly research (Meyer et al., 2016) and neoliberal shifts in universities' policies that emphasise performativity and quantifiable

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[2] Due to its relevance to my study, I focus my discussion here on UK academic libraries. For similar reasons, studies used to support my assertions are largely based in the UK, Ireland, North America and Australia. This is because of similarities in contemporary HE contexts. There are, of course, academic libraries worldwide (Lor, 2019), but with varying histories, contexts and services that were outside the scope of my study to consider. However, I hope in follow-up studies to incorporate research into the richness and diversity of their histories and services.

performance measures (Olssen & Peters, 2005) – all of which have challenged libraries' traditional remit to curate physical collections of books (though, as I will discuss, these developments have also created new service opportunities). Overall, for libraries, such changes mean that being service organisations at the 'heart' of the university, reputationally associated with physical collections of books (Calvert, 2014), often no longer automatically or necessarily bestows prestige or resource allocation (Murray & Ireland, 2018). Indeed, claim many researchers, the more academic libraries strive in the current HE climate to provide seamless access to online research catalogues and databases, the more their work tends to become invisible:

> Being part of a support organization in academic institutions and striving for seamless services unnoticeable for users render research libraries and their potential invisible to policy makers and managers. Therefore, research libraries have to struggle for attention and look for allies in order to compete with emerging duplicating structures. (Maceviciute, 2014, p. 298)

Aware of this fraught positionality, some examples of libraries' recent efforts to contend with such tensions have included attempting to align their services with the strategic goals of their institution (Jeal, 2014), reorganising library staff along functional specialisms (Hoodless & Pinfield, 2018) and framing librarians as partners with research faculty (Borrego et al., 2018). Importantly for my thesis, a key mechanism of such efforts has been libraries' attempts to claim and consolidate jurisdiction over previously un-associated areas of activity in the university. Abbott's (1988) theory of labour, which posits jurisdictional struggles between professional groups to assert authority and expertise over knowledge domains, has been used to illuminate and help explain libraries' recent expansions into, among other things, information literacy instruction (O'Connor, 2009), wellbeing initiatives (A. M. Cox & Brewster, 2019) and various digital librarianship specialities (A. M. Cox & Corrall, 2013). Verbaan and Cox (2014), for example, chart how academic libraries, by extending existing jurisdictions in open access and information literacy, have sought to claim jurisdiction over aspects of research data management – a field of expertise that has emerged from funders' mandates for open access to data sets and research outputs – as within their professional purview.

Significantly, in terms of the priorities of my thesis, researchers have also noted that such jurisdictional struggles have broadly led academic libraries in the twenty-first century to embrace activities that produce knowledge for the university, such as creating institutional

repositories of scholars' outputs, assisting with publication of open access journals and developing research support platforms (A. M. Cox & Corrall, 2013; A. M. Cox et al., 2017; Dempsey, 2017; Pinfield et al., 2017). Novak and Day (2018), for example, describe the efforts of their university library to develop the role of the institutional repository (an archive for preserving research outputs for an institution) in terms of disseminating non-traditional digital scholarship produced by university members.

Recent jurisdictional shifts to knowledge production in academic librarianship is thus the critical context and principal focus of my thesis, particularly unpacking the values and politics at the root of such practices and their performative effects on the research landscape. Manoff (2015), for example, notes that algorithmic biases in library discovery systems – i.e., online library catalogues that surface results from connected scholarly databases – prioritise certain search results and therefore manipulate what is known to researchers. It is therefore imperative to understand the "conditions that determine what can be accessed, purchased, owned, and preserved as well as the technologies that shape … what can be asked and how" (Manoff, 2015, p. 275).

## 1.2.2: Libraries and Twitter

In the context of digital changes affecting the HE landscape, librarians were often early adopters of social media, defined in this study as

> web-based services that allow individuals, communities, and organizations to collaborate, connect, interact, and build community by enabling them to create, co-create, modify, share, and engage with user-generated content that is easily accessible. (McCay-Peet & Quan-Haase, 2017, p. 17)

The mid-2000s saw the proliferation of social media, or 'Web 2.0' – such as Twitter, Facebook, blogs and wikis – that were based on user-generated content (Anderson, 2007). The corresponding 'Library 2.0' movement was championed by librarians who were early adopters of social media (e.g., Farkas, 2007; Stephens, 2007), but was not embraced universally, with some librarians questioning the relevance of social media for library services (Holmberg et al., 2009; Huvila et al., 2013). Nevertheless, despite lingering scepticism, researchers have charted the rising adoption of social media by academic libraries (Collins & Quan-Haase 2014; Godwin, 2011). By 2014, a survey of libraries by publishers Taylor and

Francis found that 70% had a social media presence, with blogs, Twitter and Facebook being the most popular (Taylor & Francis Group, 2014). Discussions about the benefits of social media, particularly Twitter, for academic libraries continue to appear regularly in the library-practitioner literature (e.g., Joe & Knight, 2019; Verishagen, 2019).

Notwithstanding this uptake, the use of Twitter as a tool for conducting librarianship has not been theorised in the literature about librarianship or HE to date. Little is known about academic librarians' day-to-day social media practices and the relationship of such practices to librarians' professional responsibilities and the user groups they serve. Moreover, we know little about the evolution of librarians' Twitter practices and the effects of these practices on knowledge production in HE, despite numerous studies exploring the productive possibilities of Twitter for academic research more widely (C. Lang & Lemon, 2014; Nicholas & Rowlands, 2011; Weller & Strohmaier, 2014). It is precisely because Twitter streams are quiet and behind the scenes, and that librarians devote hours crafting them, that I believe they are worthy of investigation (Beaulieu & Høybye, 2011 make a similar argument about 'boring' email lists). For this study, I could have explored high-profile roles for librarians such as their support for open access publishing or the teaching of information literacy (which have strong coverage in the library-practitioner literature), yet I decided instead to focus on librarians' social media practices, specifically their use of Twitter, because of the central – albeit under-theorised – role such practices play in the enactment of modern librarianship.

For readers unfamiliar with Twitter, a short explanation of its features would be beneficial before continuing with the remaining sections of the chapter. Twitter – considered a *microblog* for its short, user-generated content in reverse-chronological order (Rogers, 2014), as opposed to *blogs* with longer discursive entries – was founded in 2006 with a limit of 140 characters per post (increased to 280 in 2017). Unlike platforms such as Facebook and LinkedIn, where users' posts are viewable only by explicitly chosen connections, Twitter's posts, called tweets, are usually available for any subscriber to see (Twitter has a privacy function, but only around 10% of users lock their accounts [Wojcik & Hughes, 2019]). Twitter's designers originally envisaged that the platform would provide short answers to the question 'What's happening?' whereas the platform now plays important roles in the communication of information about social movements, natural disasters and political events (Murthy, 2018). Tweets' brevity creates a real-time stream of information, encouraged by

features such as retweets, hashtags and @replies (Halavais, 2014). For example, Figure 1.1 is a tweet from the Lancaster University Library with key features labelled and defined:



1. **Twitter handle:** Twitter username. Always preceded by the @ symbol.
2. **Hashtag:** Hyperlinked word(s) to group tweets on similar topics. Always preceded by the # symbol.
3. **Reply button (and number of replies):** For responding to tweets.
4. **Retweet button:** For sharing tweets.
5. **Like button (and number of likes):** For showing appreciation for tweets.

**Figure 1.1: Screenshot of a tweet with key features labelled[3]**

Twitter's features enable regular updates from users and for posts to accrue slowly (Murthy, 2018), resulting in a timeline of information that can be viewed, interacted with and/or

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[3] See https://help.twitter.com/en/glossary for a complete glossary of Twitter terms.

sorted by handles and hashtags. Researchers of Twitter note that it favours the present and popular (Rogers, 2014) and, as such, is a window onto societal processes and phenomena. Likewise, researchers stress that, for their creators and the Twitter audience, tweets' meanings cannot be divorced from socio-cultural contexts (Murthy, 2017), which small-scale, ethnographic research of Twitter practices tends to demonstrate in rich detail (Marwick, 2014). I adopt both perspectives in this study to explore how librarians' Twitter practices are windows onto historically situated techno-political contexts.

## 1.3: Proximate areas of scholarship

My specific topic of investigation – whether and how academic librarians' produce knowledge via Twitter – was informed by exploring three proximate areas of scholarship in which I locate my thesis: *knowledge production of HE professionals*; *roots of academic libraries' research support services*; and *academic libraries and Twitter*. I critically examine these areas of scholarship in Chapter 2, but here give a synopsis of how the strengths and weaknesses of the literature shaped the priorities of my study.

### 1.3.1: Knowledge production of HE professionals

Firstly, the literature of *knowledge production of HE professionals* considers how a broad swathe of professionals in HE (in principle including librarians, though they are not discussed much in this literature) produce knowledge for the university. Though this area of literature tends to be more broadly concerned with HE professionals' identity than knowledge production, the scholarship probes HE professionals' strategies for negotiating and contesting tensions related to their liminality which often results in knowledge production. Collectively – and usefully for my study in terms of contextualising librarians' positionality within the university – the studies paint a picture of HE professionals whose work is largely behind the scenes, frequently misaligned with the priorities of academic faculty and, therefore, often under-appreciated in the wider HE context. In terms of the aims of my study, however, the principal limitation of the literature is its elision of the mundane practices that stem from HE professionals' liminal status and that contribute to their knowledge production. The authors provide glimpses into these practices, but rarely provide focused and extended discussions. The result from my perspective is an impoverished

understanding of HE professionals' practices of knowledge production — an area to which it is anticipated my study will fruitfully contribute.

### 1.3.2: Roots of academic libraries' research support services

The second area of literature I examine, *roots of academic libraries' research support services,* considers the technological, political and professional foundations of a new area of academic librarians' services in HE often referred to as 'research support services' (which broadly entail services to support the work of faculty and other university research staff). I was interested in this literature principally for how it could inform my understanding of factors that influence librarians' knowledge production. I found that this body of literature overwhelmingly locates the origins of academic libraries' new services in broad drivers — such as 'technology change' — thereby eliding discussion of campus politics and librarians' creative problem solving. In framing the roots of librarians' work in general drivers, the scholarship implies an inevitable and automatic evolution of librarians' roles without accounting for their active part in establishing new services. The principal limitation of this literature is thus the authors' discursive focus on broad drivers that suggests a teleological narrative of library transformation – a representation that I believe mutes the agency and creativity of librarians in negotiating change. The aim of my study is to complicate this picture by focusing on the mundane decision-making that animates librarians' contributions to HE.

### 1.3.3: Academic libraries and Twitter

Thirdly, the literature of *academic libraries and Twitter* considers the content and engagement of academic librarians' Twitter practices. The literature's strength is its provision of points of comparison with my study's participants. Like the HE professionals discussed earlier, librarians' Twitter practices attempt to increase the visibility of university research, create meaningful professional relationships and assert authority and expertise across HE. However, the principal weakness of the literature is its lack of critical focus on librarians' positionality in the university, preferring instead to trumpet social media's ability to promote services and stay current with technology. I argue that painting librarians' Twitter practices as attempts at mere promotion and engagement misses important areas of librarians' creativity and agency in negotiating tensions associated with their roles and concomitant effects of such activities on their social media work.

Overall, the key gap I found across the three areas of scholarship was a lack of attention to individuals' mundane practices that constitute knowledge production. This lacuna was valuable for setting the priorities of my thesis, selecting a theoretical framework and moulding my research questions.

## 1.4: Problem statement

In sum, and to collate the strands of the chapter thus far, research indicates that academic librarians' roles in the contemporary digital landscape of HE have shifted significantly to knowledge production. At the same time, librarians have been enthusiastic adopters of social media, particularly Twitter, for various professional purposes. Little is known, however, about links between knowledge production in HE and librarians' Twitter practices. Do academic librarians produce knowledge via Twitter? How and for what purposes? Research into other professional groups in HE who are similarly positioned to librarians – i.e., who straddle academic and administrative roles – shows that they produce knowledge via creatively negotiating tensions associated with their positionality; yet this literature, too, omits extended discussions of the day-to-day practices that contribute to knowledge production. My study thus proposes to investigate the mundane decisions and practical politics that animate academic librarians' Twitter practices in order to critically understand new ways that knowledge is produced in HE. My study's aim, therefore, is to draw attention to, and pursue further research into, academic librarians' new roles by exploring how social media – particularly Twitter – has intertwined dynamically with librarians' shifting responsibilities. In the following section, I discuss why I found infrastructural theory valuable for untangling and analysing such practices.

## 1.5: Theoretical foundation

P. Trowler (2012b) appeals for greater reflectivity in the role and use of theory in HE research. The remaining sections of this chapter, therefore, explain how I conceptualised, modified and applied tenets of infrastructural theory in my study, especially in terms of constructing research questions, analysing empirical data, drawing conclusions and developing theory for future use (cf. Ashwin, 2012).

## 1.5.1: Infrastructural theory

Popular conceptions of infrastructure posit it as an unnoticed and enduring substrate, such as bridges or the Internet, enabling the circulation of goods and information (Carse, 2016). In the fields of STS and cultural anthropology, however, infrastructure, though considered a system of support, is theorised as contingent, value laden, performative and remarkably fragile (Appel et al., 2018). In other words, infrastructure that we take as 'just there' and invisibly supportive of modern life is seen to be constituted of a myriad of mundane practices and political decisions rooted in situated human values (Star, 2002). From this perspective, infrastructure is constantly emerging, contingent and instrumental:

> Viewed as open-ended experimental systems that generate emergent practical ontologies, infrastructures hold the potential capacity to do such diverse things as making new forms of sociality, remaking landscapes, defining novel forms of politics, reorienting agency, and reconfiguring subjects and objects, *possibly all at once*. (Jensen & Morita, 2017, p. 620, emphasis in original)

Infrastructural theory, therefore, with its emphasis on invisible and mundane practices that lead to larger social effects intuitively felt applicable to my study which aims to complicate discussions about academic librarians' social media work in HE. Indeed, infrastructural theory intuitively felt apt for my purposes as, arguably, academic libraries provide many infrastructural services within HE, such as provision of digital libraries, standardised online catalogues and metadata standards/classification schemes (Borgman, 2003). Infrastructural theory was also therefore useful for posing questions that could help address gaps in the proximate areas of scholarship discussed in Section 1.3.

## 1.5.2: Knowledge infrastructures and infrastructuring

As will be discussed in Chapter 3, two aspects of infrastructural theory were particularly compelling for my project: the notions of *knowledge infrastructures* and *infrastructuring*. Firstly, *knowledge infrastructures* (henceforth, KIs) are defined as "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (Edwards, 2010, p. 17). Monteiro et al. (2014) assert that the distinguishing feature of KIs is their "epistemic machinery" (p. 8), i.e., their ability to produce new forms of knowledge. It is not that other forms of infrastructure cannot do this, it is that the term implies a special focus on how particular infrastructures "exert effects on the shape

and possibility of knowledge in general" (Edwards et al., 2013, p. 23). Examples of KIs include databases, taxonomies and scientific monitoring instruments (Karasti et al., 2016a-d). The more I learned about KIs, the more I felt that they would provide a useful framework for interpreting librarians' Twitter practices.

Secondly, the notion of *infrastructuring* is popular in the information systems literature (Pipek & Wulf, 2009). Infrastructuring, as a verb, conveys the idea that infrastructures are accretions of technologies and social relations always in the making (Anand, 2015) which require ongoing repair and maintenance (Karasti et al., 2018). Importantly for my project, infrastructuring stresses that work to maintain infrastructure is laden with individuals' values reflecting care towards technology and hopes for the future (Houston et al., 2016). The processual approach of infrastructuring, therefore, with its emphasis on mundane practices and decision making, aligns well with my personal beliefs about social research and knowledge production as set out in Section 1.1. It thus seemed a compelling approach for investigating infrastructures.

### 1.5.3: Framework devised for the study

As will be explained in Chapter 3, the notions of KIs and infrastructuring underpin the theoretical framework devised for this study. In terms of *specific* aspects of KIs to emphasise, I developed a framework that distilled Star & Ruhleder's (1996) seminal list of eight dimensions of infrastructure (also addressed in Chapter 3) into four categories. Table 1.1 lists the categories and provides brief definitions.

| Category | Definition |
|---|---|
| Invisibility | Refers to infrastructure's invisibility in daily use, the mundane and unnoticed work of maintaining infrastructure and individuals' attempts to make infrastructure visible. |
| Roots | Refers to the values and ethical principles that shape the nature of infrastructure. |
| Scale | Refers to the characteristic of infrastructure to grow incrementally via accretion but simultaneously have wide social effects. |

| Culturality | Refers to the capacity of infrastructure to shape community and individuals' subjectivities. |
|---|---|

**Table 1.1: Four theoretical categories devised the thesis**

My framework is thus an original contribution to infrastructural theory based on my exegesis of Star and Ruhleder's (1996) original eight dimensions of infrastructure.

### 1.5.4: Other possible approaches

As I will discuss in Chapter 3, I explored other theories before deciding on KIs for my thesis including professional identity and technology (Stein et al., 2013), practice theory (Feldman & Orlikowski, 2011), sociomaterialism (Fenwick & Edwards, 2014) and epistemic cultures (Knorr Cetina, 2007), all of which were relevant to my project. However, I settled on KIs as a framework because of its explicit focus on the invisible practices of knowledge production, which are the principal concerns of my study.

## 1.6: Statement of purpose and research questions

The purpose of this thesis is to use my bespoke theoretical framework about KIs (discussed in Section 1.5) to explore whether academic librarians' Twitter practices produce knowledge for HE. My research questions are thus directly linked to the concerns of my framework:

**RQ1:** What are the practices by which academic librarians produce knowledge via Twitter?

- **RQ1.1:** How is invisibility enacted in librarians' Twitter practices?
- **RQ1.2:** How are roots enacted in librarians' Twitter practices?
- **RQ1.3:** How is scale enacted in librarians' Twitter practices?
- **RQ1.4:** How is culturality enacted in librarians' Twitter practices?

In answering these questions, I anticipate making a critical contribution to research in HE about the roles and influence of university professional staff by exploring the complexity and consequences of academic librarians' knowledge work. I also hope to complexify discussions in the library-practitioner literature about the nature and effects of librarians' Twitter practices which are often portrayed simplistically as service promotion.

## 1.7: Research approach

This section outlines how I designed my study in terms of participants, methodology and data-generation methods and briefly addresses issues of insider research.

### 1.7.1: Study location and participants

My study took place at the University of Cambridge where I am a librarian. The evolution of libraries at Cambridge – there are currently over 100 – is similar to the University of Oxford, but different to modern UK civic universities such as Manchester or Birmingham. At all types of universities, academic libraries developed to support their institutions' teaching and research needs. But whereas for civic universities library services were centralised in one or a few buildings and a single body of staff (Ratcliffe, 2006), 'Oxbridge' libraries evolved over the centuries to be dispersed on each campus across 100+ libraries in colleges, faculties and central research libraries (Hoare, 2006). Despite differences in institutional histories, however, Twitter activity across UK university libraries is remarkably similar in tone and content, though tweets from Oxbridge faculty libraries tend to be more discipline specific, as will be explained below.

At the University of Cambridge, many libraries have their own Twitter accounts. My study participants were six librarians working in faculty libraries (as opposed to other types of Cambridge libraries, such as college libraries), as faculty libraries tend to have strong Twitter presences and relationships with researchers. The libraries I chose have high numbers of tweets and followers and good engagement in terms of re-tweets, conversations and likes of posts (see Figure 4.1). I hand selected my participants, as I knew those who are experienced Twitter users and reflexive about their work. Such purposive sampling (Emmel, 2013) is common in ethnography and allowed me to choose participants who are excellent – though not unusual – examples of librarian tweeters, thereby offering information-rich opportunities for learning. Figure 1.2 lists the six libraries my participants represented. (NB library numbers in Figure 1.2 do not correspond to participant numbers in Chapter 5. This is to protect participants' anonymity.)

## 1.  Cambridge African Studies Library



**AfrStudiesLib**
@AfrStudiesLib  Follows you

The African Studies Library is part of the Centre of African Studies, University of Cambridge. asclibraryblog.wordpress.com

Cambridge, England  library.african.cam.ac.uk  Joined March 2011

**767** Following  **2,542** Followers

## 2.  Cambridge Judge Business School Library



**CJBS Info Lib**
@CJBSInfoLib  Follows you

Information & Library Services at Cambridge Judge Business School. Our gif game is strong, and we're pretty good at library-ing too

Cambridge, UK  jbs.cam.ac.uk/infolib  Joined March 2009

**753** Following  **1,849** Followers

## 3.  Cambridge Engineering Department Library



**Engineering Library - University of Cambridge**
@CamEngLib  Follows you

Tweets from the team at the Department of Engineering Library and Information Service, University of Cambridge. Resources, services, training and advice.

Cambridge  libguides.cam.ac.uk/engineering/ho...
Joined December 2013

**634** Following  **958** Followers

## 4. Cambridge English Faculty Library



**English Faculty Lib**
@eflcam  Follows you

Supporting teaching & learning @englishunicam @Cambridge_Uni

Follow our LGBT+ History Month takeover with #EFLQueerResearch

#EFLdecolonise

⊙ Cambridge  🔗 lib.english.cam.ac.uk  🗓 Joined July 2010

**983** Following   **2,276** Followers

## 5. Cambridge Marshall Economics Library



**Marshall Library**
@MarshallLibrary  Follows you

Marshall Library, Cambridge (UK): more than just books, journals & e-resources for economics and development studies. Tweets or re-tweets are not endorsements.

⊙ Cambridge, UK  🔗 marshall.econ.cam.ac.uk  🗓 Joined February 2009

**265** Following   **1,606** Followers

## 6. Cambridge Betty & Gordon Moore Library



**Moore Library**
@MooreLib  Follows you

Betty & Gordon Moore Library - a leading science collection with friendly staff, a variety of study spaces & inspiring surroundings. Open to all.

⊙ University of Cambridge  🔗 moore.libraries.cam.ac.uk
🗓 Joined February 2014

**443** Following   **860** Followers

**Figure 1.2: The six libraries participating in the study**

20

Like most contemporary academic libraries, Cambridge libraries are responding to changes in digital publishing and governmental assessment. Significant recent work includes initiatives to support data management and open access publishing[4] and development of an information literacy framework[5].

## 1.7.2: Methodology

Scholars of Twitter maintain that tweets are windows onto a range of social contexts, while simultaneously encapsulating multiple meanings for their creators and audience (Gaffney & Puschmann, 2014; Marwick, 2014). In general, when conducting an "in-depth contextualized analysis of tweets" (Murthy, 2017, p. 559), Marwick (2014) recommends qualitative approaches that are sensitive to individuals' situated practices:

> Qualitative methods can also reveal much about social norms, appropriateness, or larger social concerns about technology. Twitter's breadth and diversity requires recognising that different user groups have different social norms and idioms of practice. (p. 110)

As will be discussed below, I have followed this advice in my thesis.

Due to its distributed and emergent nature, studying infrastructures poses several challenges (Karasti et al., 2016a). To investigate at once KI's scope and granularity, I used an approach termed *infrastructural inversion* which asserts that "understanding the nature of infrastructural work involves unfolding the political, ethical, and social choices that have been made throughout its development" (Bowker et al., 2010, p. 99). Methodologically, infrastructural inversion is widely used to tease out factors important to the development of KIs and consider their social effects (Karasti et al., 2016a, p. 9). The notion of infrastructural inversion, discussed extensively in Chapter 4, thus strongly shaped the methodological focus of my study.

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[4] https://osc.cam.ac.uk/
[5] https://camiln.org/

Infrastructural inversions are often conducted using ethnographic approaches (Karasti et al., 2016a), i.e., approaches which study social practices in natural settings using a range of methods to draw out and interpret human meanings and their relationships with institutional and political contexts (Hammersley & Atkinson, 2007, p. 3). Using the tenets of multi-sited ethnography (Marcus, 1995), explained in greater detail in Chapter 4, I conceptualised my participants' libraries and Twitter practices as a set of linked sites with shared histories and ecological relationships.

### 1.7.3: Methods

To examine the meanings and knowledge production of librarians' Twitter practices, my specific data-generation methods, congruent with ethnographic methodologies, included two rounds of semi-structured interviews, participant diaries, analysis of Twitter Analytics reports, a focus group and follow-up questions. The diaries provided a longitudinal perspective on the daily work and decision-making of my participants' knowledge production (i.e., their infrastructuring). The diaries also substituted for co-located participant observation (as such observation would likely disrupt my participants' workplaces), thus creating a degree of 'co-presence' often found in ethnographic studies of web-based practices (Beaulieu, 2010; Murthy 2013). The focus group towards the end of the data collection period was a strategy to deepen and validate research outcomes.

### 1.7.4: Insiderness

The research for this study was conducted within a social group of which I am a member, making the research thus "insider research" (Mercer, 2007). I am, moreover, an "intimate insider" (Taylor, 2011, p. 5), well known to and on friendly terms with my participants. I will discuss the implications of insiderness in Chapters 4 and 7, but here note that my insider status unfolded differently with each participant, depending on factors related to seniority and the political environments of our libraries. Such uneven dynamics, which sometimes led to strained rapport, affected the direction of our discussions.

## 1.8: Significance of study

In conclusion, research indicates that the role of academic librarians is increasingly shifting to knowledge production (Dempsey, 2017; Pinfield et al., 2017), but to date there has been little critical analysis of librarians' knowledge production via social media. By situating my research within broader studies of contemporary HE professionals, and framing my study with notions drawn from infrastructural theory, it is anticipated that my research outcomes will illuminate devolved aspects of knowledge production in HE and, thus, lead to greater appreciation for HE professionals' work. It is also hoped that my bespoke theoretical framework will lead to more precise ways of discussing librarians' contributions to HE in the digital age. In this way, I anticipate my research outcomes will help frame academic libraries as dynamic and evolving HE institutions.

## 1.9: Thesis overview

Looking ahead to the main body of my thesis, this study has six further chapters ordered logically to inform my research design, answer my research questions and support my discussion and conclusions.

- **Chapter 2: Literature Review,** critically analyses three key areas of literature related to this study:

    - Knowledge production of HE professionals

    - Roots of academic libraries' research support services

    - Academic libraries and Twitter

- **Chapter 3: Theoretical Framework,** introduces the concept of KIs, including key characteristics and their relevance for my thesis. The chapter also outlines the bespoke theoretical framework devised for this study.

- **Chapter 4: Methodology and Methods,** discusses how I addressed methodological challenges of studying KIs – infrastructural inversion and multi-sited ethnography – and describes my data-generation methods and data-analysis procedures.

- **Chapter 5: Research Outcomes,** presents the outcomes of my data analysis.

- **Chapter 6: Discussion,** answers my research questions and discusses the contribution of my research outcomes to the areas of literature reviewed in Chapter 2.

- **Chapter 7: Conclusion,** concludes my thesis by exploring issues of research quality, contributions to new knowledge, wider implications of the study and areas for future research.

# Chapter 2: Literature Review

## 2.1 Introduction

Boote and Beile (2005) assert that the foundation of doctoral work involves rigorous and critical analysis of scholarly literature. Such analysis moves beyond summarising previous studies and involves drawing conclusions, from a critical perspective, about themes and sub-currents of the literature, identifying gaps in its coverage and ascertaining whether key claims are warranted. Crucially, the literature review situates one's study in existing scholarly conversations and justifies how it can fruitfully contribute to them. The best doctoral studies, argue Boote and Beile, start with the literature review and thread its implications through every aspect of the study, from formulating research questions to drawing conclusions for future work.

As discussed in Chapter 1, my research questions for this study concern how the theory of knowledge infrastructures (KIs) can illuminate the practices by which librarians produce knowledge in HE. My interest in KIs, and then the formulation of my research questions, was informed by gaps I noted while conducting this literature review. At the outset of writing Chapter 2, my intent was to explore claims in the scholarly literature about sociotechnical practices which animate the knowledge production of HE professional staff (including librarians). What I found, however, were shortcomings about the mundane practices of these mechanisms, despite an overall concern with new roles and responsibilities.

My study is therefore located at the intersection of three areas of scholarly literature: *Knowledge production of HE professionals*; *roots of academic libraries' research support services*; and *academic libraries and Twitter*. Regarding the first two areas, I constructed and defined the topics myself (discussed further in Section 2.1.2), as scholarly literature addressing these subjects directly is scarce; the third area was comparatively simpler to define.

I have ordered the areas of my review by decreasing levels of abstraction:

1. *Knowledge production of HE professionals* (21 studies) examines what the literature about a broad swathe of professionals in HE says about HE professionals' practices of knowledge production;

2. *Roots of academic libraries' research support services* (23 studies) examines what the literature about a new service area of academic librarians says about academic librarians' practices of knowledge production in HE;

3. *Academic libraries and Twitter* (21 studies) examines what the literature about academic librarians' Twitter practices says about librarians' practices of knowledge production via Twitter.

In terms of the priorities of my study, the most significant shortcoming I found across the studies was an elision of the day-to-day practices that constitute knowledge production, a lacuna I hope that my thesis will fill.

## 2.1.1 Locating the project

If doctoral research is intended to contribute to academic literature, then it is vital to identify which literature(s) it addresses. My study is based on two bodies of scholarship: HE research and library-practitioner research. However, I did not explicitly set out to use these two bodies of literature, rather they were the natural results of my literature searches as outlined in Section 2.1.2 below. HE research tends to be published in peer-reviewed journals or book chapters. Drawing mainly on theories from the social sciences and shaped by research grants often awarded by HE organisations, it focuses primarily on teaching and learning, student experiences, HE policies and institutional management (Macfarlane & Burg, 2019; Tight, 2014, 2018). Similarly, library-practitioner research is published in peer-reviewed journals and book chapters. However, library-practitioner research employs theory lightly (Kumasi et al., 2013) and uses surveys and case studies as its primary methodology (Turcios et al., 2014), while nevertheless striving to improve the practice of librarianship (Brancolini, 2017). Despite overlapping concerns — especially in terms of teaching, learning and student outcomes — these two bodies of literature are distinct and rarely cite each other.

As discussed above, my thesis is located at the intersection of three areas:

1. Knowledge production of HE professionals (based primarily in HE research);

2. Roots of academic libraries' research support services (based primarily in library-practitioner research);

3. Academic libraries and Twitter (based primarily in library-practitioner research).

Considering the wide-ranging nature of these topics, there inevitably were other areas of literature I could have reviewed, such as benefits of librarians' work to student learning outcomes and knowledge production more generally in HE (such as debates around Mode 1/Mode 2 knowledge [Nowotny et al., 2003]). Though both topics spoke to my project, I ultimately rejected them because they were too broad to distil and make robust contributions to. I also considered reviewing literature on a single HE professional group who parallel librarians' work, such as academic developers, but felt that this approach would limit my ability to detect patterns in knowledge production across the university. I believe that the three topics I have reviewed are scholarly conversations to which my study can fruitfully contribute novel perspectives and challenges.

## 2.1.2 Searching for literature

For *knowledge production of HE professionals* (the term 'HE professionals' comes from the work of Schneijderberg and Merkator, 2013), because there is no single classification for staff with mixed academic and administrative portfolios (Sebalj et al., 2012), searching for studies to review was challenging. To situate the literature in the modern HE context, I limited my search to studies that engage Whitchurch's (2008b, 2009) conceptualisation of 'blended' or 'third space' HE professionals. Whitchurch's study of new staff roles in the context of neoliberal HE changes has been broadly influential, and much recent work on HE professional staff cites her work (Veles & Carter, 2016). I looked particularly for empirical studies which employ Whitchurch in their conceptual reviews while exploring the relationship between new staff roles and wider concerns of academia. Though I acknowledge that this approach circumscribed my pool of potentially usable studies, I felt it offered me the opportunity to locate the most suitable literature for my review.

To identify this literature, I used Scopus, an interdisciplinary database available via Lancaster University. I limited my search to peer-reviewed studies in English which cite at least one of Whitchurch's top-four most-cited studies (Whitchurch, 2006, 2008a, 2008b, 2009) as determined by Scopus, as citations to her other works tail off after that. I then exported the results to a spreadsheet, which identified 175 articles after de-duplication. I then read each abstract, looking particularly for empirical investigations and excluding literature reviews, frameworks/models and studies about university leadership, a process which further reduced the list to 21 studies.

To identify literature on *roots of academic libraries' research support services*, I again used Scopus because of its good coverage of key library-practitioner literature ("Scimago," 2018). (Experiments with two library-literature databases, Library and Information Science Abstracts and Library, Information Science and Technology Abstracts, did not obtain better results.) I performed a search using the terms and roles most commonly associated in the literature with librarians' research support services: *(TITLE-ABS-KEY ("academic librar*" OR "university librar*" OR "research librar*") AND TITLE-ABS-KEY ("research support" OR "liaison librar*" OR "library liaison*" OR "academic liaison*" OR "subject librar*" OR "functional specialist*" OR "functional team*" OR "functional librar*" OR functionalist* OR "functional approach*" OR "relationship management"))* which yielded 135 studies after filtering for articles/chapters in English published from 2014-2019. I limited my results to the previous five years because influential reports on research support services in academic libraries (Auckland, 2012) and concomitant new roles for academic librarians (Jaguszewski & Williams, 2013) were published between 2012-2014 and quickly became influential on, and cited in, the library-practitioner literature. I then read each abstract, looking for empirical studies about new services and excluding those about training and evaluation. I also excluded studies about health sciences libraries because they offer significantly different services than other types of academic libraries. This process narrowed the list to 23 studies.

For *academic libraries and Twitter*, I began again in Scopus. I performed a search using the terms commonly associated in the literature with librarians and social media: *TITLE-ABS-KEY ("academic librar*" OR "university library)*" AND ("social media" OR twitter OR microblog* OR "social network*" OR "library 2.0"))* which yielded 332 studies after filtering for articles/chapters in English. I then read each abstract, looking for empirical studies about the content of libraries' social media work and levels of engagement with their followers. I excluded studies concerning rates of social media adoption, librarians' perceptions of social media and studies exclusively about platforms other than Twitter (e.g., Instagram or Pinterest). This resulted in 21 studies.

### 2.1.3 Analysing the literature

I began planning how to analyse the 65 studies discussed above by reflecting on how they could refine the focus of my study and develop my research questions. For all three areas of my literature review, my sense of this was similar: I was primarily keen to extract claims about practices of HE knowledge production. Because this was often not the explicit

intention of the studies, I often had to look past core arguments and explore subtexts and secondary themes.

P. Trowler (2018) outlines "five key orientations to engaging with the literature" (pp. 15-16) which guided my analysis: Presenter, Critic, Taxonomist, Lacunae locator and Tool-maker. I used all five except Tool-maker (which was not relevant as I was not using the literature review to create a conceptual tool to be used later in my thesis) as I read the 65 studies and noted how they informed my research priorities. In other words, for the aims of my study — discerning academic librarians' practices of knowledge production via Twitter — I felt my review needed to *present* the key claims of the 65 studies; *critique* their methods, assumptions and conclusions; *discern common themes* across each area and explore areas of (dis)agreement; and *note gaps* in the research which my study could address.

In practical terms, to accomplish this, I read the 65 studies thoroughly and noted possible themes. I then chose the most viable themes based on their significance to my study and tracked them in spreadsheets, noting claims, methods and critical perspectives. Figure 2.1 presents an extract of one of these spreadsheets.

| | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| | Study | Job Title/Role | Key Claims | Methods | Bridging | Guiding | Translating | Knowledge Produced | Contestation |
| 2 | Allen-Collinson (2009) | Research administrators | RAs discursively and creatively contest their invisibility and stigmatisation | Interviews with 27 participants in 19 UK universities | | X | | ""But research administrators also clearly valorised the very ambiguity of this social space, with its attendant possibilities for | HE-professionals in Dawkins' (2011) and Allen-Collinson's (2009) studies similarly |
| 3 | Bennett et al. (2016) | Scholarship of teaching and learning academics | The liminality of SoTL academics obscures their educational roles/identities and contributions to HE | Group auto-ethnography with 7 participants | | | X | helping students, helping researchers; "In another more positive paradox, however, the teacher-narratives also | Finally, and from a meta-perspective, Bennett et al. (2016), explore how knowledge |
| 4 | Berman & Pitman (2010) | Research-trained professional staff | Professional staff with higher degrees greatly benefit HE, and universities should better exploit their capabilities | 32 email surveys to university staff with PhDs at an Australian university | X | X | X | Berman & Pitman (2010): acting as university administrators – the study looks at "the extent to which those with | |
| 5 | Birds (2014) | Entrepreneur managers | Research-intensive universities inherently cannot capitalise on the skills of Ems | Interviews with 4 participants. Part of a larger ethnographic study | X | | | "The participants in this study exercised considerable agency in negotiating their way through the bureaucratic structures of | For Birds (2014, 2015), HE-commercial innovators have hybrid identities forged in a |
| 6 | Birds, (2015) | Staff involved with creating a university spinout company | HE commercial innovators have hybrid identities which are inherently unsustainable over the long term | Ethnographic study entailing 12 interviews and participant observation | X | | X | People doing 'innovative' work in the uni spinning out new companies 'develop hybrid roles at the margins of their | For Birds (2014, 2015), HE-commercial innovators have hybrid identities forged in a |
| 7 | Daly (2013) | Directors of development and alumni relations | Tension-filled relationships with faculty shape the identities and practices of DDs in HE | Interviews with 17 participants | | X | X | Looks at the 'power and influence' of directors of development and alumni relations – relationship building is the | |
| 8 | Dawkins (2011) | Governance services personnel | HE governance professionals fluidly cross boundaries to exert significant influence in HE | Reflexive framework based on author's experiences | | X | X | Looks at the knowledge creation that happens when government services personnel (e.g., secretaries to committees) | HE-professionals in Dawkins' (2011) and Allen-Collinson's (2009) studies similarly |
| 9 | Graham (2012) | Professional staff generally | HE professionals contribute significantly to the strategic goals of the university | Interviews with 14 participants | | X | | Looks at the contributions that professional staff make to the "design, development and maintenance of learning | |
| 10 | Graham (2013) | Professional staff generally | In a context of changing technology, HE professional staff are deeply involved in teaching and learning activities | Interviews with 14 participants, of which 4 are profiled in study | | X | X | IT support officer, senior disability services officer, information-services librarian, faculty-based educational | |
| 11 | Graham & Regan (2014) | Professional staff generally | HE professional staff at two institutions have similar behaviours that support student outcomes | Interviews with 28 participants in two universities (UK and | X | X | | Contributions of professional staff to student outcomes. | |
| 12 | Hockey & Allen-Collinson (2009) | Research administrators | RAs have a set of strategic behaviours and practices that support university research objectives | Interviews with 27 participants in 19 UK universities | | X | | Looks at the informal knowledge needed to do the role of graduate research administrators – they also say that | Research administrators in Hockey and Allen-Collinson's (2009) study, for instance, |
| 13 | Jankowski & Slotnick (2015) | Assessment practitioners | APs translate faculty work for assessment frameworks and, thus, craft narratives of the university for | Interviews with 4 participants, examination of job postings and | X | X | X | J&S compare assessment practitioners with Whitchurch's 'blended professionals': "Blended professionals find that as | |
| | Karlsson & Ryttberg (2016) | Administrative professionals | By virtue of their liminality, HE professionals have holistic perspectives | Interviews with 26 participants in 3 Swedish | | X | X | "The place of the strategic expert, it was argued, is to facilitate decision-making, as | |

**Figure 2.1: Extract of literature review spreadsheet**

Analysing the literature was a slow and iterative process that entailed reading the 65 studies several times and writing pages of notes. The culmination of this process is the literature review below which examines each area of the literature in turn.

## 2.2 Area 1: Knowledge production of HE professionals

As discussed in Section 2.1, the first area of the literature review focuses on studies drawing on Whitchurch's (2006, 2008a, 2008b, 2009) frameworks regarding changing roles of HE professionals. In the main – and similar to Whitchurch's concerns – the authors of the studies set out to raise awareness of HE professionals' new roles and identities, hopeful that their talents can be fully appreciated and utilised by the university (Berman & Pitman, 2010; Takagi, 2015).

In terms of the objectives of my thesis, the strength of the literature is its examination of HE professionals' strategies for negotiating and contesting tensions related to the hybridity and liminality of new professional roles. Green and Little (2015), for example, argue that HE professionals' hybridity stems from "varied disciplinary identities" (p. 12), an amalgam which Bennett et al. (2015) claim results in liminal spaces requiring negotiation and which Birds (2015) asserts is "contested and uncomfortable" (p. 640). Collectively, the literature paints a picture of HE professionals whose fluid and emergent roles are largely behind the scenes, frequently misaligned with the priorities of academic faculty and, therefore, often under-appreciated in the wider HE context. On the other hand – and significantly for my study – many authors also argue that HE professionals' liminality affords them a "substantial degree of freedom" (Karlsson & Ryttberg, 2016, p. 7), granting a "free hand" (White & White, 2016, p. 5) that can be "liberating" (Bennett et al., 2016, p. 22) and synergistic (Daly, 2013, p. 25; Lightowler & Knight, 2013, p. 326).

Particularly relevant for my study is Whitchurch's (2008a) contention that this hybridity and liminality, along with latitude in negotiating boundaries and roles, often leads to "new forms of institutional knowledge" (p. 383). In terms of informing my study's research question, therefore, I am chiefly interested in how the authors of the literature discuss the relationship between HE professionals' hybridity/liminality and their production of knowledge. Through my analysis of the literature, as outlined in Section 2.1.3, I found that that it presents two perspectives on this process. Firstly, HE professionals, by *bridging* units of the university and

translating and facilitating policies and requirements, produce knowledge in HE. Secondly, HE professionals, by *contesting* their liminal roles and engaging in activities to assert their authority and expertise, again produce knowledge in HE. My review below explores points of disagreement and alignment within and between these opposing dynamics.

In terms of the priorities of my thesis, however, the principal limitation of the literature is its elision of the practices and activities that stem from HE professionals' liminal status and contribute to knowledge production. The authors provide glimpses into this process, but rarely provide focused and extended discussions. The result, for the purposes of my study, is an impoverished understanding of HE professionals' practices of knowledge production — a point which I argue in Section 1.1 is crucial for a balanced picture of the modern university. To be fair, the authors' intention is generally to explore how liminality affects HE professionals' identities, not knowledge contributions. I assert, however, that the authors' omission of a discussion of HE professionals' routine practices understates creative and active ways that HE professionals negotiate inherent tensions of their status and, thus, inadvertently undermines the complexity of HE professionals' circumstances.

A separate criticism of the literature is that, with two exceptions (Graham, 2012; Graham, 2013), none of the studies discuss the work of academic librarians – an observation that I explore further in the Summary of Area 1.

### 2.2.1 Bridging

As noted in the introduction to Area 1, the first perspective on knowledge production offered by the authors of the literature is that HE professionals, in their liminal and hybrid capacities, often act as bridges by translating policy requirements for academics or representing university research to industry. Indeed, the related notions of bridging, guiding, facilitating, translating and relationship building appear in much of the literature. For example, in terms of outgrowth of liminality, Kensington-Miller et al. (2015) state that "we regard our broad knowledge base as a strength, allowing us to move between disciplines, seeing the links, translating and interpreting them" (p. 280). Karlsson and Ryttberg (2016) similarly contend that HE professionals "regard themselves as guardians of the 'university as a whole'" and as "carriers of the culture, structure and routines of the organisation" (p. 7). Such conceptualisations express a positive and constructive negotiation of relations between HE professionals and academic faculty. Yet, despite the usefulness of the bridging metaphor,

the authors' findings are weak in terms of noticing the mundane practices of HE professionals that constitute these negotiations — an omission, I believe, works to undermine HE professionals' agency and represents a missed opportunity for raising awareness of the contributions of HE professionals.

Ryttberg and Geschwind (2017), for example, note that their participants "describe their role as building bridges between different parts of the institution by translating, interpreting and anchoring the decisions made by the university leadership" (p. 8). Similarly, Lightowler and Knight (2013) identify knowledge brokers who translate university research as partners in industry; Warren et al. (2016) discuss development directors who bridge the interests of academics and donors, while Berman and Pitman (2010) examine research-trained professionals who render policy requirements into plain language for academic faculty. However, in each study, the authors only briefly mention such negotiations and do not investigate deeply the day-to-day practices that constitute such activities, such as professional values and decision-making.

Two other prominent tropes for describing HE professionals' bridging activities are narration and relationship building. In terms of narration, Dawkins (2011) and Jankowski and Slotnik (2015) assert that secretariat staff and assessment practitioners, respectively, shape institutional narratives through production of meeting minutes and other official documents, an activity which they argue stems from such staff's ability to bridge structures of the university with some autonomy. In terms of relationship building, in the context of clashes of values between HE professionals and traditional notions of academic culture, Daly (2013) claims that development directors view building relationships as the primary means to successfully creating "institutional knowledge of the fundraising process" (p. 26). Birds (2014) similarly argues that academic entrepreneurs must develop strong relationships to develop business plans and, in the long run, "entrepreneurial universities" (p. 63). In none of these studies, however, do the authors attempt to describe in detail constituent professional practices of such activities.

However, among the studies under review, there are three notable exceptions which include extended discussions of activities associated with bridging (including similar metaphors) and attendant knowledge production. Graham and Regan (2016), in their study of the contributions of professional staff to student learning outcomes, assert that HE professionals' hybrid status facilitates "pedagogical partnerships" (p. 605) that support

students' education. Stoltenkamp et al.'s (2017) reflective case study closely examines how instructional designers' negotiation of institutional distrust over their technical capabilities produced a successful lecture-streaming project. Furthermore, in their study of learning designers, White and White (2016) argue that bridging and brokering led to negotiations of HE professionals' power and allocation of academic control in the context of creating a university MOOC. These extended investigations, often couched in case studies, are welcome exceptions to the overall paucity of discussions of HE professionals' practices of knowledge production and further strengthened my decision to focus on such mundane day-to-day activities in my thesis.

### 2.2.2 Contestation

As noted in the introduction to Section 2.2, the second perspective on knowledge production offered in the literature under review is that HE professionals often contest their liminal roles and engage in activities to assert their authority and expertise. Such practices of contestation are opposed in spirit to the notions of bridging discussed above which focus on building relationships and sharing information. Notions of contestation, on the other hand, concern HE professionals' efforts to question and undermine their positionality within the university. Paradoxically, and as I discuss further below, this process of contestation often entails activities which attempt to assert HE professionals' authority and expertise, often resulting in new knowledge in HE. Notwithstanding the utility of this perspective for informing my research question, the principal limitation of the literature is the same as the studies that concern bridging: despite glimpses into the professional practices that constitute contestations, the authors generally elide the details of how such challenges are accomplished.

For example, in the attempt to contest stigmatisation of their position in HE, research administrators in Hockey and Allen-Collinson's (2009) study strategically construct meeting agendas to encourage passage of beneficial initiatives. HE professionals in Dawkins' (2011) and Allen-Collinson's (2009) studies similarly manipulate meeting minutes to craft narratives of their positions and the wider institution. For Birds (2014, 2015), HE commercial innovators have hybrid identities forged in a hostile university environment of competing priorities; however, these hybrid identities – the nature of which rest on contesting and reconciling competing demands – ultimately help the university to start new companies. Shelley (2010) offers the most theoretically informed perspective (citing Bourdieu) by positing a "shifting

arena" of tensions where roles of research administrators overlap with academics causing research administrators to creatively question their positionality and assert expertise in areas such as writing bids and recruiting researchers. Finally, and from a meta-perspective, Bennett et al. (2016) explore how knowledge about the nature of academic disciplines is created when SoTL[6] academics question their liminal positionality by theorising and engaging in "non-sanctioned writing" (p. 224) about their identities.

The contention that when HE professionals contest their positionality they create knowledge for the university is useful for the objectives of my study and is a dynamic that I observed in my librarian-participants and discuss further in my concluding chapters. However, as stated earlier, my principal critique of the literature is the authors' omission of detailed accounts of intervening steps between HE professionals' contestation of positionality and knowledge production for the university. For example, how do HE professionals arrive at decisions to contest their positionality, determine how best to assert their authority and choose the professional values they draw on? By answering such questions, I hope to address the gap in the literature about practices of knowledge production.

### 2.2.3 Summary of Area 1: Knowledge production of HE professionals

In sum, despite tensions related to role liminality discussed above — indeed, *because* of them — the literature under review paints a picture of HE professionals' creatively negotiating structural tensions, such as shifting centres of power and contesting role positionality, to assert their authority and expertise. In terms of the priorities of my study, this insight is key to understanding often unnoticed practices by which knowledge is produced in HE and supports my claim that HE professionals are "not [yet] acknowledged as intellectual capital that contributes to the success of higher education institutions" (Ryttberg & Geschwind, 2017, p. 2).

There are two principal shortcomings in the literature, however. Firstly, the literature begs many questions about *how* the activities of HE professionals lead to knowledge production. This 'black box' of justifications and decisions along with concomitant social effects is

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something that I hope my study will unpack and illuminate in the context of academic librarians, thus leading to more nuanced understanding of the work of HE professionals.

Secondly, only two studies (Graham, 2012; Graham, 2013) explore the nature of academic librarians' work. It is arguable that, if librarians are missing, perhaps they are qualitatively different from HE professionals. I would counter, however, that academic librarians experience similar tensions with faculty and other stakeholders while engaging in concomitant practices of bridging and contestation to build authority and expertise (Anthony, 2010; Christiansen et al., 2004). The second principal way that my project will build on the claims of the literature, therefore, is to extend the discussion to the context of academic librarians.

The next section of the literature review draws parallels with studies of HE professionals by examining efforts of academic librarians to establish new areas of expertise in the face of changing technology and university research strategies.

## 2.3 Area 2: Roots of academic libraries' research support services

As discussed in Section 2.1, Area 2 of the literature review examines studies from the library-practitioner literature about the burgeoning field of research support services. 'Research support services' broadly denotes a new service area for academic libraries in the 21$^{st}$-century entailing assistance for researchers on topics such as data management, research impact and open access publishing, as well as establishment and maintenance of institutional repositories for data sets and research outputs (S. Brown et al., 2018). Libraries' provision of research support naturally varies across HE contexts from, for example, standalone services such as bibliometric assistance to well-developed research data management programmes (Corrall et al., 2012; A. M. Cox et al., 2017; Keller, 2015). I chose to focus on this service area, however, because it illustrates libraries' recent creative efforts to stay relevant in rapidly changing university environments (J. Cox, 2018; L. Lang et al., 2018). Because libraries often position research support services as integral partners in academics' research projects (Borrego et al., 2018; Case, 2008), I was primarily interested in this literature for its claims about librarians' knowledge production.

Significantly, Pinfield et al. (2014, p. 17) make a critical observation of libraries' provision of research support services which is important for my thesis but is not a perspective embraced

by the other studies under review. The authors claim that academic libraries' efforts to expand jurisdiction over aspects of research support in HE often entail the opportunistic knitting together of previously un-associated services across the university, such as the creation of data management plans and tracking the impact of faculty research. Such services are often not squarely within the purview of specific university units or need intermediaries to act as brokers. As asserted by Pinfield et al. (2014), librarians, by virtue of their traditional roles as neutral information arbiters, have been able to fill such lacunae opportunistically. The crucial point for my study is that uniting disparate strands under the banner of research support services often "involves arguing (explicitly or implicitly) for the bundling of these different strands into a single... agenda which should then be managed in a coherent way" (Pinfield et al., 2014, p. 17). In other words, in the area of research support, academic libraries have created a new field of expertise for themselves and, thus, a new domain of knowledge for the university.

For the purposes of my study, Pinfield et al.'s (2014) contention underlines the principal weakness of the remaining studies under review which is that the authors locate the origins of libraries' new service orientations in broad HE drivers — such as technology change — thereby eliding discussion of campus politics and libraries' creative problem solving. As I assert in my review of Area 1 (Section 2.2), the practices of HE professionals, a group I view academic librarians to be a part of, regularly entail creative negotiation and contestation of structural tensions to assert their authority and expertise. Indeed, Pinfield et al.'s (2014) argument provides a key example of how librarians engage in similar bridging and translational activities as HE professionals. However, in framing the roots of librarians' work in broad social drivers, the authors of most of the literature under review imply an inevitable and automatic evolution of librarians' roles without accounting for their active part in establishing new services. As discussed in Section 2.1.1, this simplistic framing is symptomatic of library-practitioner literature more generally which is, in the main, based on case studies, lightly theoretical and oriented towards improving services (Brancolini, 2017; Kumasi et al., 2013; Turcios et al., 2014). I assert, however, that the principal limitation of the literature is that the authors' discursive focus on broad drivers provides a teleological narrative of library transformation that mutes the agency and creativity of librarians in negotiating change.

Therefore, in the sections below I highlight the inherent determinism of three interrelated sets of drivers which the authors of the literature under review — with the exception of

Pinfield et al. (2014) — assert lead to provision of libraries' research support services: 1) technological changes; 2) university research strategies; and 3) librarians' professional values and expertise. The drivers are ordered by level of abstraction, moving from exogenous to internal factors. Through my review, I hope to underscore how tropes about drivers diminish librarians' active practices in creating and instituting new areas of HE knowledge.

### 2.3.1 Technological changes

Firstly, in many of the studies, the authors present technological drivers as divorced from social processes, implying a unidirectional and inevitable force of technological change. There are almost no robust accounts of the myriad ways that libraries actively interpret and negotiate such changes. For example, the underlying technological change most often cited in the literature is increased computing capacity to organise information and process data (Koltay, 2019). Yet despite different conceptualisations of these changes — Eldridge et al. (2016), for example, speak amorphously about technological changes, noting a "rapidly evolving information environment" (p. 161); Epstein and Rosasco (2015) cite democratisation of Internet searches; and J. Cox (2017) identifies the emergence of the field of digital humanities — the authors rarely highlight libraries' strategic role in linking technology change, establishment of research support services and knowledge production. J. Cox (2017) and Epstein and Rosasco (2015) offer the most nuanced approaches with their discussions, respectively, of the library's role in showcasing university digital publishing and training departmental support personnel to provide front-line literature searchers for faculty. In both cases, however, despite glimpses into processes of decision-making and seizing opportunities, most of the creative, agential work — i.e., practices of knowledge production — is unexplored.

Another prominent technological driver discussed is changes in the scholarly communications environment, particularly funders' mandates for open access — i.e., accessible via the Internet to anyone — research data and publications. Such "compliance regimes" (McRostie, 2016, p. 370), many authors claim, lead to new library services such as assistance with publication of open access journals (Eddy & Solomon, 2017), formation of communities of practice supporting open access (Coombs et al., 2017) and creation of educational resources for the campus community (Verhaar et al., 2017). In all cases, however, the authors concentrate their discussions on services themselves and neglect the practical steps of negotiating, e.g., by embracing or resisting, funders' requirements. In the

process, I argue, they neglect opportunities to interrogate academic librarians' practices of knowledge production.

### 2.3.2 University research strategies

Secondly, in many of the studies, the authors argue that alignment with university strategy is essential for the relevance and survival of academic libraries, but do not delve deeply into the social processes by which such new areas of expertise are identified and secured. Hoodless and Pinfield (2018), for example, are adamant that libraries create "a clear link to the overall university strategy... to 'future proof' the library" (p. 350) but do not describe in detail the intervening steps of service provision or knowledge production. Hollister and Schroeder (2015) similarly assert that "establishing the role of the library as an essential partner in the research enterprise is a compelling demonstration of institutional value" (p. 98), but then leap to discussion of proposed services such as data management and bibliometric analysis without comment on university context or transitional decisions. Other authors likewise argue that external performance exercises have led universities to declare a priority in producing 'top-tier' research and that, therefore, academic libraries should offer services such as tracking faculty publication data (Day, 2018), compiling bibliometric statistics (Haddow & Mamtora, 2017) and assisting with research data management (S. Brown et al., 2018) — but rarely do they elucidate the steps involved in such knowledge production. More nuanced approaches are offered by L. Lang et al. (2018) and Novak and Day (2018) who argue, respectively, that their libraries built university-wide credibility by offering analysis of "institutional research impact" (p. 3) and honing open-access publication of faculty research via an institutional repository. In both cases, however, despite glimpses into processes of decision-making and seizing opportunities, most of the intervening agency leading to knowledge production is unexplored.

### 2.3.3 Librarians' professional values and expertise

Lastly, much of the literature locates roots of research support services in librarians' professional — often dubbed 'core' or 'traditional' — values and expertise. However, comparable to drivers discussed above, the sense that professional roles inexorably lead to research support services needs unpacking, not least because what is traditional is a modern interpretation (Gorman, 2015; Koehler, 2015) and, given complicated university contexts, on its own is unlikely to account for new strategic directions. Some authors speak broadly about

traditional values and capabilities that have spurred new research support services such as "expertise in discovery, information literacy, copyright, and the organization of information" (J. Cox, 2017, p. 111) and "structured thinking, knowledge of information management theory, ability to communicate, understanding of knowledge dissemination and awareness of trends" (R. A. Brown et al., 2015, p. 231). In both cases, however, the authors do not explicate how such values and expertise 'naturally' lead through the thicket of campus politics to knowledge production, such as creation of digital scholarship projects (J. Cox, 2017) or research data management programmes (R. A. Brown et al., 2015).

Other authors are more specific about the steps involved in knowledge production. Coombs et al. (2017) and Stephan (2018), for example, credit the success of library-initiated discussion groups about faculty research to librarians' traditional roles as neutral and non-judgemental information brokers. Such groups have led to knowledge production such as library promotion of interdisciplinary faculty projects (Stephan, 2018) and improved access to faculty research via open access repositories (Coombs et al., 2017). McRostie (2015) similarly identifies librarians' traditional role as "keeper and curator of knowledge" (p. 363) —especially in archiving and preserving materials — which justified new services (and knowledge production) at her library such as "digital curation processes; metadata specification; research tool documentation and generation of tutorials and manuals; digitization; collections identification and development; application of archival standards; needs assessment; and data repositories" (p. 369). Furthermore, Kott et al. (2015) and Díaz and Mandernach (2017) argue that strong professional relationships with faculty, which both sets of authors consider a cornerstone of librarians' traditional remits, are at the root of contemporary service developments, such as production of bibliographies to assist university decision-making (Kott et al., 2015) and assistance with curriculum development (Díaz & Mandernach, 2017). In all studies, however, the authors present librarians' values and expertise as self-fulfilling and leading automatically to library evolution — a leap that, I argue, silences the complicated efforts of librarians behind the scenes to produce knowledge and secure continued relevance of their roles.

### 2.3.4 Summary of Area 2: Roots of academic libraries' research support services

In sum, the literature under review highlights how academic librarians' roles are changing in the contemporary HE context. As noted in the introduction to Area 2, Pinfield et al. (2014) assert that such shifts often take the form of librarians' actively seizing unclaimed areas of

need in the university and justifying the process based on alignment with professional roles and values. Despite this observation, the authors of every other study under review locate the roots of research support services in broad and teleological drivers, moving directly from drivers to the success (or not) of new services. Despite the extent of knowledge production discussed in the literature, the rhetorical device of drivers, I argue, mutes librarians' agency and creativity in negotiating change, positioning their services and asserting their authority strategically – thus producing knowledge. I strongly believe that monolithic drivers alone cannot explain the nature of librarians' work and that explicating this work requires a more nuanced approach examining the intricacies of librarians' day-to-day practices (cf. Feldman & Orlikowski, 2011, p. 1246). The principal way, therefore, that my project builds on the claims of the literature is to unpack their inherent determinism and, in the process, provide an opening to investigate academic librarians' practices of knowledge production in the 21$^{st}$ century, including social media, which I discuss in the next section.

## 2.4 Area 3: Academic libraries and Twitter

As discussed in Section 2.1.1, Area 3 of the literature review focuses on studies that explore the content and engagement of academic librarians' Twitter practices. As the central aim of my thesis is to investigate librarians' HE knowledge production, the literature provides critical context and points of comparison for the Twitter practices of my study's participants. Drawing parallels with my discussions in the sections above of HE professionals and librarians' efforts to establish research support services, librarians' Twitter practices involve similar attempts to increase the visibility of university research, create meaningful professional relationships and assert librarians' authority and expertise (none of the studies for Area 3 were reviewed for Area 2, despite their ostensibly overlapping concerns). I believe, therefore, that a survey of these social media practices will help illuminate the entanglement of librarians' knowledge work with broader tensions that HE professionals often navigate in the contemporary university.

Though conducted earnestly, the literature suffers from the methodological weaknesses of library-practitioner literature generally (discussed in Section 2.1.1), namely reliance on how-to articles, small-scale case studies and lack of theoretical grounding (Kumasi et al., 2013; Turcios et al., 2014). Critics of such studies — which are not covered in my literature review as they did not meet my inclusion criteria outlined in Section 2.1.2 — note that library social media studies are often inattentive to the interplay of social media practices with other

library services (Deodato, 2018) and the inequalities that social media use bolsters (Lilburn, 2012). They also observe that such studies are mainly concerned with initial adoption of social media, lack rigorous data-generation instruments (Vasilakaki & Garoufallou, 2015) and provide few frameworks for evaluating social media's value for libraries (Gardois et al., 2012).

The literature under review, therefore, is largely uncritical of Twitter, preferring to trumpet Twitter's ability to promote services (Huvila et al., 2013). Throughout this section of the literature review, I strive to be attentive to these weaknesses so that my research will add methodological and theoretical perspectives to the debates. The review below is divided into two themes: content-based studies, which explore the types of information academic libraries post to Twitter, and engagement-based studies, which investigate the reach and effectiveness of libraries' Twitter practices (often the two perspectives are covered in one study). Such analysis will help strengthen my argument that academic librarians are active contributors to university outcomes while demonstrating that the nature of such contributions depends on the wider institutional context, a point also made by Del Bosque et al. (2012) and Harrison et al. (2017).

### 2.4.1 Content

The most common finding across the content-based studies is that academic libraries use Twitter mainly to promote events, services, study spaces and collections. For example, in two studies involving analysis of several thousand tweets, Al-Daihani and Abrahams (2016) and Al-Daihani and AlAwadhi (2014) found that academic libraries primarily use Twitter to inform users of core library activities. Offering a more nuanced perspective, Stvilia and Gibradze (2014) notice that — in addition to events and resources — academic libraries' tweets emphasise community connections. Conversely, two small studies comparing tweets between academic and public libraries (Aharony, 2012; Alsuhaibani, 2020) have concluded that academic libraries relay more formal announcements about news and services than their public counterparts.

Despite the emphasis on news and announcements, many authors of content-based studies argue that academic libraries' tweeting reveals attempts to establish connections with library users and other stakeholders (Young & Rossmann, 2015). As noted by Stvilia and Gibradze (2014), academic libraries use Twitter's features, such as hashtags and links to external

websites, to educate users, thereby raising awareness of libraries' services and buttressing libraries' credibility. However, Del Bosque et al. (2012) assert that few libraries exploit Twitter's functionalities expertly, while a similar observation leads Deodato (2014) to conclude that academic libraries largely miss the point of Twitter. Nevertheless, Neilson (2016) found that libraries use Twitter not only to promote events but also to curate current-awareness streams of topics that are external to the library. In addition, Harrison et al. (2017) identified similar outreach and networking activities on Twitter but observe that such community building is stronger among research-intensive universities, although the authors do not speculate why.

In terms of language and semantics, again the authors tend not to adopt critical perspectives (as does Deodato, 2014, for example, when he claims that libraries' social media work reinforces dominant societal discourses). However, some studies have explored how librarians craft their tweets linguistically. Al-Daihani and Abrahams (2016) data mined thousands of tweets by academic libraries and found that such tweets have a semantic tenor reflecting "knowledge, insight, and information concerning personal and cultural relations" (p. 139). On a smaller scale, Aharony (2010) analysed 50 tweets from each of the 30 libraries in his mixed-public/academic library sample, categorising them according to the formal and informal language used, although he does not explain the criteria he used to make his judgements. Aharony (2010) found that academic libraries use formal language more frequently than public libraries, reflecting, he speculates, academia's more formal educational environment. Despite noting academic libraries' overall concern with knowledge advancement in their Twitter practices, the authors of these studies do not explicitly discuss the implications of these efforts for HE knowledge production, a point I hope my thesis will illuminate.

Aharony's (2010) point about the role of institutional context in shaping libraries' Twitter content is important and has been highlighted by other authors. For example, Del Bosque et al. (2012) note that of the 34 libraries in their sample, private universities are more likely to be active contributors to Twitter compared to public institutions, a point which, they speculate, is attributable to the leniency of private universities' social media policies compared with those of their public counterparts. In a more focused study that deliberately looked for content differences across institutional types, Harrison et al. (2017) found that research-intensive universities are more likely to tweet about academic topics and events external to the library than smaller institutions and are, moreover, less likely to tweet about

appealing study spaces. I hope that the conclusions of my thesis will add nuance to these rather surface-level discussions of context.

Collectively, the content-based studies paint a picture of academic libraries' constructing tweets using formal language to broadcast library news and information of interest to their users whilst being mindful of wider institutional contexts. However, many of the studies were conducted in the early days of Twitter – Del Bosque et al. (2012), for example, note that 2009 was the watershed year for academic libraries' joining Twitter – and Stvilia and Gibradze (2014) argue that "the use of Twitter by libraries is evolving and that libraries are adding new themes, uses, and strategies to their tweeting repertoires" (p. 140). The next section, therefore, complicates this portrait by exploring academic libraries' social media reach and engagement.

## 2.4.2 Engagement

The notion of social media engagement is complex, and scholars from various disciplines have debated the activities, identities and sentiments it encompasses (Smith & Gallicano, 2015). In the library-practitioner literature, engagement with Twitter generally means user activities such as likes, retweets and replies as well as gaining followers. Most authors of the engagement-based studies believe that high engagement with stakeholders is the gold standard by which social media practices should be assessed, thereby necessitating the employment of quantitative tools of varying rigour to measure user activity. However, notwithstanding the wide variety of approaches adopted, the authors generally find that academic libraries have low levels of Twitter engagement and, consequently, often conclude that it is not worth libraries' time to maintain a Twitter presence (Griffin & Taylor, 2013; Sewell, 2013; Winn et al., 2017).

Studies which attempt to measure academic libraries' Twitter engagement include Alsuhaibani (2020) who compared the Twitter activity of a public and an academic library in Australia and found that the academic library's highest engagement stemmed from promotional tweets about services and events. M. J. Jones and Harvey (2019), with a larger sample size, came to similar conclusions. In comparison, Stvilia and Gibradze (2014) found that engagement peaks for Tweets about library study spaces and academic support services. Not surprisingly, users engage most often with content about services of potential use to them.

Most of the authors of engagement-based studies, however, lament that academic libraries mainly use Twitter as a broadcasting tool, not as a platform to foster participation and dialogue (Deodato, 2014). M. J. Jones and Harvey (2019), for example, find that few academic libraries encourage responses from followers through the wording of their tweets. While Stvilia and Gibradze (2014) observe that some academic libraries are adept at using certain Twitter features to promote discussion, Del Bosque et al. (2012) assert that most libraries could be more sophisticated in their use of Twitter's inherent features, such as hashtags, thereby encouraging user interaction. The subtext of most studies is puzzlement over missed opportunities. Griffin and Taylor (2013), for example, lament that academic libraries use Twitter as "one-way information conduits" (p. 266), thus missing chances to build knowledge dialogically. And Huang et al. (2017) speculate contextual reasons why English-speaking libraries have a lower "rate of reciprocal interactions" (p. 334) compared to Chinese libraries, such as the higher number of knowledge-sharing posts in Chinese libraries and the ability of Chinese libraries to devote substantial staff time to social media activities (p. 335). Unsurprisingly, Palmer (2014) finds that libraries who employ what he terms "intentional interactivity" (p. 613), such as directed tweets, have greater user engagement.

If counting likes and retweets has been criticised for producing a simplistic picture of user sentiment (Murthy, 2017; Smith & Gallicano, 2015), so too has the practice of deriving demographic information from scant user-provided information on Twitter profiles (Sloan, 2017). Nevertheless, the engagement-based studies reviewed here rely on information gleaned from profiles to determine who engages with libraries' Twitter accounts. Given this caveat, the authors generally find that libraries do *not* reach their desired audience of students and faculty. M. J. Jones and Harvey (2019) and Stewart and Walker (2017), for example, both state that most retweets come from users outside the library; Kim et al. (2012) and Sewell (2013) further note that faculty have low participation rates. Interestingly, several studies find that other units of the university often have higher rates of engagement and are libraries' most influential followers. Griffin and Taylor (2013), Kim et al. (2012) and Palmer (2014), for example, find that top re-tweeters of academic libraries' content are university organisations, a phenomenon which greatly assists diffusion of libraries' messages across the university. Indeed, Shulman et al. (2015) observe that because institutional accounts readily share library content, such followers are particularly influential in propagating library information. This observation has led Yep et al. (2017) to assert that "libraries are actively contributing to the broader campus conversation" (p. 7).

## 2.4.3 Summary of Area 3: Academic libraries and Twitter

Despite initial enthusiasm for Twitter's possibilities, the literature reviewed in Area 3 paints a pessimistic picture of a mismatch between libraries' hoped-for Twitter benefits and engagement with desired constituents. Whereas content-based studies show academic libraries' creating Twitter content that is educationally themed, community oriented and formally worded, engagement-based studies lament low rates of interaction with students and faculty. That user sentiment is difficult to measure (Murthy, 2017) and engagement cannot be simplistically defined by counting likes and replies (Smith & Gallicano, 2015) is never considered by the authors and may be a symptom of the methodological weaknesses of library-practitioner literature generally (discussed in Section 2.1). Outside of librarianship, social media researchers have called for sophisticated approaches to engagement such as exploring users' active listening practices — as opposed to the pejorative term 'lurking' — on social media (Crawford, 2011). Such qualitative approaches might complicate entrenched narratives of academic libraries' poor Twitter practices. This is certainly an aim of my research.

However, adoption of Twitter has been uneven across academic libraries, and there have been *benefits* in many cases (Chatten & Roughley, 2016; Young & Rossmann, 2015). There is no consensus in the library-practitioner literature regarding the possibilities and realities of Twitter implementation. Moreover, despite acknowledgement of the scholarly tenor of academic libraries' tweeting, the literature under review rarely positions libraries' Twitter practices as knowledge producers in HE. The principle way that my study will add to the literature, therefore, is to add nuance to discussions about the goals and motivations of librarians' Twitter practices while identifying concomitant ways they produce knowledge in HE. Indeed, the engagement of university units with libraries' Twitter accounts discussed in the previous section is significant and should not be regarded as second best to engagement with students and faculty. My study will thus add to the discussion by delving into tensions and practical politics that inspire libraries' tweeting while demonstrating how such activity produces knowledge.

## 2.5 Conclusions

To conclude, my study's priorities concern librarians' practices of HE knowledge production. In terms of the aims of my study, the most significant shortcoming I found across the literature was a lack of attention to individuals' day-to-day practices that constitute knowledge production. As noted in Section 2.1, my sense, therefore, that the theory of knowledge infrastructures (KIs) was appropriate for my concerns was informed by gaps noted while conducting this literature review.

To summarise, firstly, regarding *knowledge production of HE professionals*, I examined 21 studies from the HE literature about tensions faced by HE professionals and their consequent coping strategies and knowledge production. I found that HE professionals, by virtue of freedoms afforded by their liminal status, often bridge competing cultural perspectives within the university; at the same time, I found that they often contest tensions generated by their liminal status by attempting to assert authority and expertise. In both processes, HE professionals often contribute actively to university outcomes. Because the literature emphasises tensions associated with HE professionals' status and identities — as opposed to the service-orientation of the library-practitioner literature — it has encouraged me to refine the focus of my research by illuminating subtle staff experiences that I can apply to the academic librarians' activities. In turn, I hope that by framing librarians' work as KIs (and by extension the work of HE professionals), I will be able to provide a detailed exploration of the micro-politics, decisions and social effects of HE professionals' knowledge production, a point on which the literature is weak.

Secondly, in terms of *roots of academic libraries' research support services*, I surveyed 23 studies from the library-practitioner literature about academic librarians' recent efforts to develop research support services. I found that, despite many examples of knowledge production, the literature often frames such efforts simplistically as driven by changes in technology and university research strategies and underpinned by librarians' 'traditional' values. Because the literature emphasises such drivers, it has enabled me to refine the focus of my research by teasing out details of librarians' professional contexts. In turn, I hope that by framing the work of librarians as KIs, my thesis will add to the literature by contributing a detailed exploration of the micro-politics, decisions and social effects of librarians' knowledge production, points that the literature tends to simplify through deterministic descriptions of drivers.

Lastly, for *academic libraries and Twitter*, I explored 21 studies about the content and engagement of librarians' Twitter practices. I found that while academic libraries create Twitter content that is educational and builds community, there are persistently low rates of interaction with stakeholders. Because the literature emphasises this perceived mismatch between intent and reality, it has enabled me to refine the focus of my study by providing critical context and points of comparison for my participants' Twitter practices. In turn, I hope that by framing librarians' work as KIs, my study will add to the literature by identifying tensions and practical politics that animate librarians' tweeting and demonstrating how such work actively adds to campus conversations, an area in which this literature are weak.

In sum, I have identified in the literature discussion of three broad mechanisms of knowledge production in HE: Bridging/contestation for HE professionals; drivers for academic libraries' research support services; and content/engagement for librarians' Twitter practices. The most general of these mechanisms is drivers, a vantage point that, I have argued, effectively removes the practices of individuals from social processes and, as discussed throughout this chapter, is characteristic of the library-practitioner literature more generally. On the other hand, the mechanism most concerned with social dynamics is bridging/contestation, and this too is linked to the nature of HE research, particularly studies that frame their perspectives using Whitchurch's (2008b, 2009) theories of HE professionals' changing roles and identities.

These varying perspectives on knowledge production in HE — and my observation that the literature rarely explicates in detail social practices that constitute such mechanisms — were useful for moulding my research question and selecting a theoretical framework for my thesis. The framework I chose, knowledge infrastructures (KIs), is concerned with drawing out practices and values that underpin knowledge production. The theory of KIs therefore helped pose questions that could assist in addressing the shortcomings of the literature reviewed in this chapter. The next chapter therefore presents an explanation of the theory of KIs and its use in my thesis.

# Chapter 3: Theoretical Framework

*Usually perceived as something "just there," ready-at-hand, completely transparent, something upon which something else "runs" or "operates" (a system of railroad tracks upon which rail cars run; a computer network upon which a research lab operates or disseminates data like the WWW), any infrastructure that has been the target topic of activities has probably also been the object of passionate debates — for the engineers in charge of building the railroad system or for the scientists and technologists in charge of developing the network.* (Bowker et al., 2010, p. 99)

## 3.1 Introduction

The aim of this study is to explore academic librarians' practices of knowledge production via Twitter. As noted in Chapter 2, the literature concerning librarians' knowledge work, and the knowledge work of analogous HE professional groups, does not dwell deeply on the social practices that lead to knowledge production. As explained in my definition of knowledge production (Section 1.1.3), I believe that individuals' practices are the fundamental building blocks of knowledge. The purpose of this chapter, therefore, is to establish the rationale and characteristics of my chosen theoretical framework — knowledge infrastructures (KIs) — which comprises a set of empirical focal points that will guide my exploration of librarians' Twitter practices in HE.

As discussed in Section 1.5.4, however, I did not originally set out to conduct an infrastructural study. I initially explored theories of professional identity and technology (Stein et al., 2013), practice theory (Feldman & Orlikowski, 2011), sociomaterialism (Fenwick & Edwards, 2014) and epistemic cultures (Knorr Cetina, 2007), all of which I continue to believe are useful to my project (and are revisited in Section 6.4 to inform alternative interpretations of my research outcomes). However, my decision to use KIs as a theoretical framework was based on its specific focus on invisible work practices and the generative effects of such practices on knowledge production – a focus which therefore offered the possibility of informing gaps in the literature identified in Chapter 2. The notion of KIs, in fact, neatly marries my interests in sociomaterialism, practice theory and identity. Furthermore, what I found particularly compelling about the theory of KIs is its capacity to undermine broad historical narratives such as those often attached to the 'progress' of technology or the structure of organisations. The theory of KIs insists that what is portrayed as 'true' is often made up of contingent political decisions and ongoing invisible work and further suggests that such practical politics are imbricated with human values and have

ontological effects on the creators and users of infrastructure (Knox, 2017, pp. 355-356). Therefore, my hope in investigating librarians' Twitter practices through the theoretical framework of KIs is to produce a nuanced picture of librarians' work that is situated historically, imbued with professional values and largely invisible to outsiders. My theoretical framework should thus help to analyse critically librarians' activities in HE and the persistent and silencing tropes often attached to their work.

In this chapter, therefore, I outline how I will use the concept of KIs as a theoretical framework to explain the nature and effects of librarians' Twitter work in HE. Firstly, I define the notion of KIs and disambiguate it from similar terms. Next, I explore Star and Ruhleder's (1996) influential list of eight dimensions of infrastructure, alongside the related notion of infrastructuring, which together highlight the aspects of human activity that underpin the nature of KIs. While writing this chapter, however, I found that the elements of Star and Ruhleder's (1996) list overlapped significantly, thus limiting their use analytically. In the final section of the chapter, therefore, I discuss how I devised logical groupings of the eight dimensions threaded with the processual sensibility of infrastructuring, which resulted in a bespoke theoretical framework that better fit the aims and context of my study. This exegesis and synthesis, which has implications for the methodological focus of my study and is the basis for the analysis of my study's research outcomes, is therefore an original contribution to the literature about KIs and potentially useful to other infrastructural studies. Taken together, my theoretical framework supports well the goal of my study to explore academic librarians' practices knowledge production via Twitter.

## 3.2 Defining knowledge infrastructures

The most-cited definition of KIs comes from Edwards (2010) who states that KIs are "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (p. 17). Bowker et al. (2010) define KIs more simply as "pervasive enabling resources in network form" (p. 98). Importantly for the concerns of my study, KIs can "present new ways of creating, generating, sharing, and disputing knowledge and explore the altered mechanics of knowledge production and circulation" (Karasti et al., 2016a, p. 7). The concept of KIs thus assumes an entanglement of technologies, individuals' values, invisible work behind the scenes to maintain infrastructure

and the generative influence of such practices on possibilities of knowledge (Edwards et al., 2013).

What, then, does the notion of KI encompass to make it a productive term? As discussed in Chapter 1, scholarly research has changed dramatically with digitisation and the ability to collaborate and share information in networked environments (Karasti et al., 2016a, p.2). The underlying systems of such efforts, such as cloud computing and social media, are recent developments which have led to new "cognitive divisions of labor" (Bowker, 2016, p. 397) in terms of who creates and maintains support for, among others, big science and the digital humanities. The notion of KIs draws attention to the scale, distribution, sociality and influence of such systems (Monteiro et al., 2013), emphasising the professional practices and politics that constitute research support and the associated effects on knowledge production that such invisible work creates. In Section 3.3 below, I look more closely at the key features of KIs and link them to themes that are pertinent to my thesis. First, however, it is necessary to clarify some basic terminology and delineate KIs as a field of study in its own right.

### 3.2.1 A note on terminology

The literature about KIs often cites researchers who share similar terms such as information infrastructures and cyberinfrastructures. Indeed, Edwards (2010) and Bowker (1994), who have popularised the term knowledge infrastructures, have also written extensively about information infrastructures and cyberinfrastructures (e.g., Edwards et al., 2009). Other terms in use are e-research and e-infrastructures (Pollock & Williams, 2010).

Definitions of the five terms overlap to a significant extent. For example, Bowker et al. (2010) define information infrastructures as "digital facilities and services usually associated with the internet: computational services, help desks, and data repositories to name a few" (p. 98). Meanwhile, Ribes and Lee (2010) define cyberinfrastructures as "networked information technologies supporting scientific research activities such as collaboration, data sharing and dissemination of findings" (p. 231), while Pollock and Williams (2010) characterise e-infrastructures as "large-scale information systems intended for long-term use with multiple users and uses" (p. 521). The common thread running through these studies, reflecting their roots in the social concerns of STS and Computer-Supported Cooperative Work, is an

emphasis, not on size and shape of infrastructure, but on entanglements of people, technology and values. This social focus is particularly relevant to the concerns of my investigation into librarians' practices of knowledge production. Indeed, Pipek and Wulf (2009) point out that even small technologies such as calendaring apps and paper hand-outs and, importantly, the individuals who help others access such technologies, can be considered infrastructural if they support work practices (p. 456).

Despite the terms' many similarities, Monteiro et al. (2014) assert that the distinguishing feature of KIs is that they highlight the "epistemic machinery" (p. 8) of particular infrastructures, i.e., their ability to produce new forms of knowledge. It is not that other forms of infrastructure cannot do this, it is just that the term KIs implies a special focus on how research infrastructures "exert effects on the shape and possibility of knowledge in general" (Edwards et al., 2013, p. 23). As the focus of researching and theorising about infrastructures is similar across many studies, when discussing others' research throughout my thesis, I use the terms somewhat interchangeably and as presented by the authors. However, I consistently concentrate on my own study's key emphasis, namely librarians' practices of knowledge production.

### 3.2.2 Mapping the field

There is a core of researchers in Europe and the United States writing about KIs (e.g., Borgman, Bowker, Edwards, Jackson, Karasti, Monteiro, Parmigianni, Pipek, Pollock, Ribes and Williams and others) whose work was mainly published post-2000 and who often cite a set of foundational sources from the 1990s (e.g., Bowker & Star, 1999; Star & Ruhleder, 1996). Arguably, this has resulted in a silo of literature about KIs and research infrastructures, which might explain why the notion has not been deployed more widely in HE-research journals. While it might be a disciplinary silo, the field is lively in its dialogue and critical of future directions of infrastructure studies, as evidenced by the many special journal issues devoted to the topic (e.g., Edwards, et al., 2009; Karasti et al., 2016a-d; Monteiro et al., 2014; Pipek et al., 2017; Ribes & Lee, 2010).

## 3.3 Elements of knowledge infrastructures

The literature about knowledge infrastructures is fairly consistent about the core elements of KIs, but less clear about how they interrelate and create "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (Edwards, 2010, p. 17). In this section, therefore, I outline the main features of KIs and discuss how I believe they complement each other. I also discuss how I will apply these features to analyse my study's empirical data.

### 3.3.1 Star and Ruhleder's eight dimensions of infrastructure

As mentioned in Section 1.5, Star and Ruhleder (1996) proposed a list of eight features of information infrastructures that has subsequently become foundational in the KI-literature (Edwards et al., 2013; Karasti et al., 2016a). Star and Ruhleder (1996) characterise information infrastructures as embedded deeply in individuals' practices, which they believe are constituted by an array of political decisions. Significantly, Star and Ruhleder frame their list with the question "When is an infrastructure?" (p. 112), after Engeström's provocation "When is a tool?" (Engeström, 1990). The question implies a relational view of KIs, holding multiple meanings and emerging from individuals' situated needs and practices. As discussed in Section 3.1, these eight dimensions underpin my thinking about KIs, but the theoretical framework I devised for this study is a distillation of the dimensions into four categories (combined with the notion of infrastructuring, as explained in Section 3.3.2). Table 3.1 reproduces Star and Ruhleder's (1996) eight dimensions.

|   | Dimension | Definition |
|---|---|---|
| 1 | Embeddedness | Infrastructure is "sunk" into, inside of, other structures, social arrangements and technologies |
| 2 | Transparency | Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks |
| 3 | Reach or scope | This may be either spatial or temporal— infrastructure has reach beyond a single event or one-site practice |
| 4 | Learned as part of membership | Strangers and outsiders encounter infrastructure as a target object to be learned about. New participants acquire a naturalized familiarity with its objects as they become members |
| 5 | Links with conventions of practice | Infrastructure both shapes and is shaped by the conventions of a community of practice, e.g. the ways that cycles of day-night work are affected by and affect electrical power rates and needs |
| 6 | Embodiment of standards | Modified by scope and often by conflicting conventions, infrastructure takes on transparency by plugging into other infrastructures and tools in a standardized fashion |
| 7 | Built on an installed base | Infrastructure does not grow *de novo*: it wrestles with the "inertia of the installed base" and inherits strengths and limitations from that base |
| 8 | Becomes visible upon breakdown | The normally invisible quality of working infrastructure becomes visible when it breaks |

**Table 3.1: The eight dimensions of information infrastructures (reproduced verbatim from Star & Ruhleder, 1996, p. 113)**

Taken together, Star and Ruhleder (1996) assert that "the configuration of these dimensions forms 'an infrastructure,' which is without absolute boundary or *a priori* definition" (p. 113). In Section 3.4, I elaborate on and consolidate these eight dimensions. For now, I highlight that the importance of Star and Ruhleder's list for KI-studies cannot be overstated, as it broke with conventional ideas of infrastructure as solid, unchanging and unremarkable while demonstrating infrastructure's complicated social and political nature (Jensen & Morita, 2017, p. 618). Twenty years after the publication of Star and Ruhleder's (1996) list, the principal themes of a four-part special volume of *Science & Technology Studies* devoted to KIs (Karasti et al., 2016a-d) — a volume which I take as representative of the contemporary field of KI-studies — still echoed these eight dimensions, especially as related to invisibility, labour, scale, values and performativity, along with KIs' processual and relational nature.

For the purposes of this study, Star and Ruhleder's (1996) eight dimensions form the basis for my research questions and the foundation for the analysis of empirical data, especially in terms of my intention to investigate and demonstrate the entanglement of technology and professional values in librarians' HE knowledge contributions. In the KI-literature, however, Star and Ruhleder's (1996) dimensions are often complemented by the notion of *infrastructuring* (e.g., Kow & Lustig, 2018; Marttila & Botero, 2017; Mikalsen et al., 2018), which I also find compelling for my project and therefore describe in detail in the next section.

### 3.3.2 Infrastructuring

The notion of infrastructuring stems from design considerations in the information systems literature (Pipek & Wulf, 2009). Infrastructur*ing*, as a verb, emphasises the "doing and making" (Marttila & Botero, 2017, p. 103) of infrastructure, i.e., the practices of the creators and users of infrastructure, as opposed to what infrastructure supports. The notion of infrastructuring, furthermore, views such activity as integral to the infrastructure itself (Pipek & Wulf, 2009, p. 453). From the perspective of infrastructuring, KIs are accretions of technologies and social relations — something always in the making — which in turn necessitate ongoing repair and maintenance (Karasti et al., 2018). Such mundane maintenance work is laden with values reflecting care towards technology and hopes for the future (Houston et al., 2016), but also threaded with tensions that are often necessary for the infrastructure's existence.

Importantly for my thesis, the concept of infrastructuring suggests that, through repair and maintenance, infrastructure exerts an influence on its creators, users and its own technological base:

> This is the central fact about 'infrastructuring' — it is not that the act of building an infrastructure ever simply ratifies pre-existing relationships: the act of infrastructuring changes what it is to be a road, a unit of currency or an ecology. Infrastructures are engines of ontological change. They stand between people and technology and nature and in so doing reconfigure each simultaneously. (Karasti et al., 2018, pp. 270-271)

Infrastructures, in other words, are more than just "matter that enable the movement of other matter," they are "the relation between things" (Larkin, 2013, p. 329). Via what Jensen and Morita (2017) term the "ontological experiments" of infrastructure, infrastructuring can shape new social forms, capabilities or identities. The notion of infrastructuring, therefore, brings a practice focus to KIs which Karasti and Blomberg (2018, p. 235) suggest creates an "opening" for studying KIs ethnographically in terms of understanding complex and emerging sets of practices and their effects on their creators. For the purposes of my study, therefore, infrastructuring is not a set of features added on to Star and Ruhleder's (1996) dimensions, but a processual sensibility that informs my use of their list, honing my focus on the human activities of KIs that are evolving, entail values/tensions about technology and future aspirations and exert ontological influences on individuals' identities.

## 3.4 Framework devised for the study

As explained in Section 3.3.2, the notion of infrastructuring emphasises the "doing and making" (Marttila & Botero, 2017, p. 103) of KIs and brings a processual focus to the varied social practices that constitute KIs. As viewed through the lens of infrastructuring, therefore, Star and Ruhleder's (1996) eight dimensions (discussed in Section 3.3.1) collectively demonstrate that — as constellations of decisions, politics and technology — KIs are simultaneously stabilising and, counterintuitively, contingent and fragile. In practice, however, because Star and Ruhleder's eight dimensions greatly overlap in terms of subject matter, I foresaw that using them individually as tools of analysis would be unwieldy. I decided, therefore, to cluster the dimensions logically around the same or similar concepts. This synthesis is an original contribution to the KI-literature based on my careful exegesis of

Star and Ruhleder's dimensions as viewed through the lens of infrastructuring. Figure 3.1 shows the relationship between the notion of infrastructuring and the four categories I devised:
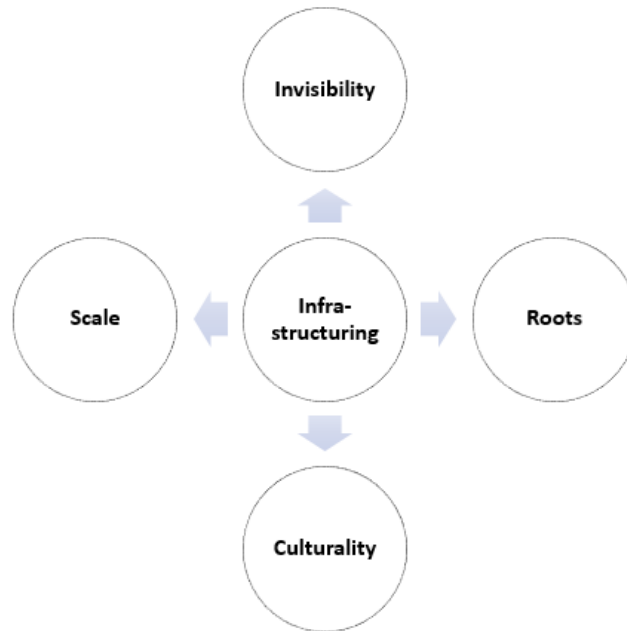


**Figure 3.1: How the four categories of the theoretical framework relate to the notion of infrastructuring**

In the following sections, I explain how I devised each category and their respective importance to my study.

### 3.4.1 Invisibility

Firstly, the category of *Invisibility* comprises Star and Ruhleder's (1996) dimensions of *transparency* and *becomes visible upon breakdown.* By invisibility, researchers of KIs generally mean "'taken for granted', 'out of everyday experience or use' or 'out of sight'" (Karasti & Blomberg, 2018, p. 251). Karasti et al. (2016a) further identify three ways in which these dimensions commonly manifest themselves in KI-studies:

> Invisibility may refer to the invisible nature of the infrastructures themselves … the invisible work performed by actors ... and the processes of making visible—or invisible—activities and related challenges. (p.8)

In other words, the intertwined aspects of invisibility — in terms of transparency of use and the work required to maintain them, as well as methods for exposing their internal politics,

discussed in Chapter 4 — structurally informs most studies about KIs. As Irani et al. (2010) assert:

> Infrastructural invisibility is a privilege of a division of labor where those in keeping the infrastructure in working condition are not those who rely on it on a daily basis. (p. 9)

Seen through the lens of infrastructuring, therefore, invisibility foregrounds individuals' efforts to understand and increase the visibility of infrastructure (Pipek & Wulf, 2009, p. 460). Invisibility also foregrounds the repair and maintenance involved in sustaining a KI. That such work is often "rendered invisible" (Jackson, 2014, p. 225) is key for the context of my study, namely an HE context in which librarians often struggle with feeling invisible and constrained by stereotypes.

For the purposes of this study, therefore, I define invisibility as feelings of being misunderstood and under-appreciated and how such perceptions animate maintenance of KIs that is invisible to outsiders. I will use this definition to highlight the stereotypes that my participants believe render their work invisible and the earnest efforts that consequently fuel their Twitter work. In other words, like the practices of *Wikipedia* editors who "craft" and "hone" entries behind the scenes (Jackson, 2014, p. 225), academic librarians' knowledge practices are often hidden from the public. Therefore, the role of invisibility in my participants' Twitter work will be a key area of investigation, especially their sense – real or perceived – of being invisible within HE.

### 3.4.2 Roots

Secondly, the category of *Roots* comprises Star and Ruhleder's (1996) dimensions of *embodiment of standards* and *built on an installed base* and draws attention to KIs' physical and ethical foundations. Karasti et al. (2016a) discuss how these notions intertwine:

> Knowledge infrastructures are seldom built *de novo* ... they gather and accrete incrementally and slowly, over time. They are brought into being on top of existing infrastructures that both constrain and enable their form. Knowledge infrastructures are ecologies consisting of numerous systems, each with unique origins and goals, which are made to interoperate by means of standards, socket layers, social practices, norms, and individual behaviors that smooth out the connections among them. (p. 7)

In other words, the "long now" (Ribes & Finholt, 2009) of infrastructure development means that KIs are not "fully coherent, deliberately engineered, end-to-end processes" (Edwards et al., 2013, p. 14), but, by definition, "consist of multiple layers and dimensions at differing stages of maturity" (Bowker et al., 2010, p. 108). Some researchers have investigated the role of technical standards in shaping KIs, such as Edwards et al.'s (2009) discussion of software gateways and Goëta and Davies' (2016) study of open-data standards. Others have interpreted *standards* and *installed base* more broadly, foregrounding the intense sociality at the root of KIs. As Star (2002) asks, "what values and ethical principles do we inscribe in the inner depths of the built information environment?" (p. 117).

Seen through the lens of infrastructuring, therefore, roots foreground the negotiation of value tensions in the formation of KIs, including individuals' fluctuating professional ethics (Fukushima, 2016), attachments to the past (Stuedahl et al., 2016) and aspirations for the future (Granjou & Walker, 2016). This is key for the context of my study where the destabilising nature of changes in HE influences librarians' historically embodied professional practices and provides a foundation for their Twitter practices. As Granjou and Walker (2016) argue, "Research infrastructures encode narratives about the value and relevance of the research they enable" (p. 51).

For the purposes of this study, therefore, I define roots as the professional/ethical values and aspirations for the future that are the bedrock of librarians' KIs. I will use this definition to illuminate how my participants weave their professional values, and hopes for the future of information access and librarianship generally, into their Twitter practices.

### 3.4.3 Scale

Thirdly, the category of *Scale* comprises Star and Ruhleder's (1996) dimensions of *embeddedness* and *reach or scope* and draws attention to the micro- and macro-perspectives that infrastructural studies must simultaneously encompass. As Karasti et al. (2016a) explain:

> Theoretical challenges for studying knowledge infrastructures include understanding of the complex multi-scale relations and multiple scopes involved, the local and situated dimension of infrastructure together with its global and pervasive nature. (p. 4)

In other words, KIs are both deeply embedded in individuals' work practices and concurrently positioned across multiple sites without definite boundaries. Edwards et al. (2009) make the point that while KIs

> may be "located" in an apparently global system like the Web, their actual use is frequently entirely local, dependent upon and linked with local work flows and communities of practice. (p. 370)

In addition, Star and Ruhleder (1996) claim that:

> 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. (p. 114)

Seen through the lens of infrastructuring, therefore, scale foregrounds the inextricable links between small-scale human activities and the larger social effects such activities can engender over time and space. Two salient studies of this dynamic are Dagiral and Peerbaye's (2016) investigation into how micro-decisions that form a database for rare diseases in France affect popular and scientific conceptualisations of various pathologies and Taber's (2016) investigation into how scientific notions of 'biodiversity' in Ecuador evolved from national policies for managing plant resources. Infrastructuring furthermore suggests a focus on how people conceptualise and manage the spatial and temporal reach of infrastructure, such as Edwards et al.'s (2009) conceptualisation of "bridging scale" – i.e., individuals' conceptualisations of how infrastructures 'actually' work – and Ribes' (2014) notion of "scalar devices" – i.e., how individuals conceptualise and manage the reach of their infrastructural efforts. These perspectives are key for the context of my study where Twitter streams are, by definition, globally dispersed and simultaneously constituted by an accretion of small posts and local efforts.

For the purposes of this study, I define scale as the characteristic of KIs to exist at multiple levels simultaneously: by being locally embedded, by perpetually evolving through processes of accretion and by having social effects beyond the local context of their creation. I will use this definition to focus my attention on the continuously emerging nature of librarians' Twitter practices and how my participants envision and manage the multiple scales of their knowledge work.

### 3.4.4 Culturality

Finally, the category of *Culturality* comprises Star and Ruhleder's (1996) dimensions of *learned as part of membership* and *links with conventions of practice* and draws attention to how infrastructures and social practices are mutually dependent. Edwards (2004), for example, asserts that

> Societies whose infrastructures differ greatly from our own seem more exotic than those whose infrastructures are similar. Belonging to a given culture means, in part, having fluency in its infrastructures. (p. 189)

In other words, "strangers and outsiders encounter infrastructure as a target object to be learned about" (Star & Ruhleder, 1996, p. 113). However, people simultaneously change infrastructure, even while it affects their actions. For example, Erickson and Jarrahi (2016) discuss how mobile workers must be fluent in various KIs to demonstrate vocational competence. Such fluency is not a simple learning process, neither is it without tensions and ambivalences. Jackson and Barbrow (2013), for instance, assert that KIs in the field of ecology, though used regularly by computational ecologists, often sit uncomfortably with more traditional professional identities and, in many cases, spur new vocational callings.

Seen through the lens of infrastructuring, therefore, culturality foregrounds how infrastructures shape the communities they support (Pipek & Wulf, 2009, p 461). These dynamic processes whereby "the work of infrastructuring co-participates in generating an active and legitimate membership" (Crabu & Magaudda, 2018, p. 151) often result in shared and evolving sets of cultural references and social identities. This is key for the context of my study where librarians' efforts to stay relevant in HE often results in purposively carving out new areas of expertise alongside associated efforts to foster scholarly communities of researchers.

For the purposes of this study, therefore, I define culturality as community practices and identity changes that stem from creating KIs. I will use this definition to focus my attention on how working with Twitter — i.e., the sense of needing to be an expert in exploiting the affordances of Twitter — has shifted my participants' professional identity and sparked new community formations across the university.

### 3.4.5 Summary

In summary, if KIs are "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (Edwards, 2010, p. 17), I hope my theoretical framework outlined in this section will help explicate how such networks are created and maintained and, furthermore, highlight the significance of such networks for their designers. I believe that the strength of my theoretical framework, which is a synthesis of Star and Ruhleder's (1996) eight dimensions of infrastructure (outlined in Table 3.1) overlaid with the processual sensibility of infrastructuring, lies in its ability to illuminate those practices that inherently underpin the creation of knowledge in HE.

## 3.5 Conclusion

To conclude, in this chapter I have outlined how I will use the theory of knowledge infrastructures (KIs) to illuminate librarians' practices of knowledge production in HE. Firstly, I laid the groundwork by defining KIs and disambiguating the concept from similar terms. Next, I explored Star and Ruhleder's (1996) influential list of eight dimensions of infrastructure (outlined in Table 3.1), along with the related and relevant notion of infrastructuring, which together highlight KIs' invisibility, labour, scale, values/politics and performativity. Finally, I discussed how I synthesised Star and Ruhleder's (1996) list into four logical categories and added a processual focus from the notion of infrastructuring. Considered together, this theoretical framework, which is an original contribution to the KI-literature, underscores that practices of knowledge production are inherently political and that infrastructure is, counterintuitively, uneven and emerging (Harvey et al., 2016, p. 8).

As discussed earlier, I will use this theoretical framework in three ways: to direct my study's methodological approach, provide focal points for analysing my empirical data and shape the concluding discussion of my thesis. By investigating librarians' Twitter practices through my theoretical framework, I hope to demonstrate that tensions stemming from the context of librarians' changing roles in HE translate into social media practices rooted in professional values and hopes for the future while contributing to knowledge production in HE. As summarised by Karasti et al. (2016c):

> Knowledge infrastructures [are] political tools ... [with] complex loops of feedback
> between the forms of knowledge that an infrastructure embeds and the various

forms of action that feed into and stem from the set of values that the infrastructure enacts. (p. 4)

In this way, I hope to fulfil the promise of infrastructural studies generally, as discussed in this chapter's introduction, to complicate broad claims about the nature of academic librarians' work and the silencing effects such claims often entail. Examining librarians' Twitter practices using my theoretical framework will provide useful angles from which to analyse critically librarians' knowledge work in HE.

In the next chapter, I consider the methodological implications of studying KIs, which pose challenges to researchers by being (partially) invisible, intensely social and without clearly defined boundaries

# Chapter 4: Methodology and Methods

*Viewed as open-ended experimental systems that generate emergent practical ontologies, infrastructures hold the potential capacity to do such diverse things as making new forms of sociality, remaking landscapes, defining novel forms of politics, reorienting agency, and reconfiguring subjects and objects, possibly all at once. It is of course up to ethnographic elucidation ... to pinpoint precisely whether and how this happens.* (Jensen & Morita, 2017, p. 620)

*Study an information system and neglect its standards, wires and settings, and you miss equally essential aspects of aesthetics, justice, and change. Your ethnography will be incomplete.* (Star, 2002, p. 117)

## 4.1 Introduction

In Chapter 3, I discussed my theoretical framework of knowledge infrastructures (KIs) defined as "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (Edwards, 2010, p. 17). In this chapter, I highlight the methodological implications of studying the "doing and making" (Marttila & Botero, 2017, p. 103) of infrastructure, or infrastructuring. Principally, I explain how I designed my study to explore academic librarians' Twitter work including my approach to studying the hidden and emerging nature of infrastructure, my study design, issues of insider research and my data-generation methods. I conclude the chapter by explaining how I analysed my data and attended to issues of research integrity and ethics.

## 4.2 Methodology

### 4.2.1 Infrastructural inversion

As discussed in Chapter 3, there are several challenges of studying KIs including "their geographical distribution across multiple locations and within online spaces, their evolution over extended periods of time, their sociotechnical nature, [and] the multiplicity and heterogeneity of participants and institutions involved" (Karasti et al., 2016a, p. 4). To study at once KIs' scope and granularity, Karasti et al. (2016d) note that researchers often use a methodological tool called *infrastructural inversion*, which is also the key approach used in my study.

As a conceptual tool, infrastructural inversion assumes that information systems are comprised of complicated arrangements of individuals' decision-making, practical politics and routine acts of maintenance (Karasti et al., 2016a, p. 4). Infrastructural inversion was first suggested by Bowker (1994, p. 10) to make visible the complex choices behind Schlumberger's – an international oilfield services company – coordination of worldwide oil prospecting and concomitant effects on the discipline of oil-field geology. Bowker's argument was that Schlumberger's accounts of successful oil discoveries were due not, as the company said, to the work of talented individual scientists but to an infrastructure of organisational and social techniques that created the conditions for such work to happen. Infrastructural inversion is thus an approach which encourages looking backstage to view the invisible and undervalued work of making infrastructure, thereby tracing the "politics ... easily buried in technical encodings" (Bowker et al., 2010, p. 98). The conceptual "gestalt switch" (Bowker & Star, 1999, p. 34) of infrastructural inversion — i.e., choosing to foreground mundane and largely invisible work of building and maintaining infrastructure — is therefore useful for delineating the underlying practices of librarians' knowledge production in HE, especially with its emphasis on social values, cultural relations and operation across multiple scales.

However, despite infrastructural inversion being "one of the established resources of an STS approach to knowledge infrastructures" (Karasti et al., 2016d, p. 7), it is not a unified approach nor a fully developed analytical tool. It is more an "analytical strategy" (Bossen & Markussen, 2010, p. 618) to guide the investigation of KIs. A few examples from the special volume of the journal *Science & Technology Studies* concerning KIs (Karasti et al., 2016a-d) discussed in Chapter 3 illustrate how some researchers have operationalised infrastructural inversion (as tied to the categories of my theoretical framework):

- **Invisibility:** Dagiral and Peerbaye (2016) explore tensions related to invisible labour and values embedded in the creation of a rare-diseases database via interviews, participant observation, document analysis and attendance at meetings.

- **Roots:** Stuedahl et al. (2016) explore the role that archivists' professional values play in the creation of open digital infrastructures for cultural heritage via interviews, participant observation (online and offline), document analysis and field diaries.

- **Scale:** Taber (2016) explores, via interviews and analysis of historical documents, how the notion of biodiversity in Ecuador is rooted in botanical classifications as shaped by the needs of the national oil industry.

- **Culturality:** Lin et al. (2016) explore individuals' identities as citizen scientists, particularly their emotional experiences of gathering climate-change data, via interviews, participant observations (online and offline) and document analysis.

As these examples suggest, infrastructural inversion is concerned with highlighting underlying values and other social exigencies that shape the development of infrastructure. To conduct infrastructural inversions, most authors in the special volume employ ethnographic methods such as participant observation, interviews and document analysis (Karasti et al., 2016d, p. 6). In the following section, therefore, I discuss ethnographic approaches to KIs and outline how I deploy them in my study.

## 4.2.2 Multi-sited ethnography

As discussed above, most infrastructural inversions are conducted using ethnographic approaches. Ethnography is the study of social practices in natural settings using methods to draw out and interpret human meanings and their relationships with wider institutional and political contexts (Hammersley & Atkinson, 2007, p. 3). As Blok et al. (2016) argue, ethnography is useful for researching the social and political nature of KIs:

> While infrastructures are potentially available for elucidation through a range of methodological approaches—including statistical surveys, document analysis, and virtual methods—conceptualizing them in terms of heterogeneous relations, as we do here, nevertheless privileges ethnographic methods, attuned to contextual dynamics of situated practices and agencies. (p. 11)

In terms of my study' priorities, therefore, ethnography's focus on the meanings that people attach to their professional context and work practices is particularly useful for drawing out the categories of Invisibility, Roots, Scale and Culturality outlined in my theoretical framework (Section 3.4).

Karasti and Blomberg (2018) further argue that KIs, as "extended and complex phenomena" (p. 240), naturally range beyond single geographical sites and, therefore, need complementary ethnographic approaches. Indeed, the networked nature of Twitter and ecological relationships between my participants' libraries necessitates a holistic perspective. I therefore chose to conduct a multi-sited ethnography, which Marcus (1995) defines as ethnography that

moves out from the single sites and local situations of conventional ethnographic research designs to examine the circulation of cultural meanings, objects, and identities in diffuse time-space. (p. 96)

Applying a multi-sited sensibility to KIs, Karasti and Blomberg (2018, pp. 251-253) propose analytical strategies such as exploring moments of controversy or following the circulation of objects and data between sites. Multi-sited ethnography is thus well suited for conducting an infrastructural inversion as it encourages a focus on the meanings that people bring to their knowledge practices and on the multiple scales in which knowledge production occurs. In the next section, therefore, I describe on how I wove such a sensibility into my research design.

## 4.3 Research design

### 4.3.1 Defining the field

As discussed in Section 1.7.1, the site of my study was the University of Cambridge, which has over 100 libraries, many with their own Twitter accounts. Unsurprisingly, given such dispersed digital practices, my conceptualisation of 'the field' changed throughout the course of my study. Initially, I conceptualised my research site as individual librarians and their social media practices. However, I quickly realised that my participants not only have shared historical and professional contexts in HE, they also substantially influence each other's Twitter practices. Therefore, given my aim to investigate the work and ethical values rooted in KIs and their concomitant social effects, it felt incongruent to present my librarians' practices as isolated case studies. Moreover, the inherent functionality of Twitter to accrete over time and its indeterminate reach meant that bounding the field was vexing. How do you draw boundaries around ever-expanding phenomena?

Although I have pursued what Pollock and Williams (2010) term a "strategic ethnography" (p. 521), in that I selected participants based on opportunities to learn, from a methodological standpoint, I did not consider my participants homogenous units to be compared, as happens in multiple-case studies (cf. Stake, 2005). Such an approach would have obscured the complex and ecological connections between librarians' practices and the shared context of my participants' work. The sensibilities advocated by multi-sited ethnography (discussed in Section 4.2.2), however, encouraged a holistic perspective based on interconnected practices and allowed me to think ecologically about the location of my

study. I therefore reconceptualised my research site as a network of libraries and practices bounded by the historical context of the university. Pragmatically, however, I also needed to design a feasible study for doctoral research, so I ultimately decided to include six librarians – I discuss their characteristics further below – over what I felt was a representative period of their social media work (three months, the length a university term).

## 4.3.2 Participants

My study participants were librarians at the University of Cambridge who work in faculty-based libraries (discussed in Section 1.7.1) because such libraries tend to have active Twitter accounts and strong ties with researchers. I hand-selected my participants, as I knew those who were experienced and reflective Twitter users and influential on the ecology of libraries at the university. Such purposive sampling (Emmel, 2013) is common in ethnography and allowed me to choose participants aware of the professional and political choices entangled in their work, which later would be crucial for conducting an infrastructural inversion. I did not, however, 'cherry-pick' participants aligned to my personal opinions and biases, as advised against by Mason (2002, p. 124). Instead, I selected librarians who were articulate about their Twitter use and represented a range of backgrounds and perspectives. Ultimately, I decided to work with six librarians who were among the most active library tweeters in the University, as determined through comparing numbers of tweets, followers and frequency of liking tweets. Figure 4.1 shows this comparison table as of 8 June 2017, when I determined potential participants, with the final participating libraries highlighted in yellow.

| Library Name | Tweets | Following | Followers | Likes |
|---|---|---|---|---|
| African Studies Library | 9775 | 333 | 1704 | 361 |
| CJBS Library | 8006 | 634 | 1553 | 119 |
| Education Faculty Library | 7617 | 207 | 1623 | 584 |
| Earth Sciences Library | 5751 | 343 | 953 | 4149 |
| English Faculty Library | 2847 | 739 | 1437 | 385 |
| Casmir Lewy Lib (Phil) | 2021 | 241 | 882 | 613 |
| Marshall Econ Library | 1588 | 224 | 737 | 185 |
| Squire Law Library | 1415 | 155 | 262 | 59 |
| Chemistry Library | 1414 | 537 | 291 | 335 |
| Engineering Library | 1252 | 405 | 337 | 196 |
| Moore Library | 1174 | 314 | 401 | 670 |
| SPS Library | 1017 | 557 | 263 | 84 |
| Medical Library | 1007 | 189 | 641 | 55 |
| Music Library/Collection | 990 | 128 | 362 | 1 |
| Divinity Library | 982 | 139 | 255 | 65 |
| Seeley History Library | 947 | 390 | 679 | 100 |
| MML Library | 791 | 195 | 639 | 151 |
| Whipple Library | 514 | 225 | 1348 | 83 |
| Classics Library | 419 | 149 | 585 | 4 |
| Haddon Anthro/Arch Lib | 413 | 22 | 508 | 0 |
| CUBG Cory Library | 262 | 136 | 281 | 83 |
| Rayleigh Physics Library | 175 | 276 | 155 | 60 |
| Art/Archictecture Library | 116 | 125 | 176 | 0 |

**Figure 4.1: Comparison of Twitter activity as of 8 June 2017**

### 4.3.3 Insiderness

The research for this study was conducted within a social group of which I am a member, making the research thus "insider research" (Mercer, 2007). I am, moreover, what Taylor (2011) characterises an "intimate insider" (p. 5), well known to and on friendly terms with my participants. In planning my study, I anticipated that being my participants' colleague would lead to candid and amicable discussions, thus allowing me to leverage our familiarity to gain rich and informative data for analysis. However, my insider status was not uniform or stable. For example, half of my participants were junior colleagues, and all were from faculty libraries (unlike my own college library, which is not part of the same administrative structure). I therefore was both insider and outsider. This is a key point that Mercer (2007) argues, namely that insider/outsider is a false dichotomy, with researchers constantly moving along many axes of positionality. The benefits and drawbacks of insiderness thus varied between participants. Being an intimate insider, for example, granted me knowledge of the Cambridge political context, which meant tacit understanding of sensitive issues.

However, rapport did not develop consistently or smoothly with participants due to issues of seniority and other work-place politics. In Chapter 7, I discuss the implications of these power dynamics in terms of my interpretations and research outcomes.

## 4.4 Data generation

As discussed in Section 4.2, common data-generation methods for conducting infrastructural inversions, rooted in ethnographic methodologies, are participant observation, interviews and document analysis. I therefore selected methods aligned with approaches for studying KIs and helpful for answering my research questions. I thus chose to do two rounds of semi-structured interviews, solicited diaries of Twitter activity, analysis of Twitter Analytics reports and a focus group. Table 4.1 outlines my original set of methods and purposes.

| Method | Date | Purpose |
|---|---|---|
| Interview 1 | Aug-2017 | To explore basic information about participants' Twitter practices. |
| Twitter Diaries | Sep-Dec-2017 | To document three months of participants' Twitter activities. |
| Twitter Analytics | Sep-Dec-2017 | To have a complete set of participants' tweets over a three-month period. |
| Interview 2 | Jan-2018 | To explore librarians' Twitter practices using extracts from the diaries and analytics data. |
| Focus Group | Feb-2018 | To probe initial research outcomes more deeply. |

**Table 4.1: Data-generation methods**

Additionally, as will be discussed in Section 4.4.6 below, in July 2019 I asked my participants a further member-checking question that resulted in their choosing tweets to illustrate my themes. I did not include this method in the description of my research design above, however, as the question was an addendum and, thus, did not influence the selection and logic of my original data-generation methods.

My hope in developing my initial research design was that my methods would work in concert – for example, with Interview 2 building on data generated from Interview 1, the Twitter diaries and Twitter Analytics reports – lending rigour and facilitating data-quality checks (Morse, 2018). Figure 4.2 shows the relationship between my data-generation methods.
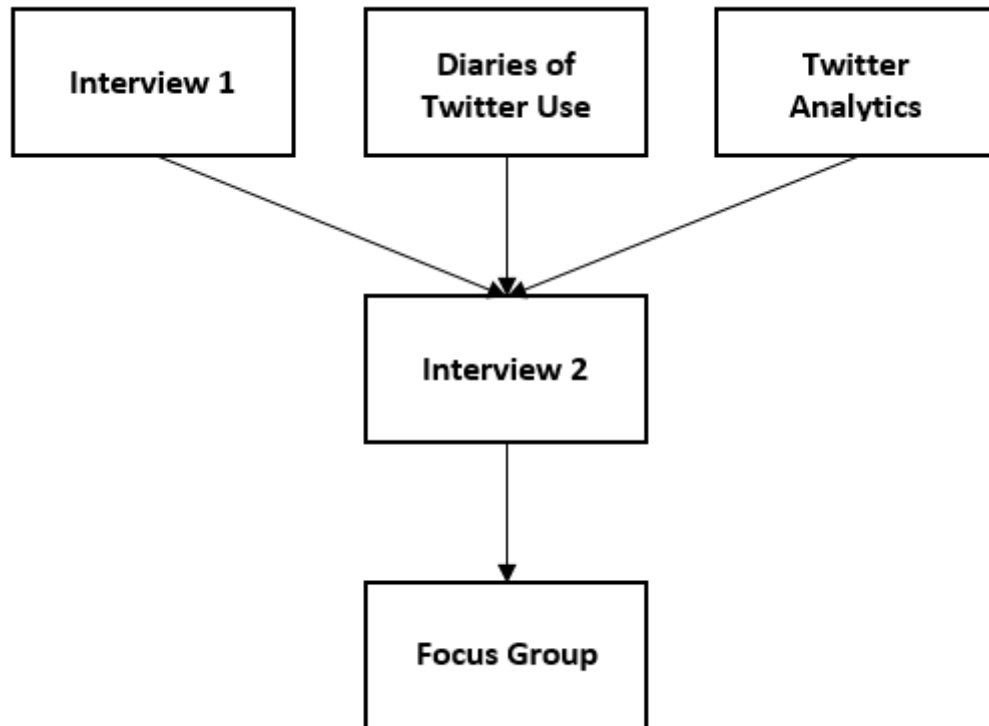


**Figure 4.2: Relationship of data-generation methods**

As Figure 4.2 demonstrates, I conceptualised a linear relationship between my methods, i.e., I combined knowledge gained from Interview 1, the Twitter diaries and Twitter Analytics to structure Interview 2 which, in turn, influenced the subsequent focus group. Figure 4.3 summarises how I believed one method would lead to the next, complementing each other based on the data they foregrounded or deferred in relation to the aims of my thesis.

**Interview 1**

**Foregrounded:** Understanding participants' perceptions of the role and context of their Twitter practices

**Deferred:** Gaining a picture of participants' day-to-day Twitter practices

**Diaries**

**Foregrounded:** Gaining a picture of participants' day-to-day Twitter practices

**Deferred:** Understanding the reach of librarians' tweeting

**Twitter Analytics**

**Foregrounded:** Understanding the reach of librarians' tweeting

**Deferred:** Understanding participants' perceptions about maintaining their Twitter feeds

**Interview 2**

**Foregrounded:** Understanding participants' perceptions about maintaining their Twitter feeds

**Deferred:** Verifying with participants' the accuracy of preliminary conclusions

**Focus Group**

**Foregrounded:** Verifying with participants' the accuracy of preliminary conclusions

**Figure 4.3: How the data-generation methods complemented each other**

At the outset of my study, I believed these methods would help build a multi-faceted picture of librarians' Twitter practices (Tracy, 2010, p. 843), thus supporting my goal to conduct an infrastructural inversion. It is also important to mention that before Interview 2, and again before the focus group, I conducted informal rounds of data analysis consisting of reading through my memos, interview transcripts and the solicited diaries and noting themes to pursue further. I further detail the timeline of my data analysis in Section 4.5.

In the sections below, I discuss each data-generation method, highlighting my expectations and how the methods unfolded in practice.

### 4.4.1 Interview 1

The purpose of Interview 1 was to explore my participants' perceptions of the role and rationale of their Twitter practices, thereby gaining insight into the historical and professional/ethical contexts of their social media work. Interviews are a qualitative method concerned with how people construct and negotiate social worlds (Mason, 2002). For this reason, I felt interviews were appropriate for eliciting the norms and values embedded librarians' practices.

When developing topics for Interview 1, a valuable exercise was to categorise questions according Cousin's (2009, pp. 84-90) typology of question types (e.g., Hypothetical Questions or Exploring Positionality) to ensure a variety of suitable prompts. Mindful, however, of Cousin's warning about posing leading questions (p. 81), I also tried to word my interview questions generally and obliquely, such as "Do you feel your tweeting was successful this past term? What do you wish you were able to do more of?"

I conducted Interview 1 in August 2017. Key to the interview was an artefact-mediated discussion involving Twitter feeds from participants' libraries, which stimulated conversations about contexts and values shaping librarians' Twitter work (Bahn & Barratt-Pugh, 2011). This took the form of scrolling through recent tweets and discussing the logic and motivation for the postings. As an example of what this Twitter feed looked like, Figure 4.4 shows a few tweets from the Lancaster University library from autumn 2018.

**Figure 4.4: Example of an academic library's Twitter feed**

Insights gained from this artefact-mediated discussion informed questions for Interview 2.

Interview 1 took place at times convenient for my participants in quiet library or faculty rooms, though one participant preferred to meet at my place of work. The interviews were approximately one hour each. On a reflexive note, data generated from the interviews was rooted deeply in the dialogue between myself and my participants. As a colleague in a senior position in a tightly knit community of library professionals, our conversations were affected by our relationships and power dynamics (Brinkmann, 2018). One junior colleague, for example, prepared answers ahead of time, so anxious was he to give me 'correct' responses, while another spoke so softly and tentatively that I was concerned that I had inadvertently

upset him. Figure 4.5 shows an excerpt of my field notes written immediately after the interviews.

> **Interview1-4:** The interview went really well. It was with the librarian for one of our area studies institutes, and she takes her Twitter feed very seriously, with scholarly and activist tweets on a regular basis. At first, the interview was a bit tentative. I think she was nervous, and the door to the room was slightly ajar, so she was likely aware that people in the corridor could hear her. But after a while she opened up and seemed very pleased someone was asking her about her professional philosophy of tweeting. The interview went so smoothly, I almost didn't need to consult my list of questions - she just naturally answered many of my questions. I just kept thinking that what librarians are doing with their twitter feeds is really profound and can't believe the higher ed literature hasn't picked up on this.
>
> **Interview1-5:** Participant was young, perhaps 24 or 25. He was extremely nervous and unsure of himself. I was annoyed really that his supervisor volunteered him for the interview, but as the participant *is* the main contributor to his library's Twitter feed, he was probably the best informed about it, but he was so nervous and soft spoken that the recording barely picked him up. His nervousness made me feel a little unsettled - I worried I was intimidating his (being his mom's age and a brusque American), even though I tried to be friendly and encouraging. He also had the least experience as a librarian, so didn't have the big-picture perspective that I was hoping for. I'm hoping that when I comb through the interview, I'll find some gems, but I'm feeling doubtful.

**Figure 4.5: Excerpt of interview field notes**

As Figure 4.5 shows, the interviews were uneven and influenced by our professional relationships. I discuss the ethics of insiderness in Section 4.6.2.2, but it is important to underscore how the entire process of interviewing, from generating questions to transcribing/analysing transcripts, was a project of knowledge creation, not just of data collection (Brinkmann & Kvale, 2015). I explore the implications of this dynamic further in Chapter 7.

Ultimately, data generated through Interview 1 were rich with participants' reflections about the role and rationale of their Twitter work and resulted in six interview transcripts that I formally analysed. Figure 4.6 shows an excerpt of one of the transcripts (participant number redacted to protect anonymity).

```
154   Interviewer
155   Yes, and so why is that particularly problematic?

156   Int1
157   I think that is just because there are so many aggressive individuals within that format, they are all pushy,
158   they all have political tenant that they are coming from, so they are all trying to make change happen and
159   sometimes they have to be a little bit more forceful than the libraries would like to project. We would like
160   to be part of that communication but we do not necessarily need to project it as our own opinions.

161   Interviewer
162   So, why do think the library is on Twitter? What are you guys doing on Twitter, why are you there?

163   Int1
164   So, basically, we are trying to increase footfall within the library; we are trying to build networks and
165   connections with other likeminded institutions and individuals so that, any ideas that they have, we can
166   say, that is a great idea, let us implement it in our own library, that kind of thing. It certainly helped oil the
167   gears of communication as well, so if we go visit a conference, there are always people there that... we
168   will mention the twitter feed and it is an opening point; you can talk about it.
```

**Figure 4.6: Excerpt of an interview transcript**

## 4.4.2 Solicited diaries

After the first interview, I asked participants to keep a diary of their Twitter activity for a three-month period, 15 September to 14 December 2017, which corresponded to the university's autumn term and is an active period for libraries on Twitter as they reach out to new students and researchers. Participants kept this diary as a private document and, corresponding to the research priorities for this instrument set out in Table 4.1, provided a screenshot and answered question prompts about the process of choosing content and the effects of their tweets. Each diary had designated space to record reflections on the process of keeping the diary. Figure 4.7 shows an extract from a Twitter diary for 11 September 2017:

| | | | | | |
|---|---|---|---|---|---|
| **Reflections on keeping this diary:**<br>• Encouraged me to focus harder on importance of representational responsibility and local policy in general.<br>• Helped me re-engage with the concept of impact factor / "tweet reach". | | | | | |
| **Date (MM-DD)** | **Screenshot** | **How did you choose the tweet's content?** | **\* What concerns or thoughts do you have about the tweet?** | **Who do you envision the post reaching?** | **What effects do you hope the tweet has?** |
| 11th Sept |  Moore Library<br>@MooreLib<br>In case you missed all the great #STEM stuff happening at #BSF17, see the hashtag and head on over to the @BritSciAssoc blog for a catch-up. | Spotted it on my main feed. I follow @BritSciAssoc. Created original content via a QR (Quoted Retweet). | Lack of visual impact - original image dropped due to amount of textual content in QR (often it retains it! - it's the frustrating hit or miss nature of the format) - it was important though to get link and hashtags in which original tweet didn't have. | 4 of our perceived network bases: local site, academic and STEM communities. | To reignite interest in the field and generate possible footfall in the library. |
| 11th Sept |  Moore Library<br>@MooreLib<br>Welcome to #PeerReview week! 📖 Help maintain scientific quality by following #peerrevwk17 & see the schedule here: peerreviewweek.org | Perfect timing to promote the week's event. Spotted it on my home feed. Created original content via a QR to get all relevant links and hashtags in. | It's rather limited in its reach and irrelevant to some but it already seems to be generating interest. | 3 of our perceived network bases: local site, academic and university. | To inform and assist our users who are involved in peer review. |

**Figure 4.7: Extract from a Twitter diary, 11 September 2017**

Not only did the diaries detail librarians' Twitter activities, they were a substitute for participant observation, as my physical presence in participants' libraries would have been disruptive. In this way, the diaries created a degree of "co-presence" often found in ethnographic studies of digital practices (Beaulieu, 2010). The number of entries in the diaries ranged from 119 to 207, and, overall, I was pleased by my participants' thoughtful comments. Interestingly, participants tended to populate either the 'How did you choose the tweet's content?' column *or* the 'What effects do you hope the tweet has?' column, but not both — which shows how interrelated the two notions are.

On reflection, however, I asked my participants to keep their diaries for too long. Advice for using solicited diaries as a data-generation method suggests that a few weeks is optimal (Meth, 2003). By December, my participants were fatigued and apologetic about not faithfully recording every tweet. However, I felt that missing entries were unproblematic, as each participant had started their diaries strongly and, by the end, were largely repeating descriptions. Despite the tiring process, most participants reflected that keeping the diaries was useful, helping clarify the purpose of their tweeting. Such self-knowledge is often one of the beneficial consequences of keeping solicited diaries (Kenten, 2010).

Having diary records of three months of Twitter activity was valuable data, exhibiting a range of content such as library resources, faculty accomplishments and educational news items. The diaries informed the nature of our second interview and helped illustrate my research outcomes, presented in Chapter 5. Ahead of Interview 2, I combed through participants' diaries, finding examples of tensions about decision-making or possible repercussions with audiences. Perhaps because the diaries were written and, therefore, felt permanent to participants, the tone of the entries was generally dispassionate. As I suspected, however, when we discussed specific entries in person, participants were more forthcoming about the complex nature of their decision-making processes.

### 4.4.3 Twitter Analytics

Twitter Analytics is a native Twitter tool that measures engagement of tweets (e.g., views, likes, retweets) and followers' demographics. Designed to assist marketers, Twitter Analytics provides statistics on the public reach of tweets (King, 2015). Bruns and Stieglitz (2014, p. 70) caution, however, that looking solely at Twitter Analytics' numbers obscures important social patterns and meanings. Indeed, using Twitter Analytics alone to measure reach and influence is contrary to my conceptualisation of KIs as relational and political. I therefore planned to use the information from Twitter Analytics mainly as a conversation prompt during Interview 2, allowing participants to reflect on the rationale and reach of their Twitter practices.

To gain a sense of the nature of influential tweets, I asked my participants to run a Twitter Analytics report for the three-month period they kept their diaries and to send me the corresponding spreadsheet. Figure 4.8 is an extract of a Twitter Analytics report sorted by engagements (Column F).

| | A | B | C | D | E | F | G | H | I | J | K | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Tweet id | Tweet permalink | Tweet text | time | impressions | engagements | engagement ra | retweets | replies | likes | user profile clicks | u |
| 2 | 9.10E+17 | https://twitter.com/ | Sooo.... Have | 2017-09-1 | 429 | 49 | 0.114219114 | 0 | 0 | 3 | 4 | |
| 3 | 9.40E+17 | https://twitter.com/ | Interview | 2017-12-1 | 1031 | 25 | 0.024248303 | 3 | 0 | 5 | 8 | |
| 4 | 9.33E+17 | https://twitter.com/ | LUCAS | 2017-11-2 | 3289 | 23 | 0.006993007 | 7 | 0 | 4 | 2 | |
| 5 | 9.14E+17 | https://twitter.com/ | Just set up a | 2017-09-3 | 659 | 23 | 0.034901366 | 2 | 0 | 5 | 6 | |
| 6 | 9.35E+17 | https://twitter.com/ | Camfed | 2017-11-2 | 2945 | 20 | 0.006791171 | 7 | 0 | 5 | 0 | |

**Figure 4.8: Extract of Twitter Analytics report**

The number of lines per report ranged from 58 to 162, with an average of 102 entries per report. This reflected differences in how frequently participants tweeted that autumn. Having the spreadsheets was useful for determining popular tweets in terms of engagement and an invaluable record of every tweet produced that term (the solicited diaries, discussed in the preceding section, representing only those tweets that participants chose or were able to record).

Figure 4.9 shows an extract of the resulting visual aid I created for Interview 2 based on each library's top-five tweets for autumn 2017. I created this aid for each library, based only on their library's tweets, and used it as a discussion prompt. Most participants were delighted with their aid and asked to keep it.
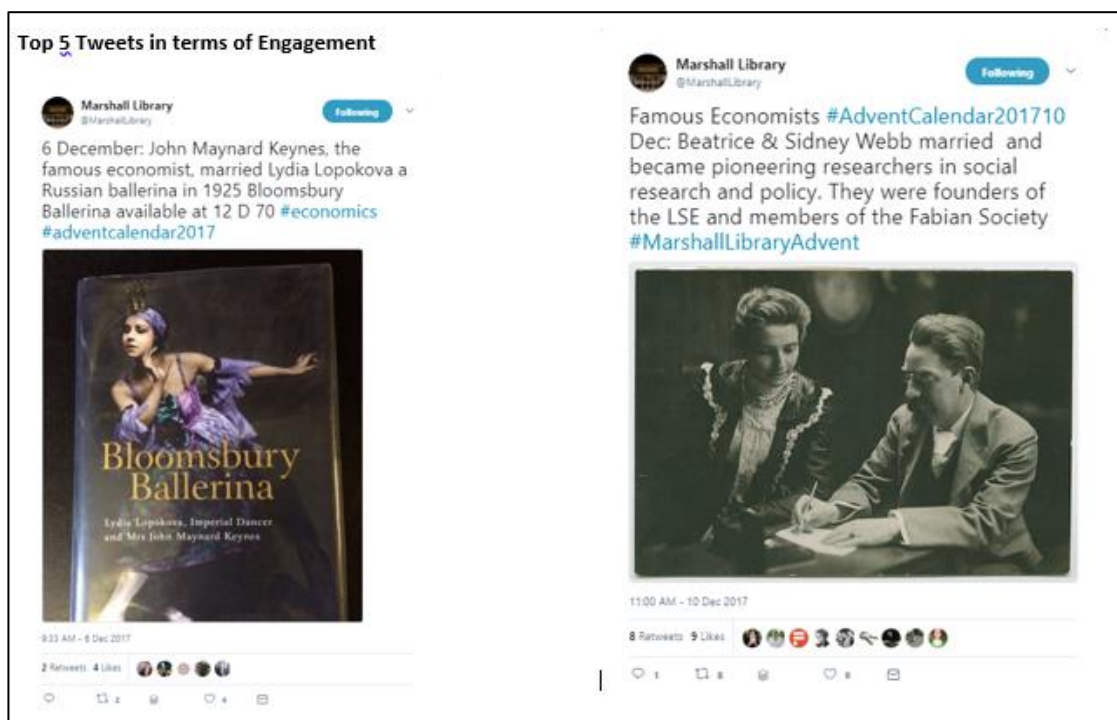


**Figure 4.9: Extract of interview guide based on Twitter Analytics report**

## 4.4.4 Interview 2

Interview 2, conducted in January 2018, further discussed the politics of creating and maintaining Twitter feeds. Questions for the second interview stemmed from insights gained in Interview 1 and were further informed by my analysis of participants' diaries and Twitter Analytics reports. Like Interview 1, Interview 2 was semi-structured and based on Cousin's

(2009) typology of interview questions. Each interview lasted about an hour. Interview 2 also entailed similar power dynamics and reflected the co-constructed nature of interviews generally, the implications of which I explore in Section 4.6.2.2 below and in Chapter 7.

Like Interview 1, at the heart of Interview 2 was an artefact-mediated discussion (Bahn & Barratt-Pugh, 2011) involving the library's top-five tweets for autumn 2017 as based on their Twitter Analytics reports. However, I felt that this part of the interview had mixed results. On the one hand, the guide prompted thoughtful reflection about characteristics of popular tweets — e.g., humour, images — and, interestingly, consternation on the part of participants that more intellectual tweets did not make the top five. On the other hand, the guide was unhelpful for discussing the principal audience for popular tweets, as pictures of individuals who engaged with the tweets were represented by thumbnail images too small to discern.

The most positive outcome of Interview 2, however, was participants' reflections on why they tweet and discrepancies between their intentions and desired levels of audience engagement, a persistent motif. For this reason, I was pleased with the second interviews and considered them successful. Like Interview 1, Interview 2 resulted in six transcripts to analyse.

### 4.4.5 Focus group

As a final data-generation method, I met with participants as a group in February 2018. As Shenton (2004, p. 68) discusses, it is important to verify research outcomes to establish credibility. A popular strategy for this is 'member checking' where participants critique the accuracy of emerging themes, thereby deepening overall analysis (Creswell & Miller, 2000, p. 127). I chose a focus group to accomplish this as I sensed that my participants, well acquainted from previous work within the institution, would enjoy the opportunity to talk together. Focus groups are small-group discussions designed to generate information efficiently through collective examination of a topic (Short, 2006, p. 105). Jowett and O'Toole (2006) stress that such intimacy is often uncomfortable for participants, but I felt that my librarians' familiarity with the topic and each other would engender synergistic interactions (Short, 2006, pp. 107-108) – which turned out to be true.

In terms of conveying my preliminary research outcomes, I did not make a formal presentation at the focus group, but instead wove the outcomes into questions such as:

- *During our interviews last autumn, a common theme was that tweeting was important but ancillary to other responsibilities. Could you comment on that further?*

- *During our interviews last autumn, there was heavy emphasis on the values of librarianship. Could you discuss further how those influence your tweeting?*

I therefore designed my focus group questions to probe research outcomes and encourage an interplay of ideas. The discussion itself lasted about 1.5 hours and resulted in a transcript that I added to the data generated from the interviews and diaries.

The outcome of the focus group was not as successful as I had hoped, however. The date of the discussion was the first day of a UK-faculty strike protesting changes to pensions at multiple HE institutions (Topping, 2018), and one of my participants opted to stand with the strikers (despite Cambridge librarians not officially taking part in the strike). Another participant was absent due to illness and a third attended despite being ill (the absent participant kindly answered questions by email afterwards). The resulting conversation was interesting but suffered from absences and low energy. I was, however, able to verify initial impressions and glean some new data, putting me on a steady footing, I felt, for upcoming data analysis.

### 4.4.6 Additional question

Finally – as mentioned briefly at the start of Section 4.4 – in July 2019, after generating my data and before writing my research outcomes, I sent a summary of my theoretical framework to my participants as a member-checking exercise. This unplanned solicitation was prompted by realising that I had not yet verified if the themes of my theoretical framework resonated with my participants. In that message, I briefly explained my categories of Invisibility, Roots, Culturality and Scale and asked my participants, if they wished, to choose two tweets from their Twitter diaries to illustrate each category. Four of the six participants complied (resulting in 32 tweets), and in Chapter 5, I present their tweets, along with relevant diary excerpts, to illustrate the themes of my research outcomes.

## 4.5 Data analysis

### 4.5.1 Informal data analysis

My methods produced a plethora of data: 12 interview transcripts, six solicited diaries, six spreadsheets of Twitter Analytics, a focus-group transcript and 32 highlighted tweets. The interviews and focus group were audio recorded and professionally transcribed. However, aware of the benefits of transcribing interviews myself (Bryman, 2012, p. 482), I proofread each transcript carefully while listening to the recordings to correct mistakes and detect nuances in participants' expressions. While checking the transcripts, I also made notes on emerging themes, which thus constituted my first level of analysis. Figure 4.10 presents an excerpt from these notes (participant numbers redacted to protect anonymity).

- What I really want to get at is **why Tweet?** Why do we do it? There are a lot of compelling reasons not to. What is special about the content, relationships, features (e.g., speed, community) of Twitter that you're not getting elsewhere? Even though it's missing its mark, why continue doing it?

- Twitter as an **extension of the personality of the library**, an extension of the people. Helps see the library as people, not as a monolithic service.

- **Content:** It's all about posting things that are **relevant** to the people in the feed. But **humour** is so very important, because it shows the personality of the library. Still, 'being an academic library,' is always at the forefront of content decisions.

- Libraries are often the one in the faculty who's known as **being experts at social media** (the gurus, ▓▓)

- Twitter has **changed librarianship** by making librarians more **responsive and tech-savvy** ▓▓). THIS IS DEFINITELY SOMETHING TO PURSUE IN LATER INTERVIEWS! It has also very much made them aware of the 'outside world' and all the things going on out there. This can be part of the **social effects** of tweeting on librarians' professional practice. -- also, seeing what other libraries tweet about definitely affects libraries' tweeting and what sorts of things *they* do in their library.

- Not liking accounts when they're 'just broadcasting' - "It's social, whereas they're just broadcasting' ▓▓.

- Twitter makes libraries **part of larger campus conversations**. (for example ▓ discussing helping Tim Gowers with the Twitter feed for Tim's journal...though interesting that Tweeting is seen as a more secretarial task!)

- Tweeting is part of libraries **much larger efforts to be forward facing.** Libraries are doing many more promotional events, and Twitter seems to be a part of that.

**Figure 4.10: Excerpt of notes taken while reading interview transcripts**

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Before commencing formal data analysis in February 2019, and while still generating data in 2017-18, I also conducted two rounds of informal analysis. My three stages of data analysis are listed in Table 4.2.

| Method | Date |
|---|---|
| Interview 1 | Aug-2017 |
| Solicited Diaries | Sep-Dec-2017 |
| Twitter Analytics | Dec-2017 |
| 1. **Informal analysis of Interview 1, diaries and Twitter Analytics reports to prepare for Interview 2** | |
| Interview 2 | Jan-2018 |
| 2. **Informal analysis of Interview 2 to prepare for focus group** | |
| Focus Group | Feb-2018 |
| 3. **Formal analysis of all data (Feb-2019)** | |
| Additional Question | Jul-2019 |

**Table 4.2: Data analysis timeline**

The stages of informal data analysis were opportunities to gather my thoughts and write notes about interpretations of the data. This process of memo writing continued through the data-generation phase and beyond, so that when I started formal data analysis in February 2019, I had many pages' worth. These notes and memos were helpful starting points for approaching formal data analysis as described in the next section.

## 4.5.2 Formal data analysis

I began formal data analysis in February 2019. Because over a year had passed since I began generating data, I started this phase by immersing myself in my memos and the interview recordings, transcripts, diaries and interview aids. This was a useful review of the data-generation experience and the wealth of information it generated.

I structured my formal analysis thematically – a popular approach in qualitative research (Braun & Clarke, 2006) – because it prioritises identifying "common threads" in a set of data and "submitting them to descriptive treatment" (Vaismoradi et al., 2013, p. 400). In terms of procedure, I discerned themes that informed the aim of my study to explore academic librarians' practices of knowledge production. As described below, this process had two stages: inductive and deductive. Not traditionally used in the same study, combining inductive and deductive approaches was a pragmatic way of organising and managing my data (cf. Fereday & Muir-Cochrane, 2006).

### 4.5.2.1 Inductive thematic analysis

Inductive thematic analysis is "a process of coding the data without trying to fit it into a pre-existing coding frame" (Braun & Clarke, 2006, p. 83). Despite the theoretical nature of my research questions, I first wanted to make sense of my data 'from the bottom up' using concerns generated from the data themselves. I felt that this first pass over the data would help organise my thinking for the theoretically informed analysis later (which proved correct).

I initially made a list of possible themes extending from my data, then grouped them under the wider categories of Context, Rationale, Process, Ideal v. Real, Effects and Content. An excerpt of my mind-map for this initial sorting is Figure 4.11.

**Figure 4.11: Excerpt of mind map for inductive thematic analysis**

I next refined and defined these codes, an excerpt of which is Figure 4.12.

**Codes and Themes for Librarians' Twitter Practices**

**Context**

- LIBRARIANSHIP: context of changing roles of librarianship

- CRITICALITY: criticality / scepticism of Twitter and social media

- INHERITING: inheriting a Twitter feed; installed base

- INJUSTICES: perceived injustices

- POSITIONALITY: positioning of library in campus context

- LIBCONTEXT: specific local context to the library

- STEREOTYPES: stereotypes of librarians and combatting them

- UNICONTEXT: wider university context and changes

- WORLDCONTEXT: wider world affairs

**Figure 4.12: Excerpt of code list for inductive analysis**

Finally, I coded the interview transcripts, diaries of Twitter usage and the focus-group transcript using qualitative data analysis software, namely Atlas.ti™, a sample of which is Figure 4.13 (participant number redacted to protect anonymity).
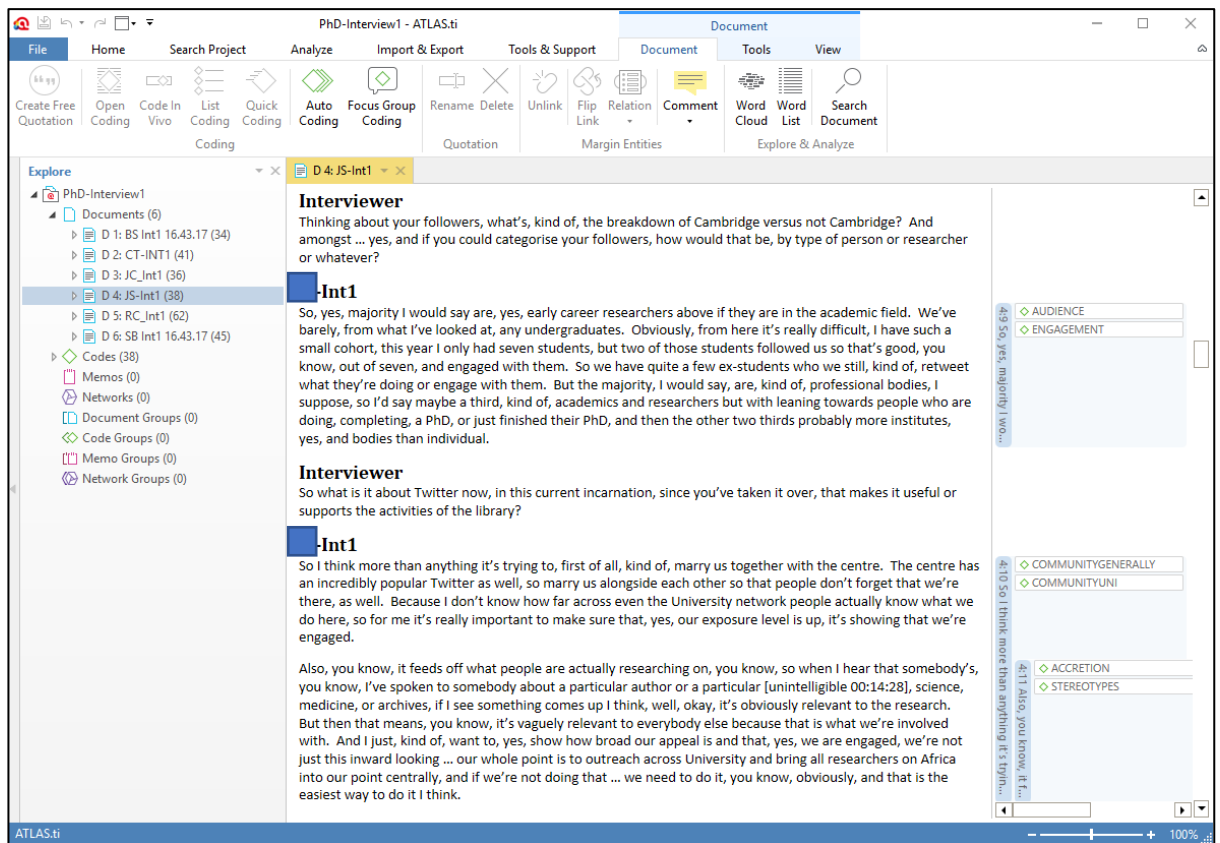
**Figure 4.13: Excerpt of an interview transcript coded in Atlas.ti™ using inductive categories**

This first round of inductive data analysis resulted in a helpful overview of my data and guideposts by which to manage my second stage of coding, namely deductive thematic analysis.

*4.5.2.2 Deductive thematic analysis*

Deductive thematic analysis is "driven by the researcher's theoretical or analytic interest" (Braun & Clarke, 2006, p. 84). As my research questions were derived from my theoretical framework, I felt I needed to code my empirical data accordingly. However, rather than start afresh with the raw transcripts, I used the codes constructed through inductive analysis to orient myself. As a first step, I mapped my inductive codes to the four categories of my theoretical framework: Invisibility, Roots, Scale and Culturality, an excerpt of which is Figure 4.14.

| Invisibility | Roots |
|---|---|
| <ul><li>CREATIVITY</li><li>DOUBTS</li><li>INJUSTICES</li><li>INVISIBLE</li><li>LIBRARIANSHIP</li><li>MAINTENANCE</li><li>NOTWITTER</li><li>PASSION/TOUGHT</li><li>POSITIONALITY</li><li>STEREOTYPES</li></ul> | <ul><li>AFFORDANCES</li><li>COMPSOCMED</li><li>INHERITING</li><li>LIBCONTEXT</li><li>LIBRARIANSHIP</li><li>NEUTRALITY</li><li>POSITIONALITY</li><li>PROFVALUES</li><li>STRATEGY</li><li>TENSIONS</li><li>UNICONTEXT</li><li>WORLDCONTEXT</li></ul> |
| **Culturality** | **Scale** |
| <ul><li>AUDIENCE</li><li>COMMUNITY [ALL]</li><li>CONVERSATIONS</li><li>EFFECTSLIBS</li><li>EFFECTSLIBNS</li><li>ENGAGEMENT</li><li>LIBRARIANSHIP</li><li>NOTWITTER</li><li>POPULARTWEETS</li><li>SOCIALITY</li><li>TWITTERBENEFITS</li></ul> | <ul><li>ACCRETION</li><li>AFFORDANCES</li><li>COMMUNITY</li><li>CONVERSATIONS</li><li>EFFECTSLIBS</li><li>EFFECTSLIBNS</li><li>ENGAGEMENT</li><li>KNOWLEDGEPROD</li><li>POPULARTWEETS</li></ul> |

**Figure 4.14: Map of inductive codes to deductive theoretical categories**

At this stage, I was concerned that my inductive codes appeared in more than one theoretical category, thus producing a "weak or unconvincing analysis" (Braun & Clarke, 2006, p. 96). However, I also felt that my codes were multi-faceted enough that they could easily fit into multiple categories. I discuss the significance of this overlap further in Chapter 7.

My final stage of analysis was to read thoroughly the Atlas.ti™ reports generated from the inductive analysis, marking them with my deductive theoretical categories and then re-coding the original interview and focus group transcripts, again using Atlas.ti (Figure 4.15). This process resulted in deep understanding of my data and greatly facilitated writing my research outcomes chapter (participant numbers redacted to protect anonymity).
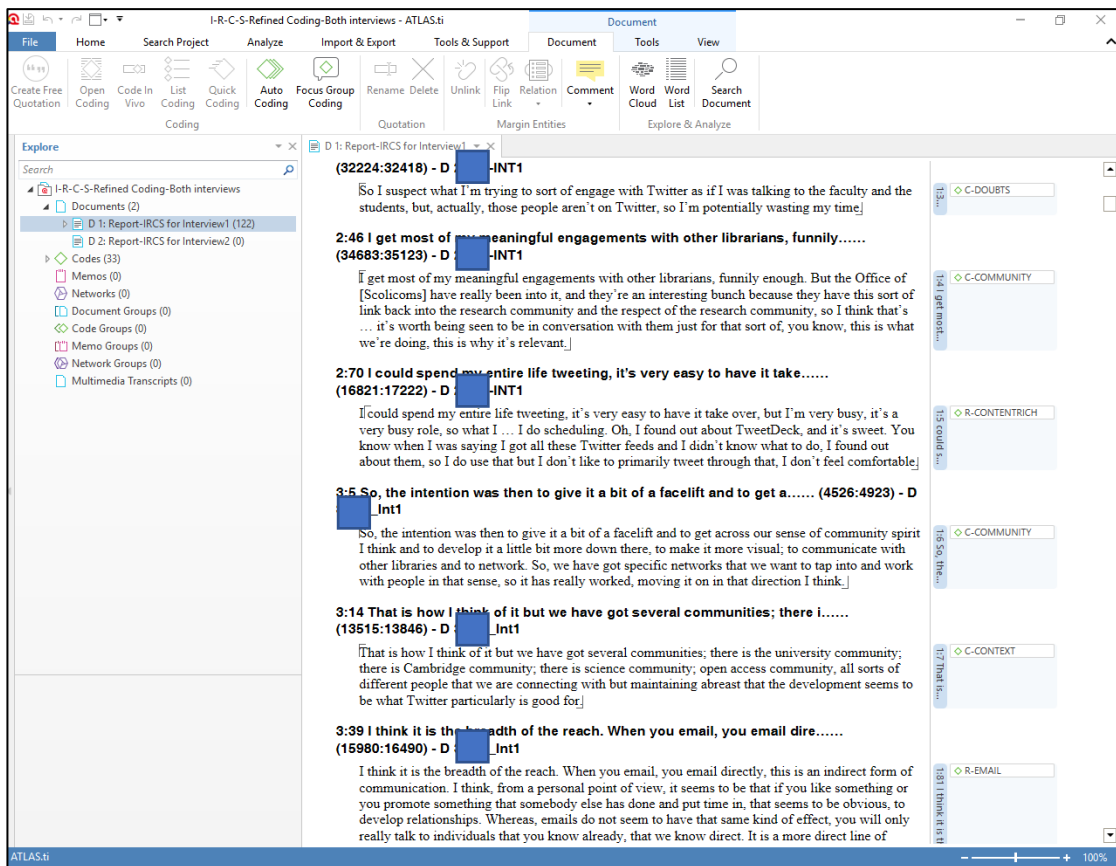
**Figure 4.15: Excerpt of an interview transcript coded in Atlas.ti™ using deductive categories**

## 4.6 Research quality and ethics

### 4.6.1 Research quality

As discussed earlier, my study is grounded in an ethnographic sensibility and driven by concern over the marginalisation of librarians' practices. As such, I subscribe to the position, advocated by Lincoln et al. (2018), that quality and integrity in qualitative research should be assessed in terms of *transferability*, or whether a study expresses "trustworthiness and authenticity, including catalyst for action" (p.110). In other words, have I achieved a result that seems truthful to my participants while encouraging readers to think critically about librarians' role and influence in HE? Using the criteria for "excellent qualitative research" presented by Tracy (2010) that I felt were relevant to my study, I believe my study might be judged constructively on whether I attain trustworthiness and transferability via *rich rigour*, *sincerity* and *credibility*:

- **Rich rigour:** By "rich rigor," Tracy (2010, p. 841) means generating a thorough set of data through appropriate and adequate theoretical frameworks, samples, tools and analysis. As discussed in Chapter 3, I considered a range of frameworks before settling on KIs as best suited to my study. Furthermore, my research outcomes and discussion chapters demonstrate that my data-generation methods and stages of analysis produced a plethora of data with resonant and contrasting themes.

- **Sincerity:** Sincerity, according to Tracy (2010, pp. 841-82), refers to investigators' honesty and self-reflectivity about the influence of their personal biases and the successes and shortcomings of their research processes. Throughout my study, I have been reflective about my concern regarding academic librarians' invisibility and my desire to demonstrate their knowledge contributions. Along the way, I have also shown that my research process was not always smooth or fruitful.

- **Credibility:** By credibility, Tracy (2010, pp. 842-844) means a study's seeming truthfulness, dependability and congruence with reality. She lists strategies for establishing credibility, which relate to creating a multi-faceted picture of complex social relations, including data variety, multivocality and partiality. In my research outcomes and discussion chapters, I therefore strive to explain my participants' situated practices using many concrete examples. My interpretations were gained through a variety of ethnographic methods which encouraged the expression of multiple meanings and verification (or not) of my initial research outcomes.

In Chapter 7, I return to these points and evaluate my research outcomes against these standards.

## 4.6.2 Ethics

Tracy (2010, pp. 846-48) discusses ethics in terms of institutional requirements and as an approach to conducting research that affirms participants' human dignity. Ethics are an important quality issue to attend to and, accordingly, I devote significant space here to discussing them.

### 4.6.2.1 Institutional requirements

Lancaster University granted ethical approval for my study in July 2017 and no further authorisation was needed from the University of Cambridge. Per the requirements of the approval process, I demonstrated my commitment to ethical standards by creating participant information sheets and consent forms, ensuring anonymity and assuring participants they could voluntarily leave the study. I also recorded the interviews on encrypted devices and stored the anonymised data on secure Cambridge servers. Though my

study was not conducted with high-risk groups, nor was the data considered sensitive according to the criteria of the Research Ethics Committee, I tried to maintain the highest possible ethical principles throughout, not least because my participants were colleagues and friends.

### 4.6.2.2 Ethics of insiderness

The intimacy and shared institutional knowledge of insider research also amplified ethical issues often encountered in qualitative studies. I felt conflicted, for example, over how much to share with participants about the motivation and goals of my study. As colleagues, I felt they deserved honest and intelligent explanations, but was concerned that such information might pressure them to speak to my 'agenda.' Ultimately, knowing that "all research findings are shaped by the circumstances of their production" (Bloor, 1997, p. 39), I decided that I needed to be clear about my desire to raise awareness of librarians' work in HE, as I knew this was a widely shared professional concern. I believe this decision led to richer and more open interviews.

### *4.6.2.3 Ethics of Twitter data*

A final ethical consideration concerned whether it was appropriate to reproduce participants' tweets in my study, or whether I should preserve anonymity. This is a complicated question given the public nature of Twitter (Zimmer & Proferes, 2014). The Association of Internet Researchers argues that social media's complexity means that universal ethical approaches are impractical, while advocating instead for evaluating research contexts situationally (AoIR, 2019). Interestingly, Williams et al. (2017) found that over 80% of participants surveyed in Twitter studies expected to be asked for consent before their tweets were reproduced in scholarly publications (p. 1156). For this reason, I gained my participants' consent to reproduce their tweets in my study.

## 4.7 Conclusion

To conclude, in this chapter I have examined methodological challenges of studying KIs and strategies to draw out and investigate their features, namely infrastructural inversion and multi-sited ethnography. I then discussed how this methodology influenced how I

conceptualised my field of study, selected my participants and chose my data-generation methods. Finally, I concluded with a description of my approach to data analysis, standards of evaluation and ethical considerations. Throughout, I have tried to demonstrate that I am self-reflectively aware of my role as investigator and my influence on my study's research outcomes. In the next chapter, I hope this overall methodological strategy will illuminate a little-studied corner of HE, namely academic librarians' Twitter practices, while discussing how such work has generative effects on knowledge production in the university.

# Chapter 5: Research Outcomes

*A lesson of infrastructure is that it surfaces the social conditions and times in which it is sited; thus, it demonstrates as much about our historical and cultural attentions in a particular moment and place as it does about the thing itself.* (Howe et al., 2016, p. 552)

## 5.1 Introduction

The aim of my thesis is to explore academic librarians' practices of knowledge production in HE, specifically librarians' infrastructuring of knowledge infrastructures (KIs) via Twitter. In this chapter, therefore, I present the research outcomes from my data analysis, as interpreted through the four categories of my theoretical framework – Invisibility, Roots, Scale and Culturality – with an eye to depicting the extent to which librarians' Twitter practices are implicated in knowledge production. This chapter thus presents each category in turn, illustrated with excerpts of data generated for the study along with examples of tweets selected by my participants (discussed in Section 4.4.6). In the process, I aim to present data that answers my research question and sub-questions:

**RQ1**: What are the practices by which academic librarians produce knowledge via Twitter?

- **RQ1.1:** How is invisibility enacted in librarians' Twitter practices?

- **RQ1.2:** How are roots enacted in librarians' Twitter practices?

- **RQ1.3:** How is scale enacted in librarians' Twitter practices?

- **RQ1.4:** How is culturality enacted in librarians' Twitter practices?

This chapter thus aims to illustrate the core argument of my thesis that librarians' Twitter practices are KIs, which Edwards (2010) defines as "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (p. 17). In the process, my overarching concern is to document librarians' activities of infrastructuring, i.e., the "doing and making" (Marttila & Botero, 2017, p. 103) of infrastructure, based on my conviction that understanding  mundane practices of knowledge production reveals significant social circumstances in HE that are normally hidden or obscured (in Chapter 6, I discuss whether my research outcomes substantiate this claim). My

processual approach to infrastructure is embodied in the chapter's themes and sub-themes, as summarised in Table 5.1.

| Theoretical Category of Infrastructure | Themes and Sub-Themes |
|---|---|
| **Invisibility**: How feeling invisible to the wider university community shapes librarians' knowledge production via Twitter. | 1. **Highlighting invisible work**<br>   a. Projecting the message that libraries are more than collections of books<br>   b. Projecting the message that librarians are academic<br>   c. Projecting the message that librarians support researchers' work<br><br>2. **Being visible in online spaces**<br>   a. Hoping that being visible online leads to better library services<br>   b. Hoping that being visible online leads to bigger roles in university life |
| **Roots**: How professional values and future aspirations shape librarians' knowledge production via Twitter. | 3. **Facilitating access to information**<br>   a. Creating a welcoming hub<br>   b. Helping researchers cross disciplinary boundaries<br>   c. Being a trustworthy academic partner<br><br>4. **Creating scholarly content**<br>   a. Producing academic tweets<br>   b. Producing neutral[7] tweets |
| **Scale:** How conceptualisations of Twitter's reach shapes librarians' knowledge production via Twitter. | 5. **Accreting slowly**<br>   a. Finding value in Twitter's fragmented approach<br>   b. Building relations with stakeholders<br><br>6. **Conversing widely**<br>   a. Having meaningful conversations<br>   b. Expanding conversations beyond Twitter |

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[7] A growing movement in the library-practitioner literature asserts that librarians – despite ethical aspirations – are not, and never have been, neutral (Macdonald & Birdi, 2019). Despite the fraught and contested nature of the term in librarianship, however, I have chosen not to enclose 'neutral' in scare quotes throughout my text because scare quotes are visually and semantically distracting and because my participants did not problematise the term in their interviews.

| | |
|---|---|
| **Culturality:** How librarians use Twitter to create scholarly communities, and how such efforts shape librarians' professional identities. | 7. **Crafting community**<br>   a. Leveraging social networks<br>   b. Connecting researchers<br>   c. Changing librarians' relations with researchers<br>8. **Cultivating identity**<br>   a. Creating new vocational competencies<br>   b. Rethinking professional membership<br>   c. Strengthening professional community |

**Table 5.1: Summary of themes for how academic librarians produce knowledge via Twitter**

## 5.2 Invisibility

In this section[8], I focus on how Invisibility is enacted in the knowledge production of my participants' Twitter practices. As explained in Section 3.4.1, Invisibility as it relates to infrastructure can have multiple meanings, including invisible work performed by those who create and maintain KIs and activities related to making KIs visible to outsiders. For the purposes of my study, both meanings of Invisibility are important for understanding how Invisibility is enacted in my participants' knowledge production via Twitter.

As outlined in Table 5.1, my analysis identified two interconnected themes related to Invisibility that are implicated in my participants' knowledge production via Twitter:

- **Theme 1:** Highlighting invisible work

- **Theme 2:** Being visible in online spaces

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[8] NB participant numbers in this chapter do not correspond to the library numbers in Figure 1.2 (Chapter 1). This is to protect participants' anonymity.

By illustrating these themes with excerpts from the data generated for this study, I will draw attention to the knowledge that librarians produce as they negotiate their positionality within the university and attempt to project an image of relevant library services.

### 5.2.1: Highlighting invisible work

For Theme 1, *highlighting invisible work,* I present an account of how my participants use Twitter to make librarians' work of designing and maintaining library resources visible to outsiders. This theme relates to *both* meanings of invisibility encompassed in my theoretical framework – i.e., librarians' invisible work to support researchers and associated efforts to make that work visible – in that, by highlighting invisible work, my participants engage in activities to make the infrastructural aspects of their work visible to the wider academic community via Twitter. In so doing, my participants consciously try to counter stereotypes of librarianship that they feel foster the invisibility and under-appreciation of librarians' work. P6 summarises the stereotype:

> Well, there's always these perceived attitudes towards librarians, we still get people thinking that we just stamp books and we shush people, which, even faculty members think that. And the perceived attitude that we are traditional. (P6)

The theme of needing to demonstrate that libraries are 'more than books' – and the related urgency of needing to underscore the varied projects and services of modern libraries – was manifest strongly throughout the data. Examples of the theme presented in the data extracts below include librarians' efforts to draw attention to library outreach efforts, student engagement programmes and research support training. I found that my participants' efforts to highlight such invisible work via Twitter projected three main messages.

### *5.2.1.1: Projecting the message that libraries are more than collections of books*

The first message my participants hoped to convey to counter stereotypes via Twitter was that libraries are not merely collections of books but integrated and supportive centres of skills and knowledge:

> There's virtually no tweets about books [in our Twitter stream] and that's for a good reason. It's hoping that it kind of gets the message across that we are a lot more than just a room with some books in it, you know, that we have a lot of skills that we can share and a lot of knowledge that we can help people with in terms of their research and their studies. (P6)

> So, I always kind of wanted to expand what a librarian is and kind of get away from the dusty books on shelves stereotype. I think that libraries that tweet can go a long

way to dispelling that. Just, you know, having a presence on a popular modern technology helps to dispel that stereotype, I think. (P5)

[With our Twitter feed] we want to create that open, welcoming, friendly human space that doesn't just feel like a, you know, imposing brick building with some books in it. (P3)

How these sentiments translate into Tweeting is interesting and widely varied. I show two such examples below, both of which draw attention to the work of libraries largely invisible to outsiders. In Figure 5.1, for example, the librarian presents the beginnings of what will be an exhibit of African photography in her library space:



https://twitter.com/AfrStudiesLib/status/941360537371279360

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Own content | [no answer] | Everyone! | Now I have finally convinced the agent to let me print some large sized prints, and have got some prices from her, I will start promoting our mini-exhibition with a vengeance! |

**Figure 5.1: Twitter diary extract illustrating librarians' efforts to project the message that libraries are more than books[9]**

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[9] AVMG is the Cambridge Anatomy Visual Media Group. https://avmg.pdn.cam.ac.uk/

In a different manner and highlighting academic libraries' pastoral roles and well-being initiatives, in Figure 5.2 the librarian portrays the affable scene created by a Christmas visit from the department cat, Jasper, and his effect on students:



https://twitter.com/MarshallLibrary/status/936607328509493248

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Tweeting as the Jasper visit happens | No concerns | Jasper fans | Hope the Jasper fans see this and it promotes the Library - it's Christmassy for the end of term! |

**Figure 5.2: Twitter diary extract illustrating librarians' efforts to project the message that libraries are more than books**

In both tweets, my participants consciously highlight aspects of their work that go beyond collecting and storing book collections.

The second message my participants hoped to convey to counter stereotypes via Twitter was that librarians are serious and academic members of the university community. P5, for example, expresses frustration that faculty and researchers tend not to value librarians' expertise:

> The perception that we are not knowledgeable in the way that we are. I know that none of us are *experts* in anything, but I think that isn't the point. The point is we can help people find what they need to look for. We don't *need* to be experts in that particular field. We can be experts in navigating information but there is still a perception the library is not the place to go to with complicated research questions. (P5)

> I've done sessions with people who have spoken about things like funder requirements and I've spoken about things like data management plans and the response has been "I had no idea libraries could do that. I literally just came to this drop-in session to renew a book". So, there's still a perception that we are about physical resources and we're just about kind of handing people over information, not about helping people negotiate and navigate information in a way that turns into knowledge ... So, there's a perception that we don't do half the things that we do which always frustrates me, particularly when I'm talking to friends who are not librarians. You get a lot of the "Oh, I'd love to sit around reading books all day." Yeah, so would I! (P5)

In the eyes of my participants, therefore, Twitter is a medium to convince members of the university community that librarians' knowledge is valuable. An example of such efforts is Figure 5.3 in which the librarian recounts a week's worth of teaching classes – thus demonstrating the educational impact of her library – *and* humorously associates this impact with the role of librarians:

To end #librariesweek, our week has been full of referencing teaching, LinkedIn 1-2-1s and a Qualtrics demonstration.

I... am a librarian.

4:51 PM · Oct 13, 2017 · Twitter Web Client

**3** Likes

https://twitter.com/CJBSInfoLib/status/918866831678541824

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Started the week with #librariesweek, so I'm ending it with #librariesweek | Might seem like boasting somehow, but other libraries have created charts and infographics! It's also a good opportunity to showcase what librarians actually do | Other librarians, School accounts and other libraries | Raises awareness of what librarians do |

**Figure 5.3: Twitter diary extract illustrating librarians' efforts to portray themselves as academic**


*5.2.1.3: Projecting the message that librarians support researchers' work*

The third message my participants hoped to convey to counter stereotypes via Twitter was that librarians support researchers' projects through behind-the-scenes work to provide, for example, electronic resources, classes in skills for navigating the research process and beneficial resources such as art exhibitions. The message that librarians are sending in these examples is different from that in Section 5.2.1.2 (*Projecting the message that librarians are academic*) in that they are specifically highlighting the *infrastructural* services libraries offer to assist researchers:

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I think the main thing at the moment is that they've got no grasp of the fact how much time, trouble and money and expense goes into providing the access to the digital resources they absolutely depend on. So the perception is it's arriving on their desktop somehow and they don't really know and, like, see University of Cambridge on it, they don't realise that we've got any input into that, they just tend to think of libraries as rooms full of books. Libraries *are* rooms full of books, but that's the tip of the iceberg, it's like the top of the swan and it does all this paddling underneath that they don't appreciate and they don't understand. (P2)

And it's a forward-looking library, I think. We do a lot of stuff with research support; we do a lot of stuff with e-resources and teaching, training and also the soft skills of kind of getting people to develop resilience and develop decision-making so we do a lot of interesting stuff that goes beyond the sort of traditional librarianship remit. (P5)

Because, again, with this global audience that we have, I want it to be positive, that it's not a scary place, that we are here to help them. Like we do get involved in all sorts of things, we're just not a space for books. There is a community that are doing fantastic exhibitions or outreach and that sort of thing. (P4)

This sense of needing to inform the university community of the strong research-support role of libraries pervaded the data and represents a wider evolution of library services over the past decade. An example of how my participants represent such behind-the-scenes work via social media is Figure 5.4 in which the librarian demonstrates knowledge of online identity-management tools for researchers and the capacity to share that information widely:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Our research support staff making friends over at Maths Faculty - names to faces, etc. | A missed opportunity to copy in local network[10] | ECRs, freshers. | Good turnout encouraging excellent and efficient practice. |

**Figure 5.4: Twitter diary extract illustrating librarians' efforts to portray themselves as supportive of researchers' work**

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[10] By 'local network,' the participant means other research institutes physically located near the Maths Faculty.

### 5.2.2: Being visible in online spaces

Theme 2, *being visible in online spaces,* extends the discussion in the previous section by highlighting the value that librarians place on Twitter's ability to increase libraries' visibility in users' digital spaces, particularly in an era of decreasing visits to libraries' physical spaces. As with Theme 1, this theme embodies both meanings of invisibility in my theoretical framework – librarians' invisible work to support researchers and associated efforts to make that work visible. P3 summarises this sentiment and its implications for knowledge production:

> I think it's important inasmuch as it allows us to be involved, it allows us to get out of the library digitally speaking and not just be talking to ourselves every day, which is brilliant. We get to hear what people are saying and kind of go, "Hey, we can help with that." (P3)

Examples of such hoped-for online visibility presented in the data extracts below include librarians' efforts to connect with off-campus university members, remind users about the provision of electronic research resources, highlight the role libraries play in student inductions and draw attention to libraries' presence in the larger campus landscape. In my analysis, I identified two reasons why librarians feel it is important to have such online visibility.

### *5.2.2.1: Hoping that being visible online leads to better library services*

The first reason my participants feel it is important to be visible in users' online spaces is because they feel it helps the library provide a relevant and responsive service. In other words, in a university climate where librarians feel invisible and underappreciated, contributing meaningful content to Twitter is viewed as a way of reminding students and faculty of the value of library services – and, thus, disseminating library information as widely as possible:

> It [Twitter] is also a way of keeping that connection with our students when they're not necessarily just away from the school during holidays but also when they're away doing their projects, so they may not have access to email or to a phone but we still get like social media connection ... So, when they're away doing their projects, like if they're in Brazil or somewhere, it just maintains that connection if we're not face-to-face. (P6)

> … if we don't do it [be on Twitter] that's not gonna stop researchers tweeting about open access, that's not gonna stop researchers tweeting about awful publishers' decisions, that's not gonna stop researchers tweeting about "Why is IDiscover [the library catalogue] not helping me find the thing that I want, isn't it rubbish?" But if

we're there, we have the opportunity to respond, we have the opportunity to sort of say, "Yeah, that's a fair point about open access. Have you seen the university's open access policy, have you seen our institutional repository?" Or "Yeah, this thing isn't working at the moment; come and talk to us and we'll give you a workaround." (P5)

To illustrate how being visible online via Twitter supports the provision of relevant and responsive library services, in Figure 5.5 the librarian amplifies information already circulating via email about a series of lunch-time sessions on research data management:



https://twitter.com/MarshallLibrary/status/931134681642360832

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Advertising next week's bitesize session on Data Management - using Lego which is part of the session | No concerns | Students - UGs mostly | Hope it reminds some of our UGs - they have all had an email about it too |

**Figure 5.5: Twitter diary extract illustrating librarians' hopes that being visible online leads to better library services**

Similarly, in Figure 5.6 the librarian demonstrates a library-centred take on a popular Christmas carol and, in the process, reminds users of electronic and physical library resources:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| We wrote a Christmas carol! | It was written as a counterpoint to Engineering's very library-focused one, but it turned into something more. Plus it shows that we're user-focused | Hoping to get an answer from Engineering, but they just liked it, also staff and students of CJBS, other University libraries and people | Showing off our writing prowess, while also getting across how we can help during the Christmas holidays |

**Figure 5.6: Twitter diary extract illustrating librarians' hopes that being visible online leads to better library services[11]**

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[11] Not only is this tweet informative, it offers pastoral and affective support for the university community.

Both tweets exemplify creative approaches to disseminating library information broadly.

## 5.2.2.2: Hoping that being visible online leads to bigger roles in university life

The second reason librarians feel it is important to be visible in users' online spaces is because it provides an important means of playing a meaningful role in university life. Reflecting on my question about what would happen if libraries stopped tweeting, my participants felt that the ability of the library to reach users and disseminate information – in essence, to be visible – would diminish:

> I think maybe we would just lose being part of people's online space and I think that would be a sad thing, I think it would not be hugely detrimental to people's use of the library, but it would lose something that's quite valuable in engaging with them there. (P1)

> I'd be sad to see it [Twitter] go. I think we'd lose out on one avenue of connection to the outside world and I think we'd become more inward looking and more siloed as a result because it's a way of making connections to research groups, … to academics, to course coordinators and again, just being a voice in that wider conversation. I think if we didn't have that it would be very, very easy for the library to be overlooked, I think, and not to be seen as a thing that is modern and forward-looking and outfacing. (P5)

To illustrate the connection between being visible online and playing wider roles in university life, in Figure 5.7 the librarian shows images of new students from the first week of term, conveying her interest in the students' work and the intellectual activities of her research centre (and she provides a pointer to another digital space, Instagram):

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Own content | Sometimes I'm nervous of using photos of our students, but they were so happy to be included and have their photos taken for promotion! | All followers! | Give our followers, potential candidates, and the world a better of idea of who comes to Cambridge to study African Studies |

**Figure 5.7: Twitter diary extract illustrating librarians' hopes that being visible online leads to bigger roles in university life**

Likewise, in a tweet that is similar in spirit, the librarian in Figure 5.8 pokes fun at an off-hand remark by a visiting student about the shape of a Cambridge library building, thus digitally highlighting the presence of his library in university life:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Comment mentioning library in a funny light. Love it! Used most spaceship-like photo we have on file to accompany! | A throwaway line but happy with it and its subsequent impact - note to self: community responds well to humour. Copy in locals next time. | Maths community, careers fair attendees, camlibs. | That followers see that we have are self-deprecating and have a sense of humour. |

**Figure 5.8: Twitter diary extract librarians' hopes that being visible online leads to bigger roles in university life**

For my participants, therefore, being on Twitter is not optional. They feel that a weak or non-existent digital presence has the potential to perpetuate stereotypes of their work they feel render their work invisible in HE. My participants feel that being visible online is an important means of counteracting such typecasting. In the process, my participants' Twitter practices help disseminate librarians' expertise more broadly.

### 5.2.3: Summary of themes related to Invisibility

In summary, in this section I discussed how Invisibility in enacted in my participants' Twitter practices. In the process, I considered two interconnected themes: *highlighting invisible work* and *being visible in online spaces*. I found that my participants' emphasis on being visible in users' digital spaces to counter stereotypes and increase appreciation of librarians' work shapes their knowledge production. This was a strong theme running through much of my empirical data. Significantly, however, though most of my participants feel that just being online is important, they tend to think that community and content are truly at the heart of their online efforts. Therefore, in the next section, I examine the professional values that underlie these aspects of my participants' social media work.

## 5.3 Roots

In this section, I focus on how Roots are enacted in the knowledge production of my participants' Twitter practices. As explained in Section 3.4.2, Roots as it relates to infrastructure concerns the standards, ethics and hopes woven into the foundation of a KI that shape possibilities for its growth. For the purposes of my study, therefore, the importance of exploring Roots is to foreground the professional values inherent to librarians' work, particularly attachments to traditional notions of librarianship (as interpreted in the modern context) and aspirations for the future, and how such value tensions affect subsequent knowledge production.

As outlined in Table 5.1, my analysis identified two interconnected themes related to Roots that are implicated in my participants' knowledge production via Twitter:

- **Theme 3:** Facilitating access to information

- **Theme 4:** Creating scholarly content

By illustrating these themes with excerpts from the data generated for this study, I will demonstrate the range of values in my participants' work and draw attention to the knowledge produced through my participants' interpretation of professional values in a rapidly changing HE context.

**5.3.1: Facilitating access to information**

For Theme 3, *facilitating access to information,* I present an account of how my participants attempt to facilitate researchers' access to information via Twitter. Reflecting on why librarians tweet, my participants were adamant that their social media practices are tightly related to the ideal of libraries as accessible hubs of information, a professional value rooted in the traditional ethic of librarianship to support intellectual freedom (Gorman, 2015; Koehler, 2015). Theme 3 thus relates to the meaning of roots encompassed in my theoretical framework in terms of *standards* of librarianship (i.e., the profession's core values), *ethics* of librarianship (i.e., the care and responsibility librarians feel towards their users) and librarians' *hopes* for a future of open and unfettered access to useful information. Examples of the theme presented in the data extracts below include librarians' efforts to create a welcoming presence for the library and helping researchers navigate complicated issues of scholarly communication. My participants conceptualised this core professional value in three ways, each related to the role my participants felt libraries should play in a rapidly changing HE context.

*5.3.1.1: Creating a welcoming hub*

The first way my participants attempt to facilitate access to information is by creating a welcoming Twitter presence. In the research-intensive context of the University of Cambridge, this stance was seen as related to supporting individuals' opportunities and well-being:

> I think we're not gatekeeping. What I'm really passionate about is information in terms of that everybody should have access to it … Yes, just passionate that everyone, regardless of background, you know, should be able to reach the information they require, and, you know, with as few hurdles as possible, get the help that they need to get that information and not to give up. (P4)

> I feel like we're trying to [with Twitter], well, say grandly, I feel like I am trying to create a really open and welcoming presence, trying to help people go beyond the view that library is books on shelves, you know, trying to let them know that we are there to help them with the dissertations, with their research with, you know, thorny questions about copyright. That we're interested in their research, you know, if they're doing research, we'll retweet it. ... We give them a service, we actually care about what they do, we care about their research, we care about their wellbeing ... So, yeah, I think if there was one kind of takeaway I'd like to try to create with that is openness, really. (P5)

To illustrate how my participants attempt to create a welcoming and accessible presence, in Figure 5.9 the librarian establishes friendly credentials by combining information about library tours with a map and photograph of the library:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| The beginning of Michaelmas and we are initiating some new library tours. Considering this a post in this manner seemed most appropriate. | A combination of action shot and poster to highlight our own efforts and to inform others to join us. | The University and library networks and all potential new induction candidates. | Generate footfall. |

**Figure 5.9: Twitter diary extract illustrating how librarians attempt to create a welcoming hub**

Similarly, in Figure 5.10 the librarian welcomes new students that term who are based in a university school different from hers, but who may eventually want or need to use her library's resources:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Saw this tweet as I logged on and thought it a good opportunity to send greetings to CJBS students | No concerns | New CJBS students including MPhils in Banking and Finance who will also use our library | Hope new students see it and CJBS sees they are acknowledged. It may also remind certain students they can use our library too. |

**Figure 5.10: Twitter diary extract illustrating how librarians attempt to create a welcoming hub**

Finally, in Figure 5.11, the librarian establishes friendly credentials by promoting a video to acquaint students with the town of Cambridge:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| The MBAs and MFins have arrived, the distance-learning courses have started. It's a great introductory video to Cambridge | As it's so short, it doesn't cover everything or where anything is, it's very Parker's Piece[12] and tourist-centric, but shows off the city well | All the new students | That it shows how wonderful Cambridge is |

**Figure 5.11: Twitter diary extract illustrating how librarians attempt to create a welcoming hub**

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[12] Parker's Piece is a park in central Cambridge.

### 5.3.1.2: Helping researchers cross disciplinary boundaries

The second way my participants attempt to create access to information is by helping researchers cross disciplinary boundaries, often framing this value in terms of making researchers' work visible to broad audiences. My participants frequently couched this sentiment in recent efforts in the world of scholarly communications to make information openly accessible via the Internet:

> My real passion is getting research out of the silos of a particular research group or a particular faculty and out to as broad an audience as possible, and I think that librarianship is not necessarily the most showy way of doing that … but through helping people with publication, with open access, with putting things in a repository, with communicating their research on social media or blogs or designing conference posters, we can help people get their research out there in new and interesting ways, and in ways that are accessible. (P5)

> Because, again, with this global audience that we have, I want it to be positive, that it's not a scary place, that we are here to help them. Like we do get involved in all sorts of things, we're just not a space for books. There is a community that are doing fantastic exhibitions or outreach and that sort of thing. So yes, again, always want to put a positive spin on that. (P4)

To illustrate how librarians attempt to help researchers cross disciplinary boundaries and navigate the rapidly changing world of scholarly communications, the librarian makes a case for open-access publishing of books in Figure 5.12:
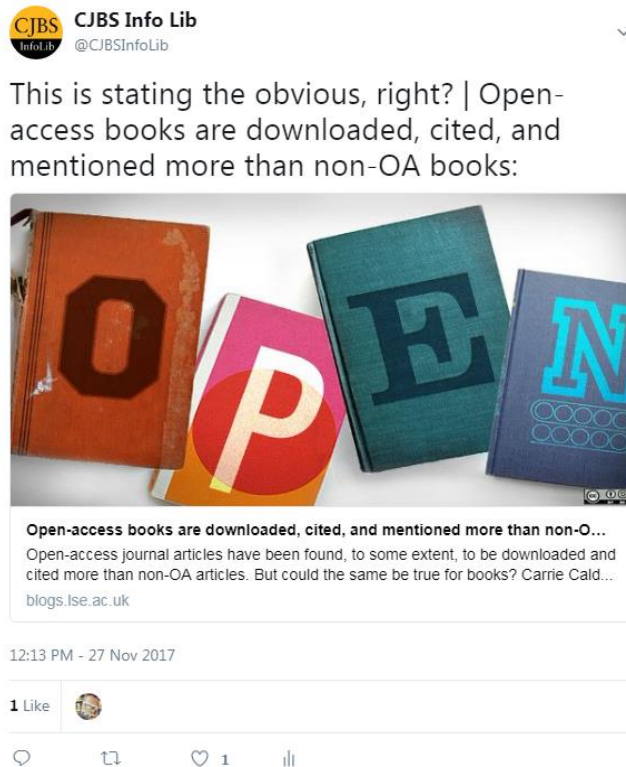
| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| This came from our OneNote Comms list | It caters more to our librarian followers | Other librarians and higher education accounts | That it makes people realise we need better access to ebooks and help our users access them |

**Figure 5.12: Twitter diary extract illustrating how librarians try to help researchers cross boundaries**

### 5.3.1.3: Being a trustworthy academic partner

Finally, the third way my participants create access to information is by capitalising on Twitter's ability to blur social hierarchies. My participants felt, for example, that Twitter enabled them to relate to academics equally as knowledgeable and trusted partners in research endeavours. Twitter's capacity to facilitate trustworthy connections across social groups thus creates a commons that troubles social divisions and facilitates librarians' ideal for unfettered dissemination of information:

I value openness and connection and believe that the library should be a welcoming space. I see us as library professionals being facilitators and helpers for knowledge, not gatekeepers of it, so presenting a human face to the world is important as it flattens perceived hierarchy and gives us a way of meeting our readers (not "users" or "customers") where they are. Tweeting is a practical application of those values as it is a social space, where people are already having conversations, and where we can connect on an equal level. (P5)

For a science student, "I don't work with books, I work with datasets, I work with lab reports, I work with technical reports," so I think it's really important in that discipline particularly to position the library as being a knowledge hub and one that can talk at different levels on the research life cycle, and I think the social media is a tool for doing that. (P3)

To illustrate how librarians use Twitter's democratising effects, in Figure 5.13 the librarian speaks to academics as a knowledgeable and trusted partner in research endeavours:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Twitter feed | [no answer] | Those interested in publishing practices and the pitfalls! | Important to share with not just colleagues here, but our colleagues at institutions in Africa who may also fall prey to publishing in illegitimate journals. |

**Figure 5.13: Twitter diary extract illustrating how librarians portray themselves as trustworthy academic partners**

To summarise, therefore, the professional ideals and future aspirations – as manifested in a modern HE context – of removing boundaries to information and between social hierarchies, strongly motivates my participants' Twitter practices. Such professional ethics, in turn, have implications for the knowledge librarians produce on Twitter, as will be discussed in more detail in the next section.

### 5.3.2: Creating scholarly content

For Theme 4, *creating scholarly content,* I present an account of how my participants translate traditional ethics of librarianship to support public service and stewardship of

information (Gorman, 2015; Koehler, 2015) into the context of Twitter. My participants were adamant that, as librarians, they have a professional obligation to their users to produce Twitter content that is rigorous academically and neutral in terms of representing a panoply of perspectives on scholarly debates. Theme 4 thus relates to the meaning of roots encompassed in my theoretical framework in terms of *standards* of librarianship (i.e., the profession's core values to disseminate quality information), *ethics* of librarianship (i.e., the responsibility librarians feel to present information neutrally) and librarians' *hopes* for a future of unfettered access to useful information. However, my participants also related tensions associated with these ideals such as competing personal and academic interests.

### 5.3.2.1: Producing academic tweets

Firstly, in terms of producing academic content, my participants relate how they conscientiously try to determine scholarly subject matter for their Twitter streams from credible sources. In the quotes below, for example, P6 discusses the workflow in her library for discerning scholarly content and P4 discusses how she establishes academic rigour:

> For the content, we've got three avenues of content, so we have a Feedly account, so we've got a whole load of blogs and websites that we follow and collates it all for us, so we just look at what's been posted … and see if any of that is relevant. Each Monday morning, several members of the team get together and create a list of things that's been in the news recently … and we put that on OneNote. And if anything is up and coming as well, so like an event coming up or say 'right, on that day we need to follow that on a Twitter hashtag', for instance. (P6)

> I always click through, if I can, to the original article, make sure, read all the way through it to make sure there's nothing contentious, that it's from a good source, that's why we tend to only follow people … anybody that we do follow, you know, properly look into what they're tweeting about, who they are, if they are just ranting obviously steer clear. Do look at the history behind the tweet that's coming out. … So, if it's a call for papers or whatever, that's fine, but if there's going to be an article, I'd like to properly read and make sure it's useful information, or at least academically viable. (P4)

As my participants reflect, before posting to Twitter, often a significant amount of work occurs to find and present content that it suitable for the university context. To illustrate librarians' high standards for presenting scholarly material, in Figure 5.14 the librarian discusses a trend of African literature to break with widely held (in the West) conventions for popular fiction:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
| --- | --- | --- | --- |
| Twitter feed | [no answer] | Global audience, and those with an interest in African literature | African literature and publishing is a hot topic and does bring about some complex issues. This article highlights the tensions involved, and also was useful for me for subject knowledge! |

**Figure 5.14: Twitter diary extract illustrating librarians' academic Twitter content**

Likewise, in a similar attempt at asserting the credibility of the library and its services, in Figure 5.15, the librarian informs researchers that her library has access to (what many consider) the best database of economics data used in the financial industry:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| This is reinforcement from the Induction - reminding students we have a Bloomberg terminal | None - except the usual concern that it won't be seen | New MPhil students plus any current staff and student users of the Marshall Library | I hope students are alerted and take up the opportunity to book our Bloomberg terminal |

**Figure 5.15: Twitter diary extract illustrating librarians' academic Twitter content**

### 5.3.2.2: Producing neutral tweets

Secondly, in terms of neutral content, despite the academic content my participants would like to convey via Twitter, they also express a sense of professional responsibility to maintain neutrality in terms of representing multiple viewpoints. In the quotes below, for example, P2 ties the need for neutrality to standards set by the UK professional organisation for librarianship, while P3 links neutrality to the traditional role of librarians as information arbiters:

I think that's part of my professional ethics. So, if you go by the CILIP[13] professional ethics that we shouldn't censor information and we shouldn't pass judgement on information, we just deliver information, so it's just part of who I am as a librarian. I was brought up as a librarian not to, don't always … again, don't always achieve it because I'm quite an opinionated sort of political person, but I'm very aware that, you know, we should always be not particularly presenting one side or the other, that it should be a dispassionate … the professional Twitter feed should be dispassionate, that's my feeling. (P2)

I feel like we're sitting somewhere in the middle. We're not this sort of posting sort of just blank statements, and we're not posting about the wider world and the politics of what's going on and what the library view is on that etc. etc. In fact, that's one well as well worth mentioning, is I try particularly to keep the politics out of it. I think that just absolutely muddies the water. (P3)

To illustrate librarians' efforts at creating neutral social media content, in Figure 5.16 the librarian establishes a degree of trustworthiness with a quantitative portrait of his library's accomplishments:

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[13] CILIP is the Chartered Institute of Library and Information Professionals. See https://cilip.org.uk/page/ethics for CILIP's Ethical Framework. Number five on the list of ethical principles is 'Impartiality.' (Page last accessed 3 March 2020.)

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Infographics look great and the release of information regarding our annual statistics seemed an ideal opportunity to promote our excellent figures. | It may seem boastful to some and somewhat self-obsessed. But it is pretty. | Our local users and other local libraries. | To inform those with an interest in what we do and how well we do it. |

**Figure 5.16: Twitter diary extract illustrating librarians' neutral Twitter content**

In sum, therefore, the care and maintenance my participants ideally devote to Twitter is substantial, entailing considerable attention to the production of trustworthy content. However, my participants also express tension between their ideals for tweeting and the reality of what they need to tweet based on the requirements of their users. This competing set of demands, therefore, is woven into my participants' social media work and has implications for the nature of their knowledge production.

### 5.3.3: Summary of themes related to Roots

In summary, in this section I discussed how Roots are enacted in the knowledge production of my participants' Twitter practices. In the process, I considered two interconnected themes, *facilitating access to information* and *creating scholarly content*, which demonstrate the imbrication of professional values and context that shape my participants' Twitter practices. My participants felt that it was imperative to create an open and welcoming presence via Twitter to increase users' access to information, reflecting in part the real or perceived boundaries they feel separate libraries and the activities of students and researchers. At the same time, they feel a professional obligation to produce content via Twitter that is academically sound and useful while simultaneously impartial – a difficult balancing act. The tensions in and between these professional practices are woven into the foundation of my participants' Twitter practices and influence the nature of their knowledge production in HE.

## 5.4 Scale

In this section, I focus on how Scale is enacted in the knowledge production of my participants' Twitter practices. As explained in Section 3.4.3, Scale as it relates to infrastructure concerns the characteristic of KIs to exist at multiple levels simultaneously: by being locally embedded (as will be discussed in Section 5.5 for Culturality), by evolving through processes of accretion and by having social effects beyond the local context of their creation. In particular, I will focus here on how conceptualisations of Twitter's reach shapes librarians' knowledge production via Twitter, but also on various tensions within this dynamic.

As outlined in Table 5.1, my analysis identified two interconnected themes related to Scale that are implicated in my participants' knowledge production via Twitter:

- **Theme 5:** Accreting slowly

- **Theme 6:** Conversing widely

By illustrating these themes with excerpts from the data generated for this study, I will draw attention to how academic librarians' professional objectives intertwine with Twitter's functionalities to produce effects that are at once local and incremental *and* operational on scales sometimes global in nature.

**5.4.1: Accreting slowly**

For Theme 5, *accreting slowly,* I discuss the value my participants place on Twitter's capacity to build relations with stakeholders slowly. As discussed in Chapter 3, accretion refers to the tendency of infrastructure to emerge gradually and unevenly via complex social and technical foundations that both limit and shape its growth. Theme 5 thus encompasses this meaning of scale by highlighting how my participants harness Twitter's inherent piecemeal functionality on a day-to-day basis to produce knowledge for the university. Examples of the theme presented in the data extracts below highlight various efforts to remind the university community continuously and consistently of the value of libraries' services. My participants expressed two such ways that the gradual accretion of tweets supported their professional objectives.

*5.4.1.1: Finding value in Twitter's fragmented approach*

Firstly, my participants related that Twitter's strict limit on the length of individual posts was, paradoxically, important for the reach and circulation of librarians' knowledge within the university. Reflecting on the tendency of Twitter streams to accrete in piecemeal fashion, my participants note that:

> I think it's good to have like a ... I don't really know what the phrasing would be, like a trickle method to broadcasting things, like if every so often there's an Instagram that says 'the e-books guide exists' or every so often, you put a thing on Twitter, I think you need like one or two every so often to get it more into people's vague attention. (P1)

> Social media, it's such an ephemeral thing, so something you tweet yesterday will automatically probably be out-of-date by then, so if you had more time, you may spend like a meticulous amount of time crafting the perfect tweets, but that's not really what Twitter is about. (P6)

> Coming from a library point of view, you are often trying to get quite a bit of information across and that is a challenge. It's a challenge but I like a challenge, so I think that's why it's such a well-used medium of communication, I think, just because it's so short, clipped and neat. People get little packages of information. (P3)

*5.4.1.2: Building relations with stakeholders*

Secondly, my participants reflected that precisely because of Twitter's patchwork "trickle method," they are able to build meaningful relations with stakeholders over time. In the

quotes below, P3 and P5 articulate this paradox of the ephemerality of Twitter and its steady role in building long-term relationships:

> I think with anything people kind of expect with social media because it's such a fast moving platform that you'll have kind of instant engagement but it's also about relationship-building, so it actually takes time to build that sense of trust and that sense of relationship for people to respond. (P3)

> I've got a slow-burn strategy about building connections and making relationships and getting more conversational. At the moment, I still think we're too broadcast, but I think it's one of those things that develops over time. If I were to try to improve it, which I am trying to do, it would be to be more about finding individual academics, individual researchers and connecting with them and getting involved in conversations with them that aren't necessarily just about library resources but are more about their research workflows, their outputs, any concerns they may have about the research life cycle or the publication process, anything like that. That's more kind of back and forth, but again I think that's something that will come with time and it will come with more face to face interaction, as well as online interaction, so the more we do these drop-in sessions that people come to, the more people I get to follow on Twitter as a result of that and that snowballs. (P5)

The quotations here illustrate the entanglement of the gradual, uneven and never-quite-completed nature of Twitter and my participants' professional objectives. From this perspective, knowledge production via Twitter is seen to be constituted locally and iteratively and, as highlighted in the next section – which considers sustained interactions with researchers via Twitter – somewhat unevenly and unpredictably.

To illustrate librarians' efforts at building relations with stakeholders over time, in Figure 5.17 the librarian discusses the success of open-access publishing initiatives at the university, especially regarding prominent milestones of the institutional repository service:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| A major landmark for our parent library project which we have contributed to and therefore reflects well on us. Great striking image, so made sure it appeared by creating original tweet. | My kingdom for more characters - wanted to include Hawking Thesis reference - could I have done it another way? | OA advocates and anyone currently looking towards Cambridge this trending week. | That we continue to show we are leading the way in this upwardly mobile and active area of interest! |

**Figure 5.17: Twitter diary extract illustrating librarians' efforts to build relations with stakeholders**

Similarly, in Figure 5.18 the librarian produces a follow-up message on the same topic, emphasising the popularity of famous scholars in the institutional repository:

Check out these #OAWeek #HawkingThesis fun facts and figures... oh, and here's that #altmetrics link: altmetric.com/details/251546...

- As of 27 October 792,586 unique IPs accessed item 1810/251038
- On a combined rolling hourly basis, that equated to at least 933,788 hits (some IPs have tried to access the thesis more than once in different hours, or one IP corresponds to multiple users).
- There was a peak of 26,196 unique IPs accessing the thesis between 1-2pm on the 24 October - 7.3 requests per second.
- At peak load, visitors to the thesis were completely saturating a 1 Gbps internet link – the University would have needed to have at least double the capacity to keep up with demand.
- The Altmetric score is currently 1524, which puts it in the top 5% of all research outputs tracked by Altmetric. You can see the stats here: https://www.altmetric.com/details/25154696

4:18 PM · Oct 31, 2017 · Twitter Web Client

https://twitter.com/MooreLib/status/925396532316295169

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| A continuation of our original Hawking Thesis tweet informing readers of its incredible worldwide impact. | Stats sent internally. | Academic and STEM communities. | Renew interest in open publishing in time for forthcoming OpenConCam event. |

**Figure 5.18: Twitter diary extract illustrating librarians' efforts to build relations with stakeholders**

Finally, in Figure 5.19, in a more light-hearted conversation, the librarian engages in a friendly exchange with a faculty member about his holiday reading choices:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| One of our members of staff mentioned us in this tweet, so had to reply | Struggled to come up with a suitable reply, so did something generic | Conrad and the CJBS community | That other people come and take books out and request titles |

**Figure 5.19: Twitter diary extract illustrating librarians' efforts to build relations with stakeholders**

## 5.4.2: Conversing widely

For Theme 6, *conversing widely*, I discuss the value my participants place on conversations with researchers via Twitter. One of the promises of Twitter is its capacity to foster significant engagement with followers and is a key reason for librarians' great uptake of the platform. Theme 6 thus encompasses this meaning of scale by highlighting my participants' efforts to encourage meaningful interactions with users on Twitter and expand such conversations beyond the digital sphere. Examples of this theme presented in the data extracts below include various conversations with parties on scholarly topics within and

outside of the university. My participants articulated two sub-themes associated with their value of conversations along with associated tensions with attaining this professional aim.

### 5.4.2.1: Having meaningful conversations

Firstly, one of the strongest themes in the interview data was persistent uncertainty over whether librarians' Twitter practices reached researchers meaningfully and beneficially. Such engagement, usually in the form of sustained conversations with researchers, was seen as the gold standard and most genuine indicator of my participants' reach within the university. Yet, as my participants below explain, they have a constant yearning for, but rarely receive, such robust engagement:

> I'm really happy it's [a tweet] popular but I want *feedback*. I want to know how did that help you? What can you now do that you couldn't do before and are you going to tell people about this? So, there's the kind of selfish element there that I want to have actual conversations to know what people are thinking. But also, I think, there's an element that, I don't know, there's just the drive to go beyond broadcasting, to actually connect with people. It's, sometimes you feel like you're shouting into the void with Twitter a little bit and just kind of hoping that someone will see it and pick up on it. But having, if you could develop a kind of community, like we [librarians] have professionally when we do things like the conference hashtags, you know, that's not just broadcast, broadcast, that's genuine, you know, "I thought this point the speaker made was brilliant." "Well, I thought it was rubbish and here's why and here's why it's applicable to me." And it's actually back and forth and it feels a lot more dynamic, it feels a lot more useful, I think. So, if we could kind of move to that somehow, that'd be lovely. (P5)

> We're all running around in the street with megaphones shouting, then occasionally you say something and then you're really surprised when somebody replies, and so that's good or why have you said that? Yes. So maybe there are more people listening than I know, but that's one of the things I don't like about it [Twitter]. (P2)

Despite the richness of possibilities that Twitter offers in terms of engaging with followers, therefore, my participants expressed an underlying thread of concern that their efforts via Twitter were for naught (or very little).

However, and in contrast to these sentiments, my participants also provided salient examples of conversations via Twitter. Though such conversations were rare, dialogue with users does happen and in ways that sometimes transcend (what might be considered) traditional library purviews. For example, in the quotes below, my participants relate instances where followers on Twitter tapped into their libraries' specialist areas of expertise:

We're hoping to use it [Twitter] as a way to direct people to the e-books, which I've done some vague publicising of, but then last week I thought, I'll refresh some of the stuff we've got on social media so ... just a little reminder that it exists, just while people are on their holidays. And we did actually get someone ... I wonder if you can see the mentions, like a new student … replied and said "Oh, I don't think I can get them until I arrive,' and then we said "You'll need a Raven account [Cambridge's authentication system], but once you've got that, you can use it." And that was quite nice, that they're already engaging preterm. (P1)

She [a former student] reached out and, you know, tagged both myself and the centre and saying, you know, this is an important piece, then we not just retweeted it but commented, you know, former student, and then, you know, it, kind of, goes on from there; then how are you and, oh, I'm missing Cambridge, and, you know, that sort of thing. And, you know, it might then go into direct message. But even within that … you know, it's still a conversation that … and I have had somebody get in touch who was a former, former student from a long time ago, who was setting up, trying to set up, a library in Africa, and said I don't know how to do it, where do I even start? So that was amazing that she found me on Twitter. (P4)

As soon as we mention anything historical, those people pop up and are really interested because they see the characters of Mary Paley Marshall in particular as part of this world [Economics] that they're interested in and that they want to look back at and speaks to their writing and their research. (P2)

To illustrate instances of conversations that tap into libraries' specialist expertise, in Figure 5.20 the librarian connects with a global network of libraries in African studies to help a Cambridge researcher:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Conversation with Rachel Rowe! | [no answer] | Historians, archivists, and all other interested parties! | Rachel and I had recently tried to identify some of the persons in these glass slides, to no avail. Rachel hopes if we raise their profile between us by using Twitter and our contacts, that we can finally get them identified. |

**Figure 5.20: Twitter diary extract illustrating librarians' conversations on Twitter**

Taking a somewhat different tack, in Figure 5.21, the librarian replies to an external follower enquiring about the provenance of a caricature of John Maynard Keynes:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Replying to @ACarpenDigital after they posted this pic of Keynes | No | It's good to be in a conversation | Could be interesting to those interested in History of Cambridge and Economics |

**Figure 5.21: Twitter diary extract illustrating librarians' conversations on Twitter**

*5.4.2.2: Expanding conversations beyond Twitter*

Secondly, as P5 describes below, such circulation of librarians' expertise via Twitter sometimes snowballs beyond the digital into the development of events and resources in the physical realm:

At the moment we're engaging really quite well with some of our MPhils, our engineering for sustainable development MPhil group, a lot of their followers are on Twitter and re-tweet what we put out and respond, and their course coordinator, in particular, responds a lot and ... and we have conversations about different things. I think the most recent one was, I've forgotten what the tweet was about, but it ends up being a thread about diversity in engineering which was really interesting and we're actually, on the back of that, we're planning to create some diversity in engineering resources which we're looking at sort of Michaelmas term time to start thinking about doing that, but maybe there'll be some drop-in sessions, maybe there'll be some kind of light touch research to see what people think of the idea and how best to respond to it so that's interesting. (P5)

We're growing it slowly but surely, I think. We haven't, I can't say we've had absolutely through-the-roof success but we have had ... there have definitely been conversations that have happened with research students who heard about something that we were doing on Twitter and then came along to a session or emailed the library and said "Can I come and talk to you about this aspect of my research" so it's getting there, which is exactly what we want really. (P5)

To illustrate the circulation of librarians' conversations beyond the realm of Twitter, in Figure 5.22 the librarian replies to a tweet by Wikimedia UK, a national charity supporting the interests of the open-online encyclopaedia, *Wikipedia*, about her library's use of *Wikipedia* with students:



**Wikimedia UK** ✓ @wikimediauk · Nov 6, 2017
Replying to @CJBSInfoLib
Don't tell students not to use Wikipedia; tell them not to cite it. It's not an 'academic' source. Use refs at bottom of pages as citations.

♡ 1      ⟲      ♡      ⬆

**CJBS Info Lib** @CJBSInfoLib · Nov 6, 2017
That's exactly what we do, we never tell our students not to use Google or Wikipedia: as an introduction & to make use of the reference list

♡ 1      ⟲      ♡ 1      ⬆
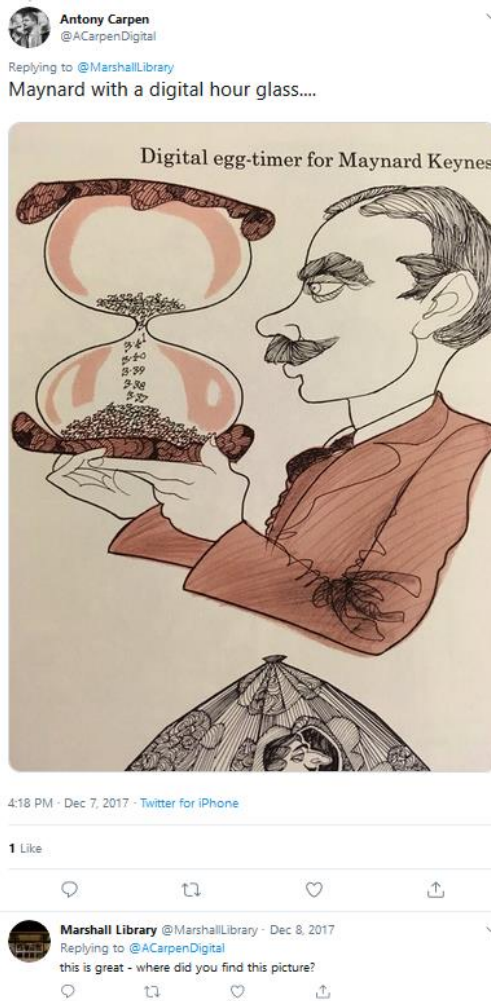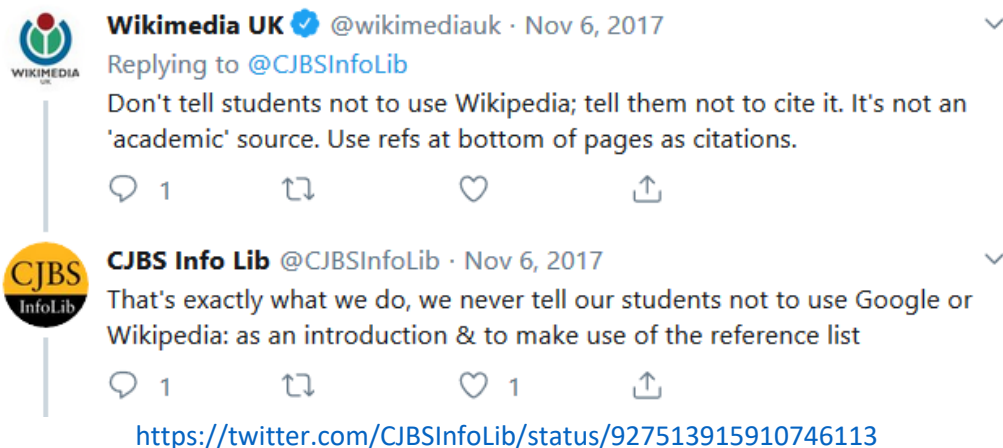
https://twitter.com/CJBSInfoLib/status/927513915910746113

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Replying to Wikimedia UK | Hard to answer in 140 characters | Wikimedia UK | That they understand what we do |

**Figure 5.22: Twitter diary extract illustrating conversations that move beyond Twitter**

In another example of fluid boundaries between digital and physical worlds, in Figure 5.23 the librarian connects with the global media entity, the BBC, in discussing a student-welfare event at her library:



https://twitter.com/MarshallLibrary/status/938011888083972097

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Tweeting in response to Jasper story on BBC website | No concerns | Jasper fans | This promotes the Library and Cambridge Economics - it's good that Jasper gets us noticed |

**Figure 5.23: Twitter diary extract illustrating conversations that move beyond Twitter**

Finally, in Figure 5.24, the librarian highlights the problem of conference travel bans on researchers from the African continent, a problem that prevented researchers from attending an African studies conference in Cambridge the year before:

**AfrStudiesLib**
@AfrStudiesLib

Happening far too often 👇🏾

> **Duncan Mainye Omanga** @dan_omanga · Sep 23, 2017
> standardmedia.co.ke/article/200125...

10:03 AM · Sep 23, 2017 · Twitter for Windows

https://twitter.com/AfrStudiesLib/status/911516391030820865

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Via Twitter feed - link takes you to article:  https://www.standardmedia.co.ke/article/2001255366/restricting-travel-of-academic-staff-an-unconstitutional-affront-to-academic-freedom | Quite a controversial topic... | Those who have experienced academics who are unable to attend conferences or lectures (even when they may be the keynotes themselves) due to visa issues. | Raise awareness of the issue, as it is preventing important exchange of knowledge and ideas. ASAUK held in Cambridge last September had over 50 African scholars prevented from attending. An awful situation. |

**Figure 5.24: Twitter diary extract illustrating conversations that move beyond Twitter**

In terms of knowledge production, therefore, my participants' Twitter work sometimes has effects, but it is also important to note my participants' persistent feelings of disconnect, regret and disappointment about their lack of sustained and meaningful conversations with researchers on Twitter. This tension between the promise of Twitter and the reality (or a sense) that no one is listening animates much of my participants' tweeting, spurring ever further efforts at reaching out to connect with scholarly communities.

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**5.4.3: Summary of themes related to Scale**

In summary, in this section I discussed how Scale is enacted in the knowledge production of my participants' Twitter practices. In the process, I considered two interconnected themes: *accreting slowly* and *conversing widely.* I highlighted that librarians feel an imperative to use Twitter to tap into networks on campus and beyond and, ideally, to engage in meaningful conversations via Twitter with researchers. Such connections, built incrementally and often unevenly, sometimes result in knowledge production beyond the traditional remit of the library. That meaningful conversations are the gold standard – often endeavoured, but rarely achieved – against which my participants measure the success of their social media work is important and relates to aspects of community building discussed in the next section on Culturality.

## 5.5 Culturality

In this section, in contrast, I reverse the formula of the previous three sections in which I discuss how librarians' Twitter practices lead to knowledge production. In this section, I explore the performativity, i.e., social effects, of KIs by discussing how librarians' circulation of expertise via Twitter leads to new forms of sociality. As explained in Section 3.4.4, Culturality as it relates to infrastructure concerns community practices and identity changes that often emerge from creating KIs. In particular, I will focus here on how academic librarians, in circulating professional expertise via Twitter, leverage social networks to connect researchers and, thus, create scholarly communities. I will also discuss how, at the same time, circulation of librarians' expertise via Twitter has outcomes for librarians' professional identity.

As outlined in Table 5.1, my analysis identified two interconnected themes related to Culturality:

- **Theme 7:** Crafting community

- **Theme 8:** Cultivating identity

By illustrating these themes with excerpts from the data generated for this study, I will draw attention to the technology practices of academic librarians that shape productive possibilities for new social patterns in the university.

### 5.5.1: Crafting community

For Theme 7, *crafting community,* I present an account of how librarians use Twitter to encourage connections between researchers. A repeated theme across the data was my participants' purposeful approach to creating scholarly community via Twitter, seen by my participants as a core remit of academic librarians on social media (and off). Examples of this theme presented in the data extracts below include librarians' efforts to connect with organisations within and external to the university and, in the process, create fruitful associations between researchers *and* with libraries themselves. My analysis identified three ways that my participants attempt to craft community.

### *5.5.1.1: Leveraging social networks*

Firstly, in the process of circulating professional expertise via Twitter, my participants try to foster scholarly community by leveraging existing social networks within and without the university. This was, however, more an iterative and often uneven process than a linear set of steps. For example, in the quotes below, my participants relate their specific intention to craft tweets that draw the attention of influential academic networks within the university in the hopes of boosting libraries' credibility and trustworthiness:

> So, the intention was then to give it a bit of a facelift and to get across our sense of community spirit I think and to develop it a little bit more down there, to make it more visual ... So, we have got specific networks that we want to tap into and work with people in that sense, so it has really worked, moving it on in that direction, I think. (P3)

> The Office of Scholarly Comms [at the main University Library] have really been into it [Twitter], and they're an interesting bunch because they have this sort of link back into the research community and the respect of the research community, so I think that's … it's worth being seen to be in conversation with them just for that sort of, you know, this is what we're doing, this is why it's relevant. (P2)

> The department Twitter is re-tweeting virtually everything that we put out which is great 'cause they have a bigger following, and so are the sites at West Cambridge like the Institute for Manufacturing, the Whittle Lab; they will frequently kind of recirculate what we're putting out and our analytics are showing that we're gaining followers. (P5)

To illustrate how librarians leverage existing networks to create scholarly communities, in Figure 5.25 the librarian taps an important campus neighbour, the Isaac Newton Institute for Mathematical Sciences:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
| --- | --- | --- | --- |
| Quoted retweet to highlight the collaboration between the INI and the Moore Library. | It's maybe too locally specific. | Science and mathematical communities. | To build our relationship with our scicom and maths friends. |

**Figure 5.25: Twitter diary extract illustrating how librarians leverage social networks**

Similarly, in Figure 5.26 the librarian seeks to amplify his library's support for women in science by forging a connection with the local Centre for Computing History:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Promotion of events that cover women in STEM is something that doesn't come around often so this worthy of a tweet. | Utilising our sway to encourage women to take up STEM subjects who might be put off by gender gap and look to apply their valued skills elsewhere? - no concerns whatsoever. We are open to all. | Anyone who is interested in the history of computing. | Build connections with @computermuseum and encourage women towards STEM subjects. |

**Figure 5.26: Twitter diary extract illustrating how librarians leverage social networks**

### 5.5.1.2: Connecting researchers

The second way my participants try to foster scholarly community is by parlaying links with influential Twitter networks into productive connections between researchers. My

participants often contrasted this purposeful intent with what they characterised negatively as mere promotion or broadcasting on Twitter:

> It's not that I'm doing it [Twitter] with the primary purpose of promoting the library, although that's quite important right now. It's more that you can link things up, you can make … so as librarians we make connections between people, we do a lot of facilitating, we do a lot of getting different people to talk to each other who perhaps don't know they should be talking to each other, and you can do all of those things on Twitter. (P2)

> But also, I think, there's an element that, I don't know, there's just the drive to go beyond broadcasting, to actually connect with people. It's, sometimes you feel like you're shouting into the void with Twitter a little bit and just kind of hoping that someone will see it and pick up on it. But having, if you could develop a kind of community, like we have professionally when we do things like the conference hashtags, you know, that's not just broadcast, broadcast, that's genuine, you know. (P5)

> So, yes, we're there to help. We're there to, kind of, nurture and, yes, develop those relationships, put people into touch with other people who will know, you know, even if we don't know we definitely know somebody who would be up to help, and that's, I think, yes, what we're about. (P4)

Thus, when the efforts of my participants to leverage academic networks throughout the university are most successful, researchers benefit not only from increased circulation of useful information but from potentially fruitful connections with each other.

To illustrate how librarians attempt to build connections between researchers, in Figure 5.27 the librarian shows support for a community effort in London to archive British Somali heritage:

AfrStudiesLib
@AfrStudiesLib

Archiving British Somali Heritage, Tower Hamlets. Volunteers to train in community archiving project via @numbiarts
bit.ly/2yaBTlm

Numbi Form - NUMBI Arts - a global conve...
numbi.org

♡ 1    10:34 AM - Sep 28, 2017

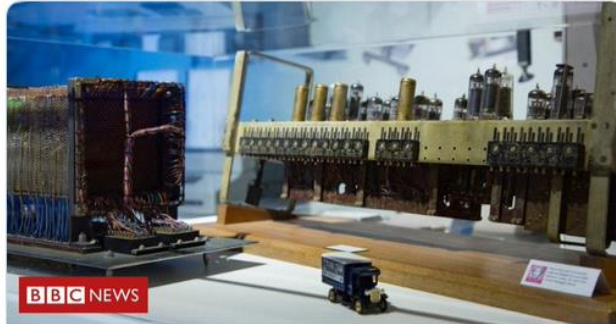https://twitter.com/AfrStudiesLib/status/913336086268702720

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Via mailing list | [no answer] | Volunteers of Somali heritage, anyone based in London, those with an interest in Somali culture and history | Projects like this are great for communities, especially in cities as vast as London. It sounds really interesting, and I'll monitor their progress with interest! |

**Figure 5.27: Twitter diary extract illustrating librarians' making connections between researchers**

### 5.5.1.3: Changing librarians' relations with researchers

The third way my participants tried to foster scholarly community is by changing libraries' relations with researchers. My participants believe that they have a professional responsibility to support such network connections and feel that the inherent features of Twitter encourage that activity by troubling traditional boundaries between social groups in the university:

> I think there's a great kind of flattening out that something like Twitter can help with. You know, you can engage with academics, researchers, students, you know, world-leading people in their field all on a very similar level and it, I like the way that

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kind of levels the hierarchy a little bit, particularly in a place like Cambridge. So, I think it kind of, it could hopefully change people's perceptions of who we are, what we do, what we can do and I think it's changed the way I relate to our audience as well because researchers who I follow on Twitter are just ... a person I follow on Twitter. So I think it kind of levels it, which is great, I appreciate that. (P5)

I think that's the main way I can think of it changing relationships with people. I can see how the Faculty members that are on Twitter and are engaged with us, there's quite a marked difference between their engagement with the library in general and people who aren't on Twitter and we never see in the library. … So, I think that's the main way, fulfilling our aims of supporting teaching and learning in the Faculty by keeping us connected to the Faculty. (P1)

To illustrate how librarians use Twitter to strengthen libraries' relations with researchers, in Figure 5.28 the librarian highlights the accomplishments of a former PhD student of the school:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Came through in the daily University news digest, related to the Business School and one of our students, also interesting broad information | Joe is an active Twitter user, library advocate while he was here and has a successful media presence, his research has universal appeal and he engages with us on our Twitter account | The School, university, business and research community, as well as alumni | Promoting the success of our students, getting the research to a wider audience, engaging with our alumni and Joe, who retweeted our tweet |

**Figure 5.28: Twitter diary extract illustrating librarians' changing relations with researchers**

Similarly, in Figure 5.29 the librarian highlights the writing accomplishments of a current student of her research centre:

| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Student in question & Centre informed me, plus received an alert via a blog that I follow | [no answer] | Global audience | Amazing to have one of our current students win a literary prize and be published yet again! We're very proud!! |

**Figure 5.29: Twitter diary extract illustrating librarians' changing relations with researchers**

Finally, in Figure 5.30 the librarian – in a bit of fun – establishes links with the university community through her use of the #chocolateweek hashtag:
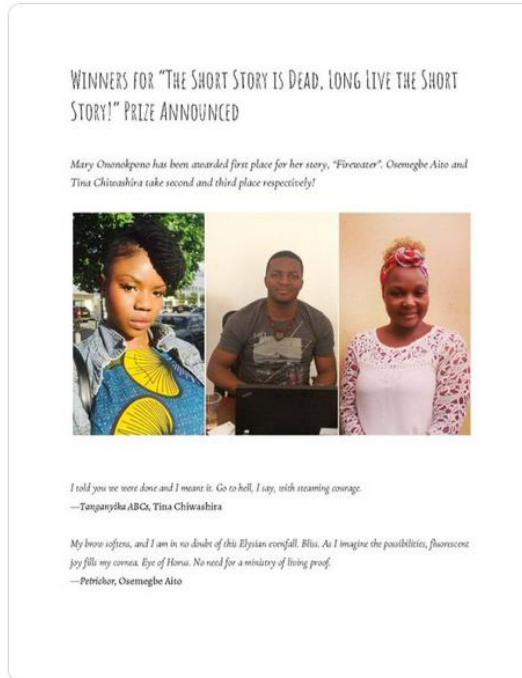
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| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Libraries week and chocolate week are both trending on Twitter | Other libraries, people at the School and around the University, students and staff | Other libraries, people at the School and around the University, students and staff | Just being part of the trending community |

**Figure 5.30: Twitter diary extract illustrating librarians' changing relations with researchers**

In summary, creating a sense of community in terms of establishing connections with individuals and university entities, as well as demonstrating the crucial role of libraries in users' repertoires of resources, was viewed as an essential aspect of my participants' Twitter practices. My participants therefore claim that their efforts to circulate beneficial information to the university is less about promoting services *per se* and more about influencing connections between researchers.

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**5.5.2: Cultivating identity**

For Theme 8, *cultivating identity*, I present another aspect of Culturality related to the performativity of librarians' circulation of professional knowledge via Twitter: effects *within* the community of librarians at the university in terms of professional identity and membership. These social changes highlight connections between the various libraries within the university, underscoring their ecological nature. Examples of this theme presented in the data extracts below include librarians' exploration of new professional skills related to social media use and expanding definitions of professional membership within the librarian community. My participants expressed three such ways that their Twitter work shaped professional identities.

*5.5.2.1: Creating new vocational competencies*

Firstly, my participants related that their Twitter work has spurred new vocational competencies, such as becoming increasingly self-assured with the activities of disseminating information via Twitter which, in turn, is now seen as core aspects of their professional repertoire:

> It's [Twitter] not natural. It's not a natural form of communication. You know, you're not sure who's gonna respond. You're kind of shouting into the void a little bit when you first start out, particularly when you set up a new account. You have the opportunity of response in real time; that actually very rarely happens. There's a whole kind of language and it's almost its own culture. It's developed its own language, it's developed its own customs, certain hashtags meaning certain things, the use of 'at' handles or whether to use them or whether not to use them, it's kind of created its own little ecosystem and if you're not in that it can be quite intimidating I think, which is why it needs that kind of familiarisation, needs that kind of practice I think to actually get to a point where you're using it for something useful, and really the only way to do that is by kind of jumping in and trying stuff out and failing. (P5)

> But actually sitting down and writing that Tweet, I kept a list of hashtags that seemed to have the most reach as well, so I had that as a back-up, and once I'd built that up … it got easier and easier and easier, and I think it has done since the very day I sat down in front of it with the intention of building it [Twitter] into something that was a valuable tool. (P3)

*5.5.2.2: Rethinking professional membership*

Secondly, in the course of becoming fluent in the use of Twitter and, thus, increasing the circulation of librarians' expertise, my participants felt that their sense of themselves as a

community of professional librarians within a single institution was strengthened in terms of better understanding of each other's professional responsibilities:

> Personally, I think because I follow so many librarians and I know so many librarians through Twitter, it's definitely broadened my knowledge of people's career paths and what's available, and people's work practices and things. Along with that the frustrations of librarianship, in quite a big way I think. (P1)

> I definitely think our, kind of, activist level, librarians as activists, socially, has risen, you know. It's a lovely platform to be involved with like that, you know, and to see things unfold, and people's personal opinions, you know, on the one side, and knowing them as a professional. I think librarians do it very well, do Twitter incredibly well. We understand it. We understand who we want the information to get to, most of the time, what we're trying to say, and how to sum it up, you know, it's a perfect platform, I think. (P4)

> It's important to me, it's definitely informed me as to just how much hard work goes on out there. If people do your projects or a bit of work and they shout about it, then yes, you will hear about it, otherwise you wouldn't hear, you wouldn't know. There's no newspaper of the Cambridge libraries, they look at all the events they've done. (P3)

### 5.5.2.3: Strengthening professional community

Finally, the third way that my participants' Twitter practices have shaped their professional subjectivities is that, in the course of becoming more expert in their use of Twitter, my participants reflected that they had become a stronger and more compassionate professional community:

> I think it's made us more of a reactive, responsive community, so we can be more supportive of each other, because before, if we didn't have social media, it would just be over email or when we meet in-person or we'd have to keep phoning each other up. So, we can be a bit more responsive in our communities, I think. (P6)

> There are so many librarians here and it's such a great community, I think Twitter just enhances that. So, if for no other reason, even if I'm failing to be a great Twitter feed for [faculty] and for [my] library, at least having the Twitter feed means that sometimes I do talk to the other librarians and I'm supporting other librarians in what they're doing and whether that's having a good impact on their feeds, I don't really know, but I do think it helps support the community. (P2)

To illustrate librarians' enhanced sense of professional membership, in Figure 5.31 the librarian lends support to a cross-libraries skills workshop based in the School of Arts, Humanities, and Social Sciences:
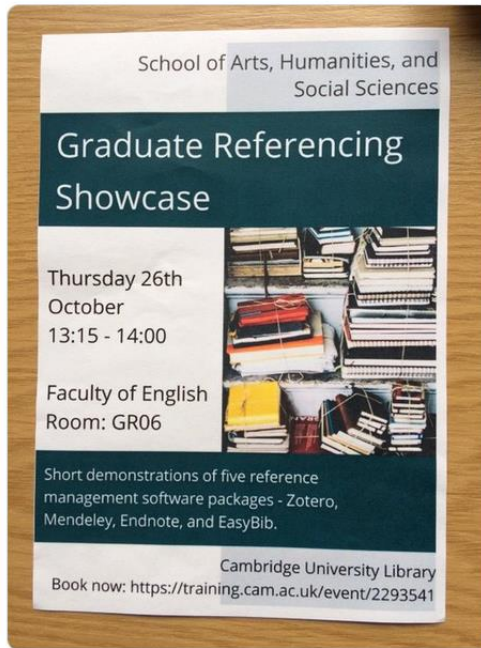
| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Advertising the HASS Referencing showcase and promoting the Economics referencing guide | No concerns | MPhil and PhD students | Will probably need an email too |

**Figure 5.31: Twitter diary extract illustrating librarians becoming a stronger professional community**

Similarly, in Figure 5.32 the librarian establishes herself as part of the wider pan-libraries interests of scholarly communications throughout the university:

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| How did you choose the tweet's content? | What concerns or thoughts do you have about the tweet? | Who do you envision the post reaching? | What effects do you hope the tweet has? |
|---|---|---|---|
| Just spotted myself and it's good to raise the profile of the Library as supporting research as well as teaching | None | Faculty staff and students primarily but hopefully researchers | Hope this promotes the Library and Librarian as engaged with RDM and research more generally - as well as showing how we are actively supporting UL strategy |

**Figure 5.32: Twitter diary extract illustrating librarians becoming a stronger professional community**

In summary, my participants feel that that their Twitter work affects them professionally in terms of developing a sense of themselves as a complex and inter-connected community of librarians within the university with shared concerns and interests. Through our conversations, it became apparent that my participants rely on the information and

connections that Twitter brings them, while they find that fluency in their social media work is central to their professional identity.

### 5.5.3: Summary of themes related to Culturality

In summary, in this section I discussed how Culturality in enacted in the social effects of my participants' knowledge production via Twitter. In the process, I considered two interconnected themes: *crafting community* and *cultivating identity*. My participants felt that it was imperative to use Twitter to tap into networks on campus and beyond to establish or reinforce ties and, it was hoped, create fruitful links between researchers. At the same time, my participants noted that in the process of their outreach efforts, their perceptions of themselves as a complex and inter-connected community of professionals within the university was strengthened.

## 5.6 Conclusion

To conclude, in this chapter I presented my empirical data as analysed through the four categories of my theoretical framework – Invisibility, Roots, Scale and Culturality – with a specific emphasis on librarians' activities of designing and maintaining KIs:

1. **Invisibility:** Through their tweeting, librarians often contest stereotypes of traditional libraries/librarians. They feel that having an online digital presence is essential for doing so. Two themes, *Highlighting invisible work* and *Being visible in online spaces,* related to this category.

2. **Roots:** Librarians thread professional values concerning intellectual freedom, stewardship and service into their tweeting that, in turn, shape their standards for Twitter content and neutrality. Two themes, *Facilitating access to information* and *Creating scholarly content,* related to this category.

3. **Scale:** The conversations librarians engage in on Twitter, though not taking place as much as desired, are often on multiple scales and incorporate diverse groups within the university and beyond. Two themes, *Accreting slowly* and *Conversing widely*, related to this category.

4. **Culturality:** A primary goal of librarians is to foster community amongst themselves and their users via tweeting. While not dramatically changing core library roles, tweeting has strengthened community ties within librarianship and a sense of professional identity. Two themes, *Crafting community* and *Cultivating identity*, related to this category.

In the process, I have illustrated my main argument that librarians' Twitter practices are KIs, defined as "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (Edwards, 2010, p. 17). I have furthermore established that an infrastructural perspective is useful for highlighting librarians' situated practices within HE's political and technological milieu and revealing how librarians' Twitter practices produce knowledge in HE.

My overarching conclusion in this chapter, therefore, is that librarians actively use Twitter to construct knowledge about themselves and, in the process, produce useful knowledge for the university. In the next chapter, I will build on this narrative by answering my research questions and discussing how my research outcomes contribute to the studies explored in the literature review.

# Chapter 6: Discussion

*The very word "promise" implies that a technological system is the aftereffect of expectation; it cannot be theorized or understood outside of the political orders that predate it and bring it into existence.* (Larkin, 2018, p. 182)

*Infrastructure embodies both an achievement … and a project which in its very form is fraught with enormous fragility and uncertainty – which in turn weighs upon the work of those involved and never ceases to question their collective involvement.* (Dagiral & Peerbaye, 2016, pp. 57-58)

## 6.1 Introduction

The aim of my thesis is to explore academic librarians' practices of knowledge production in higher education, specifically librarians' infrastructuring of KIs via Twitter. In this chapter, therefore, I discuss the significance of my research outcomes as presented in Chapter 5. Section 6.2 discusses how my research outcomes answer my research questions, Section 6.3 argues how my research outcomes contribute to the areas of literature reviewed in Chapter 2 and Section 6.4 explores alternative explanations for my research outcomes.

In writing a Discussion chapter, Bloomberg and Volpe (2016) recommend making "explicit documentation of your analytical procedures" (p. 245) to increase transparency and trustworthiness. In this spirit, my process for assembling this chapter entailed not only evaluating my research outcomes, but also reviewing my sources and the memos used to write the literature review and theoretical framework. Figure 6.1 shows my synthesis of these resources into a new set of notes to support the construction of this chapter.
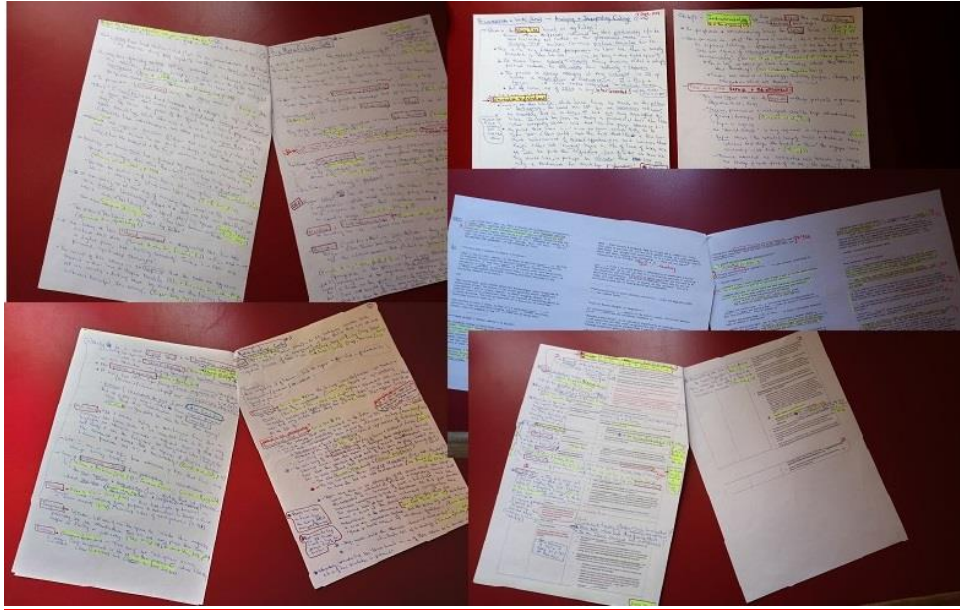
**Figure 6.1: Author's notes for writing the Discussion chapter**

My analysis for this chapter thus took the form of thoroughly reviewing my research outcomes to help answer my research questions. The priority of my study, to explore the values and politics that librarians bring to designing and maintaining KIs in HE (as discussed in Section 1.1), led me to focus primarily on how librarians' changing roles in HE translate into Twitter practices that are informed by professional values and hopes for the future and, moreover, produce knowledge in HE. As summarised by Karasti et al. (2016c):

> Knowledge infrastructures [are] political tools ... [with] complex loops of feedback between the forms of knowledge that an infrastructure embeds and the various forms of action that feed into and stem from the set of values that the infrastructure enacts. (p. 4)

As concluded at the end of Chapter 5, my overarching observation is that librarians actively use Twitter to construct knowledge about themselves and, in the process, produce knowledge for the university. Of course, an alternative face-value explanation is that my participants are merely engaging in service promotion via Twitter – an interpretation that predominates in the librarian-practitioner literature (discussed in Section 2.4). A salient example is the tweet presented in Figure 5.4 conveying information about library drop-in sessions at a campus café. From one perspective, this tweet is indeed service promotion. However, my theoretical commitments have invited me to interpret my research outcomes more critically, situating librarians' practices within the wider socio-political context of HE.

Viewed through my theoretical framework, the tweet in Figure 5.4 is an effort at highlighting librarians' invisible labour by demonstrating support for researchers' work. Such efforts at infrastructuring are thus "ongoing attempt[s] at ordering social practices" (Niewohner, 2015, p. 123). Through explicating my research outcomes, I hope to complicate understandings of librarians' work that are taken for granted or largely invisible in HE.

## 6.2: Answering the research questions

In this section, I answer my study's research questions (as defined in Section 1.6).

**RQ1:** What are the practices by which academic librarians produce knowledge via Twitter?

- **RQ1.1:** How is invisibility enacted in librarians' Twitter practices?
- **RQ1.2:** How are roots enacted in librarians' Twitter practices?
- **RQ1.3:** How is scale enacted in librarians' Twitter practices?
- **RQ1.4:** How is culturality enacted in librarians' Twitter practices?

In the sections below, I first address sub-questions 1.1-1.4 then answer the main research question. I present my answers in this order because RQ1 consolidates and builds on the answers of the sub-questions. Table 6.1 summarises the answers to my sub-questions.

| Mechanism of Knowledge Production | Answer to Sub-Question | Librarians' Practices that Produce Knowledge |
|---|---|---|
| RQ1.1: Mobilising Invisibility | Librarians use their sense of invisibility in HE to provide justification for their social media work. | • Librarians reflect on their positionality in HE to reveal sources of their invisibility. <br><br> • Librarians use researchers' digital spaces to make librarians' contributions visible. |
| RQ1.2: Translating Roots | Librarians translate values/ethics of librarianship in terms of contemporary demands and future goals, providing a foundation for determining credible Twitter content. | • Librarians attempt to create unfettered access to information based on values of openness. <br><br> • Librarians attempt to create scholarly Twitter content based on values of neutrality and trustworthiness. |
| RQ1.3: Managing Scale | Librarians attempt to understand and manage the extent of their Twitter activities. | • Librarians adopt a steady and consistent approach to producing Twitter content. <br><br> • Librarians attempt broad dissemination of their professional knowledge. |
| RQ1.4: Enacting Culturality | Librarians promote connections between researchers, helping create scholarly community and broadening the circulation of librarians' expertise. | • Librarians' Twitter work troubles institutional hierarchies and promotes scholarly communities. <br><br> • Librarians' Twitter work spurs new vocational identities and senses of professional membership. |

**Table 6.1: Summary of answers to the research sub-questions**

### 6.2.1: Mobilising invisibility (answering RQ1.1)

RQ1.1 asks *How is invisibility enacted in librarians' Twitter practices?* My theoretical motive for posing this question lies in the importance of the notion of invisibility for understanding infrastructure's capacity to shape social practices. In Section 3.4.1, for example, I discuss that 'invisibility' can refer to the invisibility of KIs in daily use, the mundane and unnoticed work of maintaining KIs and individuals' processes of making KIs visible (cf. Karasti et al., 2016a, p. 8). Indeed, Parmiggiani and Monteiro (2016) argue that people who design and maintain KIs often themselves engage in processes of infrastructural inversion to reveal the values and tensions of their infrastructural work. And Wyatt et al. (2016) furthermore note that editors of *Wikipedia* as a matter of policy make the contentious aspects of their knowledge production visual and textual. Invisibility, therefore, is a situated characteristic of KIs and a tool/tactic that can be wielded politically (Larkin, 2012, p. 336).

In the discussion of my research outcomes related to invisibility (Section 5.2), I focused on my participants' analogous efforts to make their work visible and how such activities lead to knowledge production. I summarised these infrastructuring activities in Section 5.2's main themes and sub-themes:

- **Theme 1: Highlighting invisible work**

    - Projecting the message that libraries are more than collections of books

    - Projecting the message that librarians are academic

    - Projecting the message that librarians support researchers' work

- **Theme 2: Being visible in online spaces**

    - Hoping that being visible online leads to better library services

    - Hoping that being visible online leads to bigger roles in university life

Theme 1 (*Highlighting invisible work*), for example, demonstrates how my participants discussed Twitter's utility in opposing stereotypes that obscure librarians' work. My participants related that a lack of visibility of their infrastructural contributions to university research informed much of their tweeting. Such practices display similar processes of engaging in infrastructural inversion to those identified by Parmiggiani and Monteiro (2016) and are similarly linked to a desire to share innovations or services that users might not be

aware of or associate with libraries. Similarly, Theme 2 (*Being visible in online spaces*) highlights how my participants related that a sense of invisibility impels them to 'be' in users' digital spaces to raise the visibility of librarians' work. Like the practices of *Wikipedia* editors explored by Wyatt et al. (2016), this sense of the importance of visibility has implications for the dissemination of librarians' knowledge to (potentially) large audiences.

To answer RQ1.1, therefore, I suggest that invisibility is enacted in my participants' Twitter practices in order to motivate my participants' use of Twitter and justify the considerable amount of time they spend crafting tweets. My participants thus routinely probe the state of their (in)visibility within the institution and mobilise this feeling for political ends that translate into knowledge production for the university. A sense of invisibility is therefore a significant force in my participants' knowledge production via Twitter – a theme I will revisit in Section 6.2.5 below when I address my study's main research question.

## 6.2.2: Translating roots (answering RQ1.2)

RQ1.2 asks *How are roots enacted in librarians' Twitter practices?* As discussed in Section 3.4.2, my theoretical motive for posing this question lies in the importance of understanding that individuals' values, ethics and hopes shape knowledge production (Star, 2002, p. 117). For example, Stuedahl et al. (2016) observe that knowledge production via participatory digital public infrastructures – in their case, maritime history wikis – is shaped by translating 'attachments' to (often idealised) professional and disciplinary pasts in terms of modern demands and tensions. Granjou and Walker (2016) furthermore argue that KIs designed to produce experimentally valid scientific knowledge – in their case, enclosed ecosystems called ecotrons – are 'promissory' in that KIs embody scientists' aspirations for desired futures.

In the discussion of my research outcomes related to roots (Section 5.3), I focused on my participants' analogous efforts to translate professional values and hopes in the context of new socio-technical demands and how such practices, furthermore, lead to knowledge production. I summarised such infrastructuring activities in Section 5.3's main themes and sub-themes:

- **Theme 3: Facilitating access to information**
    a. Creating a welcoming hub

    b.   Helping researcher cross disciplinary boundaries

    c.   Being a trustworthy academic partner

- **Theme 4: Creating scholarly content**

    a.   Producing academic tweets

    b.   Producing neutral tweets

Theme 3 (*Facilitating access to information*), for example, highlights how my participants felt that the traditional librarian value of intellectual freedom is at the foundation of their Twitter practices. In the analysis of my research outcomes, I noted that my participants often translate this professional value in terms of desired and anticipated futures of open and un-siloed access to research (including removing barriers to library-owned subscription-based electronic resources). Twitter's utility in creating such futures is thus one of the promises of Twitter held closely by my participants. Similarly, Theme 4 (*Creating scholarly content*) highlights how my participants related that the care and maintenance they devote to Twitter entails considerable attention to the production of scholarly online content – a desire, they feel, is grounded in librarians' ethics of neutrality and trustworthiness. My participants interpret these professional values, however, in terms of their present-day contested and fraught positionality within the university and hopes for a more equitable future.

To answer RQ1.2, therefore, I suggest that roots are enacted in my participants' Twitter practices in order to provide a foundation on which to create credible online content. Such work, moreover, represents an effort to interpret the traditional values of librarianship through the contemporary socio-technical context of HE. In this sense, roots are not only connections to librarians' sense of traditional values but constitute desired outcomes for the profession (cf. Granjou & Walker, 2016). Such attachments, moreover, are "sources and resources for people's agency" (Stuedahl et al., 2016, p. 52) and important for understanding librarians' active and creative role in keeping relevant professionally. Librarians' professional hopes and values therefore significantly shape librarians' knowledge production via Twitter – a theme I will revisit in Section 6.2.5 below when I answer my study's main research question.

### 6.2.3: Managing scale (answering RQ1.3)

RQ1.3 asks *How is scale enacted in librarians' Twitter practices?* As discussed in Section 3.4.3, my theoretical motive for posing this question lies in the importance of understanding that KIs exist at multiple levels by perpetually evolving through processes of accretion and having broad social effects beyond the local context of their creation. To gain analytical purchase on the shifting boundaries and uneven growth of KIs (Karasti & Blomberg, 2018) and draw connections with knowledge production, researchers of KIs have proposed focusing on how people interpret and manage the scale of their infrastructural activities. Edwards et al. (2009), for example, suggest focusing on how individuals "bridge scale" (p. 370) – e.g., through conceptualisations of how infrastructures 'actually work' – to reconcile tensions between the promise/potential of infrastructure and its (inevitably) uneven integration into local practice. Ribes (2014) similarly recommends focusing on individuals' "scalar devices" (p. 158), i.e., how people conceptualise and manage – e.g., through metrics or visualisations – the reach of their infrastructural efforts.

In the discussion of my research outcomes related to scale (Section 5.4), I focused on my participants' analogous efforts to conceptualise the spatial and temporal reach of their Twitter work and how such practices, furthermore, lead to knowledge production. I summarised these infrastructuring activities in Section 5.4's main themes and sub-themes:

- **Theme 5: Accreting slowly**

    a. Finding value in Twitter's fragmented approach

    b. Building relations with stakeholders

- **Theme 6: Conversing widely**

    a. Having meaningful conversations

    b. Expanding conversations beyond Twitter

Theme 5 (*Accreting slowly*), for example, highlights how my participants discussed Twitter's nature to grow gradually, reflecting how their 'slow-burn,' one-tweet-at-a-time approach helps build relationships via Twitter. This patient tactic is a way of bridging scale (Edwards et al., 2009), i.e., squaring the incremental, real-life effort of tweeting with the vast social networking that Twitter promises and, furthermore, helping spur ever-renewed efforts to

disseminate scholarly content. Similarly, Theme 6 (*Conversing widely*) highlights how my participants related that the ultimate proof of their Twitter reach was conversations with followers on Twitter. However, this gold standard, which is a scalar device (Ribes, 2014) used by participants to make plain the boundaries of their reach on Twitter, continuously leads to disappointment (such as in Section 5.4.2.1 where my participants reflect on the importance of user feedback in their social media efforts). The gap, in other words, between "engineered solution and social expectation" (Harvey, 2016, p. 52) was great. My participants related, however, that when conversations did happen, they were often global in nature and sometimes expanded into the physical realm.

To answer RQ1.3 therefore, I suggest that scale is enacted in my participants' Twitter practices in order to provide a means of understanding and managing the extent of their Twitter activity. Approaches such as bridging scale and scalar devices demonstrate the valences of big and small in infrastructural work, revealing how growth of infrastructure and subsequent knowledge production is fuelled by local increments of work. In the process, therefore, of grappling with the enormity of Twitter and its concomitant promises, librarians produce knowledge – a theme I will revisit in Section 6.2.5 below when I answer my study's main research question.

### 6.2.4: Enacting culturality (answering RQ1.4)

RQ1.4 asks *How is culturality enacted in librarians' Twitter practices?* As discussed in Section 3.4.4, my theoretical motive for posing this question lies in the importance of understanding that KIs are "engines of ontological change" (Karasti et al., 2018, p. 271) producing subjectivities and community formations that, in turn, can further transform infrastructure (Jensen & Morita, 2017, pp. 619-620). Ratner and Gad (2018), for example, explore the manifestation of new "organizational realities" (p. 540) when local educational practices interact with the exigencies of a national database of educational statistics. And Jackson and Barbrow (2013) argue that development and use of computational infrastructures in ecology have transformed ecologists' vocational values, which often spurs further extensions of the infrastructure. In both cases, knowledge production occurs via cultural transformation and is a relationship requiring work to manage and sustain (cf. Fenwick & Edwards, 2014).

In the discussion of my research outcomes related to culturality (Section 5.5), I focused on my participants' analogous efforts to create and sustain community arrangements, while also noting that such work shapes librarians' professional identities – dynamics which both, in turn, lead to knowledge production. I summarised these infrastructuring activities in Section 5.5's main themes and sub-themes:

- **Theme 7: Crafting community**

    a. Leveraging social networks

    b. Connecting researchers

    c. Changing librarians' relations with researchers

- **Theme 8: Cultivating identity**

    a. Creating new vocational competencies

    b. Rethinking professional membership

    c. Strengthening professional community


Theme 7 (*Crafting community*) for example, highlights how my participants discussed their purposeful approach to creating connections between researchers via leveraging existing social networks. Their hope was that such scholarly communities would increase the circulation of knowledge between researchers and promote potentially fruitful professional connections. My participants particularly valued Twitter's ability to trouble social hierarchies within the university – a salient example of new "organizational realities" (Ratner & Gad, 2018, p. 540) stemming from infrastructural encounters, and of how such organisational transformation shapes knowledge production. Similarly, Theme 8 (*Cultivating identity*) highlights how my participants discussed changes to librarians' professional identity and membership that working on Twitter produces. Specifically, they felt that conducting activities of librarianship via Twitter leads to new vocational competencies and a sense of an interconnected community of librarians within the university, outcomes that accord with the re-framings of vocational identities spurred by encounters with infrastructure identified by Jackson and Barbrow (2013).

To answer RQ1.4 therefore, I suggest that culturality is enacted in my participants' Twitter practices in order to promote connections between researchers, a process that helps create

scholarly community and broadens the circulation of librarians' expertise. At the same time, such work on Twitter spurs new vocational identities in terms of fluency with Twitter's functionalities and a sense of professional interconnectedness. I will revisit the theme of the entangled nature of infrastructural work and social practices in Section 6.2.5 below when I answer my study's main research question.

## 6.2.5: Negotiating promises (answering RQ1)

In the preceding sections, as summarised in Table 6.1, I discussed how the four aspects of infrastructure described in my theoretical framework – Invisibility, Roots, Scale and Culturality – are implicated in my participants' knowledge production. In this section, I therefore set out to answer my main research question: *What are the practices by which academic librarians produce knowledge via Twitter?* Answering this question addresses lacunae in the literature about HE professionals and academic librarians that I set out at the end of my literature review (Chapter 2), principally that such studies elide discussion of individuals' mundane work practices that constitute knowledge production, preferring to focus instead on abstract drivers and high-level social processes. In answering my main research question, therefore, I will complicate this literature by highlighting the micro-politics that animate librarians' Twitter practices and the effects of such work on knowledge production in HE.

To answer my main research question, I suggest that the central mechanism by which academic librarians produce knowledge via Twitter – and the practice that unifies the four categories of my theoretical framework – is through their negotiation of Twitter's promises for libraries. The most striking aspect of my research outcomes was that Twitter holds promises – i.e., perceived possibilities or capabilities – to secure a future for librarians as valid/valued actors in HE, including the capacity to create scholarly community, unfettered access to information and widespread appreciation for librarians' work. My research outcomes demonstrated that such promises animate much of my participants' Twitter work and subsequent knowledge production (cf. Granjou & Walker, 2016; Larkin, 2018). My participants' Twitter practices therefore embody what Hetherington (2016) terms the aspirational "future perfect" promise of infrastructure. This desired future is implicated in my participants' knowledge production and spans the four categories of my theoretical

framework. Table 6.2 summarises the promises of Twitter for my participants as aligned to the four mechanisms of knowledge production identified in Sections 6.2.1-6.2.4.

| Mechanism of Knowledge Production | Twitter's Promise for Librarians |
|---|---|
| Mobilising Invisibility | Librarians' work will be visible and appreciated in the university. |
| Translating Roots | Librarians will be able to facilitate access to trustworthy scholarly information. |
| Managing Scale | Librarians will be able to build meaningful relations with stakeholders. |
| Enacting Culturality | Librarians will be able to foster scholarly community. |

**Table 6.2: Twitter's promises for librarians aligned to the four mechanisms of knowledge production**

Furthermore, in accordance with studies that explore how KIs produce abstract notions such as 'biodiversity' (Taber, 2016) or 'the environment' (Blok et al., 2016), the answer to my main research question highlights how positive notions of 'the library' are the aspirational and performative effects of my participants' Twitter practices. I have noted throughout my research outcomes how my participants' efforts to assert relevance within the university is fraught with uncertainties, but my research outcomes also showed that such tensions are catalysts for further creative efforts via Twitter (cf. Ribes & Finholt, 2009). Considered through an infrastructural lens, therefore, notions of 'the library' in HE are seen to be emergent and somewhat fragile accomplishments requiring librarians' care and persistence to maintain. From this perspective, knowledge production in HE is thus not strictly limited to faculty and disciplines (cf. Bleiklie & Byrkjeflot, 2002; P. Trowler, 2012a). Instead, knowledge production is a contingent performance linked to sociomaterial priorities across a broad range of groups within the university (Fenwick & Edwards, 2014).

Of course, my theoretical framework primed certain interpretations of my research outcomes, and alternative explanations that my participants are merely engaging in service promotion via Twitter – a position advanced in the library-practitioner literature and, at times, by my participants themselves – could potentially be valid. However, my theoretical

commitments invite me to interpret my research outcomes critically as material conditions of knowledge production, acknowledging the significant socio-political context and performativity of academic librarians' work – a perspective which complicates the simplistic or absent depictions of librarians' work across the scholarly literature. Furthermore, though outside the scope of the present study, data about how researchers themselves interpret librarians' tweeting would enrich my conclusions about the performativity of librarians' Twitter practices. As I will discuss further in Chapter 7, however, my theoretical framework was useful for revealing aspects of librarians' work that are largely invisible from the outside and, for that reason, was a valuable tool despite limitations and alternative interpretations.

## 6.3: Contributing to the studies of the literature review

In this section, I discuss how the research outcomes of my study built on and contributed to the three areas of literature reviewed in Chapter 2:

- **Area 1:** Knowledge production of HE professionals

- **Area 2:** Roots of academic libraries' research support services

- **Area 3:** Academic libraries and Twitter

For Area 1, my study's main contribution is to draw attention to how HE professionals' mundane work practices are potentially implicated in knowledge production. For Area 2, my study's main contribution is to complicate simplistic tropes about drivers of libraries' research support services. And for Area 3, my study's main contribution is to explore the relationship between technology and professional values in librarians' Twitter practices.

In general, the three areas of literature are strong at highlighting particular social phenomena – e.g., coping strategies, support services, Twitter practices – but elide day-to-day material practices that sustain such phenomena. The areas of literature, moreover, rarely draw connections between mundane work and practices of knowledge production. For all three areas of literature, therefore, the overarching contribution of my study is to define routine work practices that can potentially lead to knowledge production for the university. In the sections below, I tie the mechanisms of knowledge production described in Table 6.1 to my specific contributions to the three areas of literature.

### 6.3.1: Contributing to research about HE professionals' knowledge production

In Section 2.2, I reviewed studies about HE professionals' practices of knowledge production. From my perspective, the strength of this literature lies in its discussion of HE professionals' strategies for coping with institutional tensions and consequential knowledge production. The principal limitation of the literature, however, is its elision of HE professionals' mundane work practices – an omission, I argue, that leads to impoverished depictions of HE professionals' agency.

In my review, I found two strategies relevant for understanding HE professionals' knowledge production: bridging units within the university and contesting role positionality.

In terms of bridging, several studies discuss the responsibility of HE professionals to translate and facilitate information flow between units of the university (Berman & Pitman, 2010; Karlsson & Ryttberg, 2016; Lightowler & Knight, 2013; Ryttberg & Geschwind, 2017; Warren et al., 2016; White & White, 2016). In common with these studies, particularly via the mechanism of *Translating Roots*, I found that my participants engage in translational activities by interpreting professional values/ethics to share knowledge widely – though the audience for my participants, unlike the kinds of HE professionals usually documented in these studies, is aspirational and less bounded. Similarly, three studies of HE professionals (Birds, 2014; Daly, 2013; Graham & Regan, 2016) explore generative outcomes of building relationships to further university priorities. My participants, likewise, via the mechanism of *Enacting Culturality*, strive to trouble institutional boundaries to create scholarly communities – efforts that are, however, somewhat more open-ended than the professionals documented in other studies.

In terms of contesting, several studies note that feelings of invisibility and/or conflict with academics' expertise lead to HE professionals' contesting stigmatisation and positionality in the university (Hockey & Allen-Collinson, 2009; Kensington-Miller et al., 2015; Shelley, 2010). In accordance with these studies, I found that my participants also assert their professional expertise via the mechanism of *Mobilising Invisibility* to ameliorate stereotypes, for example by deliberately striving to make their contributions visible in researchers' digital spaces.

Moreover and interestingly, three studies (Bennett, 2016; Birds, 2014, 2015) link HE professionals' hybrid identities to achieving university outcomes. My study, particularly via the mechanism of *Enacting Culturality,* similarly found a connection between my librarians' professional identities and knowledge production.

However, my study builds on the dominant narrative of the literature by addressing the paucity of data about mundane work practices that lead to knowledge production (notable exceptions being Graham & Regan, 2016; Stoltenkamp et al., 2017; White & White, 2016). Though the goal of this literature is to raise awareness of HE professionals' roles and identities, most narratives skirt how staff arrive at decisions to contest their positionality, determine how best to assert their authority and, thus, take action that produces knowledge for the university.

Three studies in particular that are deeply theoretical and rich in empirical data (Allen-Collinson, 2009; Kensington-Miller et al., 2015; Shelley, 2010) I believe could usefully be extended by my infrastructural perspective. Allen-Collinson (2009), for example, contends that university research administrators contest their marginalisation by leveraging fluid roles to craft positive narratives of their work; Kensington-Miller et al. (2015) argue that academic developers thrive by creatively using their liminal statuses to contribute to campus conversations; and Shelley (2010) posits a "shifting arena" of tensions where research administrators creatively question their positionality and assert expertise in university outputs. The research outcomes of my study, which focused on the relationship of knowledge production with entanglements of technology, notions of invisibility, professional values and cultural formations, would ground and broaden the largely discursive approaches to identity taken by these studies. My research outcomes, as exemplified in the mechanism of *Translating Roots,* for example, could enrich current conceptions of how HE professionals' interpretations of their role liminality – rooted in professional values and imbricated with technology use – manifest themselves in day-to-day work practices. Such a perspective reveals intricacies in HE professionals' contributions not only to university outcomes but to notions of their professions within HE. In other words, my infrastructural perspective across all four mechanisms of knowledge production that I have identified offers a nuanced sense of the chain of influences and consequences between mundane decision-making, professional roles and knowledge for the university. My research outcomes therefore help

unpack what is taken as apparent, neutral and 'just there' (in this case HE professionals' work) to better appreciate their active role in university outcomes.

## 6.3.2: Contributing to research about roots of academic libraries' research support services

In Section 2.3, I reviewed studies about the roots of academic libraries' research support services. From my perspective, the strength of this literature lies in its discussion of the socio-technological context of librarians' changing roles. The principal limitation of the literature, however, is its elision of details about librarians' mundane work practices that create and sustain new library services and which, in turn, generate knowledge for the university.

In my review, I found that three main drivers predominated: *technological changes*, *university research strategies* and *librarians' professional values*. Despite my frustration with the simplistic framing of these drivers, I concede that my study had broadly similar research outcomes. For example, in terms of technological change, in common with the studies under review (J. Cox, 2017; Eddy & Solomon, 2017; Eldridge et al., 2016; Epstein & Rosasco, 2015; McRostie, 2016), my participants discussed via the mechanism of *Translating Roots* the significance of changes in digital information provision and funders' mandates for open access on their Twitter practices – exigencies that tap into librarians' professional values to create unfettered access to information. Similarly, my participants also emphasised how their work on Twitter supported educational priorities of the university (Day, 2018; Haddow & Mamtora, 2017; Hollister & Schroeder, 2015; Hoodless & Pinfield, 2018; L. Lang et al., 2018). Finally, in terms of professional values, in accordance with the existing studies (R. A. Brown, 2015; Coombs et al., 2017; J. Cox, 2017; Stephan, 2018), my participants, also via the mechanism of *Translating Roots,* take seriously the role of their professional values in their Twitter practices, particularly in terms of creating scholarly, neutral and unfettered access to information.

However, despite the utility of identifying and disambiguating drivers of research support services, my study's research outcomes offered this body of literature a holistic perspective, joining up librarians' work practices with knowledge production for the university. My

study's principal contribution to this body of literature, therefore, is detailed exploration of the micro-politics, decisions and social effects of librarians' knowledge production.

To illustrate, I examine three studies that my research outcomes might usefully extend. In terms of the driver *technology changes*, Epstein and Rosasco (2015) cite democratisation of Internet searching as the impetus for a library programme to train departmental support personnel to perform first-level literature searches for faculty; in terms of the driver *university research strategies*, Novak and Day (2018) discuss how their library aligned the aims of the institutional repository with the priorities of the university to improve open-access publication of faculty research; and, in terms of the driver *librarians' professional values*, Coombs et al. (2017) credit success of library-initiated discussion groups about faculty research processes to librarians' traditional roles as neutral information brokers. Though it was not a priority of these studies to highlight invisible work practices, each would be strengthened by focusing on 'boring' decisions to create and sustain library services within the political milieu of the university, e.g., such as those highlighted in Section 5.4.2.1 (deciding to circulate information about ebooks) or 5.4.2.2 (deciding to create diversity resources). My research outcomes across all four mechanisms of knowledge production that I have identified addressed how librarians' interpretations of campus politics – grounded in professional values and imbricated with technology use – manifest themselves in day-to-day work practices, thus revealing intricacies in librarians' contributions not only to university outcomes but to notions of librarianship itself. My study thus revealed complicated political processes and highlighted the underlying contingency and fragility of taken-for-granted university institutions and knowledge (Fenwick & Edwards, 2014).

My infrastructural perspective therefore provides a better sense of the chain of influences and consequences between mundane decision-making, professional roles and knowledge for the university. Such a perspective therefore complicates teleological tropes about the causes of libraries' new services.

### 6.3.3: Contributing to research about academic libraries and Twitter

In Section 2.4, I reviewed studies about academic libraries and Twitter. From my perspective, the strength of this literature lies in its discussion of the content and engagement of

librarians' Twitter practices, setting important context for my study. The principal limitation of the literature, however, is its elision of tensions and politics that animate librarians' tweeting and, in turn, generate knowledge for the university.

In my review, I found two broad types of studies about libraries' Twitter use: content based and engagement based. In terms of content-based studies, the most common finding was that academic libraries use Twitter, in the main, to promote events, services, study spaces and collections (Al-Daihani & Abrahams, 2016). However, the studies also found that academic libraries' tweeting entails a strong theme of attempting to create scholarly communities of researchers (Gibradze, 2014; Harrison, 2017) using formal and academic language (Aharony, 2010). As discussed in earlier sections of this chapter, in agreement with such studies, via the mechanisms of *Translating Roots*, *Managing Scale* and *Enacting Culturality,* my participants similarly generate content with an eye to academic rigour and the creation of community connections.

In terms of engagement-based studies, the most common finding was that despite libraries' gold standard of conversations with students and researchers via social media, libraries tend to broadcast information more than foster participation and dialogue (Deodato, 2014; M. J. Jones & Harvey, 2016). In accordance with these studies, particularly via the mechanism of *Managing Scale,* my participants similarly expressed dissatisfaction between hoped-for Twitter benefits and engagement with desired constituents. This mismatch between intent and reality is a regular motif throughout my data and this body of scholarship.

However, despite similarities with my thesis, my study differs from the dominant narrative of this literature equating librarians' Twitter practices as service promotion or unsuccessful bids for engagement. Such simplistic depictions, I argue, overlook relationships between technology and professional values in librarians' social media practices and do not critically assess the context or social effects of librarians' tweeting. The research outcomes of my study, therefore – which explored the relationship of knowledge production with entanglements of technology, notions of invisibility, professional values and cultural formations – complicate such depictions.

For example, using three of the more empirically and theoretically rich studies under review, I discuss how my research outcomes could enrich their conclusions. Stewart and Walker (2017), for example, examined over 23,000 tweets from historically black colleges and universities in the United States and "found little evidence of two-way communication" (p. 6); Harrison et al. (2017) examined social media postings from six universities in the United States and found mainly promotional messages; and Huang et al. (2017) compared tweets from universities in the United States and China and found that Chinese libraries have higher rates of user engagement. By focusing exclusively on textual and network analyses of Tweets, however, these studies paint pessimistic pictures of librarians' Twitter work. Conversely, my research outcomes in Chapter 5 showed salient examples of Twitter's significance even without conversational engagement, such as in Section 5.2.2.2 where my participants discuss the importance of reaching out to research groups and in Section 5.5.2.2 where my participants discuss the effects of Tweeting on their professional identities. Applying the research outcomes of my thesis to these studies across all four mechanisms of knowledge production that I have identified – which showed librarians' actively negotiating institutional tensions, translating their professional values in contemporary contexts, striving to influence community formation and, in the process, asserting their authority and expertise – would therefore necessarily complicate such simplistic portrayals.

An infrastructural perspective, therefore, highlights the chain of influences and consequences between mundane decision-making, Twitter practices and knowledge for the university. Such a perspective situates librarians and their work in larger contexts and, thus, complicates depictions of librarians' Twitter practices as promotional and unsuccessful. Similar to the case of HE professionals discussed in Section 6.3.1, my research outcomes helped unpack what is taken as apparent, neutral and 'just there' (in this case librarians' social media work) to better appreciate its active role in university outcomes.

## 6.4: Alternative interpretations

In this chapter, I have discussed my findings in line with the priorities of my thesis to explore the values and politics at the heart of librarians' KIs. In the next chapter, in Section 7.3, I extend these findings with an enhanced view on how the categories of my theoretical framework are related. In this section, however, I would like to return briefly to the

alternative conceptual frameworks introduced or discussed in my thesis and explore how they might complement my findings and frame future research directions.

In Section 3.1, I recounted how I chose the theory of KIs to inform my thesis because of its overarching concern with the material practices of knowledge production. I also discussed that before settling on KIs, I explored other theoretical approaches, many of which I still believe are relevant to my interests. It is a useful thought experiment, therefore, to consider how three of the most pertinent frameworks I discussed in that section might have broadly augmented my findings:

- **Professional identity and technology** (Stein et al., 2013). With its focus on the role of material artifacts in individuals' identity performances, this approach might have illuminated how my participants' professional identities shift vis-à-vis social media and a rapidly changing HE context. Future research on expertise engendered through librarians' work on KIs might usefully engage this body of theory to help explain the evolution and multi-faceted nature of librarians' professional subjectivities.

- **Practice theory** (Feldman & Orlikowski, 2011). Broadly, practice theory, with its focus on situated, patterned, and habitual ways of knowing and acting, might have helped to illuminate my participants' specialised knowledge of and actions taken while using social media. Future research on librarians' infrastructuring might usefully engage practice theory to inform fine-grained ethnographic investigations of librarians' daily work.

- **Epistemic cultures** (Knorr Cetina, 2007). With its focus on the 'machineries' – i.e. organisational structures – of knowledge production in the sciences, the theory of epistemic cultures might have helped illuminate the values and relationships implicated in my participants' acquisition and reproduction of professional knowledge. Like practice theory, future research on librarians' work might usefully employ the theory of epistemic cultures to help explain librarians' mundane professional knowledge practices.

All three perspectives, therefore, might illuminate my findings in fruitful ways and undoubtedly will inform my future research.

Finally, two further conceptual frameworks were mentioned in my text, and while not formally evaluated as potential theoretical frameworks for my analysis, are unquestionably relevant for future research on academic librarians' changing roles. Firstly, Abbott's (1988) model of labour, discussed in Section 1.2.1 with reference to librarians' fraught positionality

in HE – and which posits that professional groups struggle for jurisdiction over knowledge domains – might usefully have drawn attention to the situated nature of my participants' social media practices. As outlined in Section 1.2.1, tensions associated with rapid technological changes, neoliberal performance measures and persistently outmoded perceptions of libraries have compelled academic libraries to undertake initiatives within institutions to draw attention to the value of librarians' work. Abbott's perspective argues that often such efforts take the form of consolidating and taking ownership of previously un-associated areas of work. My participants displayed similar agential and creative assertions of authority and expertise via social media in their efforts to change perceptions and make librarians' work visible. Abbot's conception is therefore a useful supplement to put a finer point on the chain of influences and consequences between my participants' mundane decision-making, their Twitter practices and knowledge production for the university.

Secondly, in Section 2.1.2, I discussed my use of Whitchurch's (2008b, 2009) frameworks about the changing roles of HE professionals, particularly her notions of 'blended' or 'third space' HE professionals, to identify those empirical studies I examined within my literature review. Significantly, Verbaan and Cox (2014), in their study of academic librarians' new roles in research data management, have illustrated that Whitchurch's conceptualisations can usefully inform our understanding of librarians' positionality in HE. That is, similar to other HE professionals, academic librarians increasingly claim or capitalise on blurred boundaries between academics and staff, thus asserting new roles and areas of expertise. This liminal and fluid 'third space' clearly holds many possibilities for academic librarians to redefine or redirect their remits in HE. Whitchurch's concepts will therefore be useful in future studies of mine for situating and explaining librarians' practices in the rapidly changing HE landscape, particularly for comparing librarians' experiences with those of other HE professionals'.

## 6.5: Conclusion

To conclude, in this chapter I answered my research questions about librarians' practices of knowledge production in HE and demonstrated the contribution of my research outcomes to literature about HE professionals and academic librarians. My principal claim is that the promise of infrastructure, i.e., its aspirational "future perfect" mode (Hetherington, 2016), is implicated in librarians' practices that produce knowledge via Twitter. As discussed throughout this chapter, my participants' Twitter practices are mobilised by a fluctuating

sense of (in)visibility in HE and rooted in modern interpretations of professional values. Such practices – which I argue are assertions of librarians' authority and expertise – strive moreover to create scholarly community, ideally by engaging in meaningful dialogue with researchers and, in the process, to produce a degree of parity and appreciation for librarians' work.

My holistic focus on the mundane micro-practices of knowledge production complicates depictions of librarians' work as inconsequential or rooted in teleological drivers. Moreover, my focus on the 'boring' practices of designing and maintaining infrastructure, i.e., infrastructuring, emphasises the active role played by librarians and other HE professionals in university outcomes. Seen in this light, such individuals are not passive recipients of infrastructure but its productive actors (cf. Blok et al., 2016, p. 17). As Appel et al. (2018) contend, when scrutinising infrastructure, "an attention to the practices of low- and mid-level administrators and technicians challenges any easy characterizations of technopolitics as exercised from afar" (p. 13).

As my study exemplifies, KIs – and, by extension, infrastructures generally – are not merely background support systems, but constituted of individuals' practices and sites for negotiations of values and tensions (Karasti et al., 2016c, p. 4). I contend that exploring these largely invisible material conditions of knowledge production is crucial for appreciating the nature and possibilities of knowledge in the contemporary HE context

In the final chapter of the thesis, I further develop the implications of these conclusions and revisit the questions of research quality explored in earlier chapters.

# Chapter 7: Conclusion

*Foregrounding the infrastructure, analytically speaking, allows the examination of otherwise unnoticed or naturalized forms of marginalization, exclusion and inequality.* (Hine, 2020, p. 27)

*Knowledge is revealed to be, not a body or an authority, but an effect of connections performed into existence in webs of relations that are worked at, around and against constantly.* (Fenwick & Edwards, 2014, p. 48)

## 7.1 Introduction

The aim of this study was to discern academic librarians' practices of knowledge production in HE via Twitter. In the present chapter, I conclude my thesis by summarising the answers to my research questions and discussing the explanatory power of my theoretical framework. I furthermore revisit the methodological concerns set out in Chapter 4, highlight the original contributions of my research and explain the wider implications of my research outcomes. Finally, I close the chapter by outlining future areas of research and submitting my personal reflections on the significance of infrastructural studies.

## 7.2: Summary of research outcomes

To underpin the narrative of this chapter, I first provide a short, accessible summary of my research outcomes as presented in Section 6.2. My principal research outcome was that as academic librarians negotiate the promises of Twitter, they create knowledge in HE. By 'negotiate promises,' I mean that for librarians, Twitter holds the potential, or offers possibilities, of operationalising traditional values of librarianship, such as intellectual freedom and information sharing, in the modern socio-political context of HE. As librarians manifest their principles in the digital space of Twitter and manage the successes and disappointments of such efforts, they hope to foster scholarly community, unfettered access to information and appreciation for librarians' work.

Referring to my conceptualisation of knowledge presented in Section 1.1.3, my research outcomes highlighted librarians' mundane practices of knowledge production, elucidating a quiet but significant area of knowledge creation in HE. In this picture, knowledge production is not strictly tied to faculty or academic disciplines (Bleiklie & Byrkjeflot, 2002; P. Trowler,

2012a), but instead is seen to be an effect of fluid and dynamic relationships between people, material conditions and situated contexts (Fenwick & Edwards, 2014). My research outcomes, for example, have highlighted such disparate forms of librarians' knowledge production as announcements about new academic resources (Section 5.3.2.1), information intended to spark connections between researchers (Section 5.5.1.2) and reflections on navigating the complexities of modern scholarly communications (Section 5.3.1.2).

With the aim, therefore, of demonstrating librarians' infrastructuring, i.e., activities to design and maintain infrastructure and associated social effects (Karasti et al., 2018), my study's research outcomes thus demonstrated the entanglement of technology, socio-political context and professional values that contribute to academic librarians' knowledge production, as summarised by the following four practices:

- **Mobilising Invisibility:** Librarians use their sense of invisibility in HE to justify their Twitter content and practices.

- **Translating Roots:** Librarians translate values/ethics of librarianship via Twitter to assert expertise and attain future goals.

- **Managing Scale:** Librarians attempt to understand and manage the extent of their Twitter activities, in the process building relations and disseminating information.

- **Enacting Culturality:** Librarians promote connections between researchers, helping create scholarly community and broadening the circulation of librarians' expertise.

By means of these overlapping mechanisms, librarians create knowledge via Twitter and, thus, their work can be characterised as knowledge infrastructures (KIs) according to Edwards' (2010) definition of "networks of people, artifacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds" (p. 17). Contrary to arguments in the library-practitioner literature that librarians' Twitter efforts are mainly about service promotion and failed attempts at user engagement, my study emphasises the performativity of librarians' Twitter practices including the knowledge such practices produce and the agencies such practices make available.

## 7.3: Utility of the theoretical framework

The strength of my theoretical framework, therefore, was its holism, i.e., its insistence on complicated relationships between the design and consequences of infrastructure. However, such holism was also a drawback in terms of analysing my data. Qualitative data tends to be rich and complicated, providing many angles from which to tell a cogent story (Tracy, 2012). Indeed, early on, as previously acknowledged in Section 4.5.2, I noticed that my four categories of infrastructure (Invisibility, Values, Scale and Culturality) were not empirically distinct; instead, I observed significant overlap and mutually constitutive relationships. For example, librarians' sense of invisibility is intertwined with professional values (Roots) and the extent of librarians' information dissemination (Scale), and so on. This was vexing at first, particularly as I had wanted 'clean' categories to conduct my data analysis. I eventually realised, however, that far from being redundant and unproductive, the overlapping aspects of my categories were in fact *the point* of infrastructural theory and, therefore, reflected different facets of the complicated social dynamics that infrastructure engenders.

Disaggregating my findings in Chapter 5 into four sections based on my theoretical categories enabled me to highlight the analytical utility of my framework, tease out the values and politics at the heart of knowledge infrastructures and delineate my participants' infrastructuring practices. However, three salient examples from my data illustrate inextricable links between the four categories of my theoretical framework and offer a complementary perspective on my findings (the sub-themes discussed below are summarised in Table 5.1). *Note in each case how Invisibility and Roots serve as the foundations for the performative effects of Scale and Culturality*.

The first example concerns the sub-theme *Building relations with stakeholders* which I presented in Section 5.4.1.2 as part of the category of Scale:

> *I've got a slow-burn strategy about building connections and making relationships and getting more conversational. At the moment, I still think we're too broadcast, but I think it's one of those things that develops over time. If I were to try to improve it, which I am trying to do, it would be to be more about finding individual academics, individual researchers and connecting with them and getting involved in conversations with them that aren't necessarily just about library resources but are more about their research workflows, their outputs, any concerns they may have about the research life cycle or the publication process, anything like that. That's more kind of back and forth, but again I think that's something that will come with*

*time and it will come with more face to face interaction, as well as online interaction, so the more we do these drop-in sessions that people come to, the more people I get to follow on Twitter as a result of that and that snowballs.*

My rationale for associating this quote with Scale was my participant's emphasis on the purposeful way that Twitter networks are built over time, which resonated with theoretical discussions of the nature of infrastructure as something that grows slowly through the piecemeal accretion of technologies and practices. However, the empirical data also implicates other categories of my theoretical framework. For example, when the participant discusses the need to engage academics in discussions "that aren't necessarily just about library resources but are more about their research workflows…," this touches on Invisibility in terms of the sub-theme *Projecting the message that libraries are more than collections of books* and Roots in terms of the sub-theme *Producing academic tweets*. Moreover, the quote overall also implicates Culturality in terms of the sub-theme *Changing librarians' relations with researchers.* Therefore, we might holistically claim that as librarians produce academic tweets and thereby attempt to project capabilities beyond book curation, they build and change relationships with researchers.

The second example concerns the sub-theme *Expanding conversations beyond Twitter* which I presented in Section 5.4.2.2 as part of the category of Scale:

*At the moment we're engaging really quite well with some of our MPhils, our engineering for sustainable development MPhil group, a lot of their followers are on Twitter and re-tweet what we put out and respond, and their course coordinator, in particular, responds a lot and ... and we have conversations about different things. I think the most recent one was, I've forgotten what the tweet was about, but it ends up being a thread about diversity in engineering which was really interesting and we're actually, on the back of that, we're planning to create some diversity in engineering resources which we're looking at sort of Michaelmas term time to start thinking about doing that, but maybe there'll be some drop-in sessions, maybe there'll be some kind of light touch research to see what people think of the idea and how best to respond to it so that's interesting.*

My rationale for associating this quote with Scale was my participant's discussion of how conversations on Twitter sparked face-to-face drop-in sessions and educational resources on the topic of diversity in engineering. However, the empirical data also implicates other categories of my theoretical framework. For example, when the participant mentions that "maybe there'll be some drop-in sessions, maybe there'll be some kind of light touch research…," this implicates Invisibility in terms of the sub-theme *Hoping that being online leads to bigger roles in university life*, Roots in terms of the sub-theme *Creating a welcoming*

*hub* and Culturality in terms of *Leveraging social networks*. Therefore, we might holistically assert that as part of librarians' efforts to play larger roles in university life, they leverage existing social networks to create welcoming hubs, thus expanding their conversations beyond Twitter.

The third example concerns the sub-theme *Changing librarians' relations with researchers* which I presented in Section 5.5.1.3 as part of the category of Culturality:

> *I think there's a great kind of flattening out that something like Twitter can help with. You know, you can engage with academics, researchers, students, you know, world-leading people in their field all on a very similar level and it, I like the way that kind of levels the hierarchy a little bit, particularly in a place like Cambridge. So, I think it kind of, it could hopefully change people's perceptions of who we are, what we do, what we can do and I think it's changed the way I relate to our audience as well because researchers who I follow on Twitter are just ... a person I follow on Twitter. So I think it kind of levels it, which is great, I appreciate that.*

My rationale for associating this quote with Culturality was my participant's emphasis on Twitter's ability to blur hierarchical social distinctions between librarians and academics. However, the empirical data also implicates other categories of my theoretical framework: Invisibility in terms of the sub-theme *Projecting the message that librarians are academic*, Roots in terms of the sub-theme *Creating a welcoming hub* and Scale in terms of *Having meaningful conversations*. Therefore, we might holistically posit that as part of librarians' efforts to create welcoming hubs and have meaningful  conversations with members of the university, librarians try to project the message that they are academic, thus often changing librarians' relations with researchers.

As can be seen from the above quotes, my participants' perspectives are rich, complicated and not easily compartmentalised. Instead of classifying the quotes individually as exemplars of Scale or Culturality, as I did in Chapter 5, the integrated possibilities presented above 'ring true' and reflect the overlapping nature of my theoretical concerns. In other words, despite the disaggregated portrayal of my theoretical categories in Chapter 5, the four categories are interdependent and together synergistically form my participants' practices of knowledge production. This more dynamic analytical perspective, I suggest, is useful for appreciating the richness and complexity of my empirical data and my participants' practices. Nevertheless, I feel that my decision to present the theoretical categories separately in my Findings chapter

was warranted based on the priorities of my study to tease out and highlight the values and politics at the heart of knowledge infrastructures.

Significantly, however, as discussed above, my participants' quotes illustrate how the categories of Invisibility and Roots are foundational to Scale and Culturality. Seen through the frame of instrastructuring (i.e., the doing and making of infrastructure), therefore, I would like to suggest that as my participants navigate aspects of their invisibility in HE and ground their social media work in situated professional values, they broaden the reach of their Twitter networks, thereby altering relationships with stakeholders. Figure 7.1 depicts the shared features of the four categories of my framework as reflected in the complexity of my empirical data:
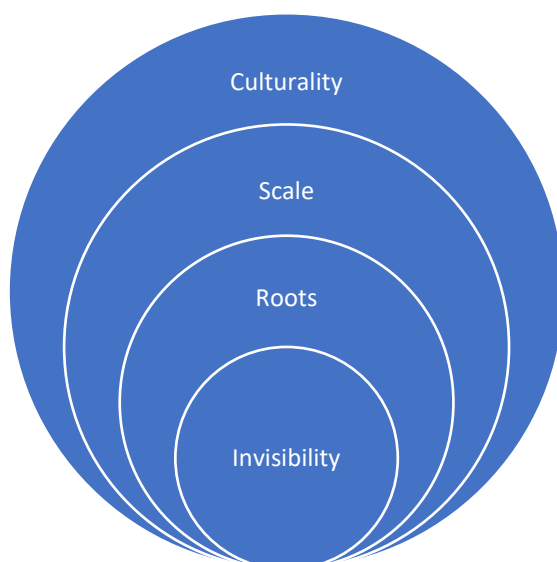


**Figure 7.1: Relationship of the four categories of the theoretical framework**

Future studies of mine that employ my theoretical framework will be alert to subtleties in how the categories are imbricated and interdependent, which will lead, I feel, to richer representations of individuals' infrastructural practices.

## 7.4: Research quality

In this section, I revisit criteria for evaluating research quality set out in Section 4.6: *rich rigour*, *sincerity* and *credibility*. I also address my study's limitations. As discussed in Chapter 1, my observation that HE scholarship overlooks librarians' contributions motivated this

study; and my background in anthropology inclined me to foreground individuals' practices and agency. I discuss how these biases influenced my research outcomes in the paragraphs below.

In terms of *rich rigour*, defined as generating an abundance of data through appropriate frameworks and methods (Tracy, 2010, p. 841), I created a plethora of data including 255 pages of transcripts and 12 spreadsheets of diaries and Twitter Analytics reports. Moreover, my combination of inductive/deductive data analysis yielded several useful themes. However, in retrospect, framing my study as 'multi-sited ethnography' was superfluous. Though the methodology helped me to conceptualise relationships between libraries and weigh the politics of bounding field sites, ultimately – because Twitter practices inherently span digital and physical realms – multi-sited ethnography did not explicitly shape my analysis to the extent that I had anticipated. I likely would have drawn similar conclusions couching my study in broader 'qualitative' or 'interpretive' framings.

In terms of *sincerity*, defined as investigators' honesty about personal biases and shortcomings of their research (Tracy, 2010, p. 841-42), I was conscious that the grievance that sparked this study tended to focus my attention on librarians' active contributions to university priorities. I have, however, where relevant tried to show tensions and ambivalences in librarians' practices, for example in Section 5.4.2.1 where my participants discuss concerns that their Twitter work is merely 'shouting into the void.' I have moreover been clear where I felt my data-generation methods did not proceed smoothly – which happened at many junctures (such as asking participants to keep their diaries for too long and the unavoidable problems at my focus group, as discussed in Section 4.4). Such sincerity does not guarantee a strong study, but it does indicate awareness of how "any method of documenting social interaction is a culturally biased, human, interpretive and selective process" (O'Reilly & Kiyimba, 2015, p. 66).

In terms of *credibility*, defined as a study's truthfulness, dependability and congruence with reality (Tracy, 2010, pp. 842-844), I enhanced research plausibility by presenting a variety of data generated via different methods and verified through member-checking exercises. I also was candid about the nature of insider research (discussed in Sections 1.8.4 and 4.6.2). Though undoubtedly being my participants' colleague meant shared understandings about

librarianship, 'insiderness' did not automatically bestow rapport or trust. On the contrary, our range of seniority and the thicket of workplace politics meant that our discussions were sometimes a bit prickly. A salient example of such tensions related to disagreements more broadly across Cambridge libraries of the appropriateness of multi-disciplinary college libraries (which I am from) in offering training for students from specific disciplines. Such 'turf wars' sometimes edged into our discussions even if they were not acknowledged directly. Untangling the complicated strands of my participants' responses thus sometimes proved difficult despite my efforts to maintain critical estrangement.

Arguably, a principal limitation of my study is its generalisability, especially given my small sample, single location and associated contextual differences between 'Oxbridge' libraries and other UK university libraries, as discussed in Section 1.7.1. Moreover, two years passed between collecting my data and finalising the thesis and aspects of the social media landscape can change rapidly. However, seen from the perspective of the related notion of transferability, i.e., whether research outcomes seem truthful and encourage critical perspectives (Lincoln et al., 2018), I believe my study can achieve that. A more pressing limitation is that, given my relational view of infrastructure – i.e., that systems are only infrastructural in relation to organised practices (Star, 2002) – I did not interview researchers about their perceptions of librarians' tweets. Having such information might lend veracity to my claims that librarians' work is infrastructural. Such interviews were outside the scope of the present study, however, but offer rich possibilities for future research.

In sum, throughout this study, I have been honest about my convictions, personal position and research limitations. Such sincerity does not ensure research quality – indeed, it could be interpreted as superficial reflexivity to satisfy performance expectations for qualitative research (cf. Pillow, 2003). However, I hope I have demonstrated awareness of the core role that values, ideology and power dynamics have played in shaping the arc of my study.

## 7.5: Contributions to knowledge

Despite the limitations discussed in the previous section, my thesis claims four core contributions to new knowledge. Firstly, my theoretical framework is an original contribution to social perspectives of infrastructure. Most empirical studies of KIs use Star and Ruhleder's

(1996) eight dimensions of infrastructure (discussed in Chapter 3) as conceptual backdrop, but not as an analytic framework. I found Star and Ruhleder's holistic list compelling, but unwieldy as a heuristic tool because its many points interlaced extensively. My distillation, which I believe preserves the intent and spirit of Star and Ruhleder's assertions, thus represents an original and pragmatic approach for highlighting and analysing KIs' hidden and performative characteristics.

Secondly, my research outcomes, as shaped by my theoretical framework, contributed original perspectives to the three areas of literature reviewed in Chapter 2. As I have noted, the three areas of scholarship tend to elide connections between mundane material activities and knowledge production in HE. The overarching impact of my study, therefore, is to define patterns of work practices – i.e., new "cognitive divisions of labour" (Bowker, 2016) – amongst librarians and other HE professionals that potentially lead to knowledge production for the university.

Thirdly, I have devised an original way to describe academic librarians' contributions to HE in the digital age. Researchers such as Pinfield et al. (2017) and Dempsey (2017) argue that academic librarianship increasingly entails knowledge production, not just information storage and retrieval. Instead of framing such new responsibilities in the simplistic language of 'drivers,' as does much of the library-practitioner literature (reviewed in Section 2.3), my study foregrounds the material conditions of librarians' knowledge production by putting interactions with infrastructure – in my case, negotiating the promises of infrastructure – at the heart of the analysis. My framework thus enables a critical, situated and agential portrait of librarians' knowledge creation, shifting conversations in the library-practitioner literature from an emphasis on drivers and services. Furthermore, foregrounding the sociomaterial factors shaping librarians' new roles serves to illuminate aspects of the wider HE context rarely discussed in the HE literature.

Finally, my study contributes new perspectives on knowledge creation in HE generally, an area of HE scholarship that researchers such as Tight (2012, p. 175), as discussed in Section 1.1, assert needs greater attention. A principal contribution of my research outcomes was to demonstrate that knowledge production in HE is not strictly limited to faculty and disciplines (cf. Bleiklie & Byrkjeflot, 2002; P. Trowler, 2012a), but instead is often a devolved

performance tied to sociomaterial priorities across a broad range of groups within the university (Fenwick & Edwards, 2014). This perspective also thus complicates "othering dualisms" (Macfarlane, 2015) in HE such as that of academics versus non-academics (Sebalj et al., 2012), a point taken up in the discussion below about the wider implications of my study.

## 7.6: Wider implications

My study's contributions suggest some implications for research, practice and policy. Firstly, in terms of research, I noted in Section 1.2.1 the near invisibility of librarians' work in the HE literature, despite library-practitioner studies that assert librarians' contributions to student and researcher success (Delaney & Bates, 2015; Oliveira, 2018). For the HE research community, my research outcomes demonstrated the productive possibilities of exposing "socially produced silences" (Rosiek & Heffernan, 2014, p. 726) in HE. In other words, I suggest that investigations into seemingly mundane and taken-for-granted aspects of HE – similar to Beaulieu and Høybye's (2011) exploration of 'boring' email lists mentioned briefly in Section 1.2.2 – can uncover not only surprisingly complicated and consequential social dynamics but also the structures that shape the silences in the first place. Similar concerted efforts to probe the contributions of HE professional groups would likely reveal more such omissions. Infrastructural theory, therefore, which foregrounds invisible work and provides critical perspectives on social context, is an apt starting place. For similar reasons, infrastructural theory can also enrich the library-practitioner literature that, as noted throughout this study, has historically been under-theorised (Kumasi et al., 2013) and largely focused on service improvements.

Secondly, in terms of practice, my study argues that infrastructure is contingent, comprised of individuals' decisions and with performative effects on socialities and agencies, which in turn affect the nature of the infrastructure (Jensen & Morita, 2017, p. 620). Infrastructure, therefore, does not present a monolithic us/them binary. Consequently, if infrastructure is a fragile accomplishment rooted in individuals' practices, then outwardly monolithic phenomena in HE – such as learning analytics, VLEs, MOOCs and Turnitin – are perhaps not nearly as powerful, permanent or insidious as we might believe (cf. Jackson, 2015; Johanes & Thille, 2019; Seaver, 2018). An infrastructural perspective affords us the ability to see systems as contingent, malleable and, ultimately, ephemeral – or not – but the

infrastructural perspective allows for such possibilities. As Appel et al. (2018) contend, when scrutinising infrastructure "an attention to the practices of low- and mid-level administrators and technicians challenges any easy characterizations of technopolitics as exercised from afar" (p. 13). For my fellow academic librarians, I would hope such an understanding offers empowerment and motivation to contest perceived repressive systems within HE.

Finally, in terms of policy, the increased understanding offered by my study of the contributions of "invisible workforces" (Rhoades, 2009) in HE to university outcomes indicates the need for better integration of such professional groups into university strategic policies. As many reports have noted, HE professionals with advanced degrees outnumber academics in modern universities and are the fastest-growing segment of HE employees (Whitchurch, 2013). As my research outcomes have demonstrated, blind spots to the influence of such professionals risks missing their important impact on universities' strategic efforts. How to foster a productive environment of respect and trust (Szekeres, 2011, p. 689), however, is an open question, but might be cultivated with more empowerment and capacity building for HE professionals (Veles & Carter, 2016). Pessimistically, however, V. Trowler (2014) and Szekeres (2004) both argue that even if 'found,' HE professionals, forever branded not-academic, will be unable to participate fully in the dominant discourses of academia. An important first step then, in my opinion, is to raise awareness of – and take critical perspectives on – HE professionals' creative patterns of work.

## 7.7: Conclusions

In this final section, I propose three areas for future research and argue for the urgency of infrastructural studies of HE.

Social media, including Twitter, is increasingly ingrained in everyday life (Markham, 2018) and used widely across HE for a variety of purposes (Fenwick, 2014; Selwyn & Stirling, 2015). For academic librarians, social media represents an opportunity to disseminate useful and timely information to a wide swathe of university users (Mahmood & Richardson, 2013). Social media, indeed, is often students' and researchers' first contact with libraries.

As technology such as social media has evolved, academic librarians have diversified their core services to include knowledge production, not merely collection curation (Dempsey, 2017; Pinfield et al., 2017). My study's core assertion is that academic librarians' Twitter practices are knowledge infrastructures and, furthermore, that infrastructural theory is useful for highlighting practices of knowledge production in HE. Based on my research outcomes, and the study's limitations discussed in Section 7.4, there are three main areas of future research that my thesis suggests.

1. Given more than 20 years of research on the nature of infrastructure in STS and anthropology, a thorough review and classification of notions of infrastructure in the HE literature would create a robust base on which to conduct further research. At present, no such interdisciplinary review exists, but such a review would have been useful for my study as I grappled to appreciate infrastructure as fluid and contingent, not simply as a background support system or sinister force with which to contend.

2. To refine my theoretical framework and understand its applicability across various HE contexts, similar studies of hidden work in academia such as the infrastructuring of learning spaces, learning management systems, learning analytics, plagiarism detection systems and package 'deals' with publishers to provide electronic access to journals would be constructive. Infrastructural theory, thus far, has not been applied widely to these areas (though see Williamson, 2018, for an application of infrastructural theory to learning analytics systems), and such investigations would help refine the utility of my framework for future researchers.

3. Future work related to my thesis would benefit from knowing how researchers utilise librarians' tweets. In the present study, I deliberately avoided classifying participants' tweets into knowledge categories as this would have implied a static view of knowledge at odds with my conceptualisation of knowledge as dynamic and fluid and infrastructure as relational (i.e., systems are only infrastructural in relation to organised practices). However, a better sense of how librarians' tweets shape researchers' practices would further enrich and lend complementary perspectives to my argument, thus expanding our understanding of knowledge production and use in the modern HE context.

Infrastructural theory, thus, offers the possibility of bringing critical perspectives to scholarship about academic libraries and HE, highlighting the contingency and agency at the heart of university work often perceived as static and monolithic. In my study, I have demonstrated a small way that academic librarians produce knowledge using Twitter, but such invisible work is a tiny fraction of librarians' ongoing infrastructural work in HE which also includes designing and maintaining archives, digital libraries, online catalogues, open-access repositories and metadata schemes. Such work of academic librarians has, in turn,

significantly shaped the scholarly landscape (Borgman, 2003). As Manoff (2015) argues, it is thus imperative to understand the "conditions that determine what can be accessed, purchased, owned, and preserved as well as the technologies that shape…what can be asked and how" (p. 275). Infrastructural theory is well positioned to ask such questions about the "socio-material-technical-political" (Simonsen et al., 2019, p. 6) conditions of knowledge production.

In closing, infrastructure is necessary for human activity and fundamental to social organisation (Star, 2002, p. 116). As researchers, we should naturally be wary of 'infrastructure' as a buzzword (Edwards et al., 2011, p. 1412) and alert to overstretching the concept (Lee & Schmidt, 2018). On the other hand, given the centrality of networked technologies for research (Borgman, 2010), scholarly communication (Bowker, 2016) and teaching and learning (Ludvigsen & Steier, 2019), foregrounding infrastructure and theorising its relationship to the ecology of activities in HE seems essential. As C. Jones (2015) asserts, "The university has proved to be a black box, assembled out of a variety of competing interests, material and social constraints and an array of loosely coupled technological systems" (p. 137). Understanding how the infrastructuring of such assemblages constitutes the complexities of the modern university seems vital as we move into the third decade of the 21$^{st}$ century.

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