The Nature of Information: an analysis of the historically situated socio-cultural assumptions concerning the nature of information under changing technological conditions of its production, reproduction, dissemination and use.

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Statement of originality

This narrative commentary along with the research outputs listed in Appendix A has been submitted in partial fulfilment of the requirements for the award of Ph.D. by Prior Output at London Metropolitan University. Both the commentary and the outputs are the sole work of the candidate. No part of this submission, including outputs, narrative, footnotes, and appendices, has previously been submitted for award elsewhere.

Abstract:

This narrative commentary in combination with the research outputs listed in Appendix A has been submitted for the award of Ph.D. by Prior Output at London Metropolitan University. The commentary summarises the coherence, context, and original contribution of the submitted research.

The research presented in this submission reflects work over a period of about ten years. It addresses the nature of information under conditions of its digital production, reproduction, dissemination and consumption. The central thesis of the research is that digital technologies have destabilised traditional assumptions concerning the nature of information. While not fundamentally altering the nature of information itself, technological change has transformed the social, cultural and professional contexts in which information is embedded and used. This change has epistemological, ontological and socio-cultural aspects, each of which is addressed within the research.

The research is broadly situated within a post-structuralist perspective, but is eclectic in its use of theoretical paradigms for their capacity to reveal aspects of a problem, rather than to provide final or foundational claims. It emphasises subjective meanings and experiences over final or foundational theories.

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This submission is dedicated to the memory of Edward Dudley, head of the School of Librarianship and Information Studies at North London Polytechnic, 1961 – 1980.

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1. Introduction to the research

This critical commentary, in combination with the submitted research outputs listed below (Appendix A), comprises a submission for the award of Ph.D. by Prior Output at London Metropolitan University. In accordance with the published guidelines for that award (London Metropolitan University, c. 2011; c. 2012), it therefore aims:

- To set the submitted work in context;
- To demonstrate that the work constitutes a coherent whole;
- To state the independent and original contribution to knowledge that has been made.

The commentary places the submitted outputs into theoretical and disciplinary contexts, analysing their relationship to the field of Information Science (s. 2; s. 3)**.** Where appropriate the commentary goes beyond the outputs to contextualise the beliefs, experience, and values that have informed them. Coherence is traced through five substantive research themes (s. 3). These interdependent themes do not exhaust the various topics addressed by the outputs, but arise out of a single thesis concerning the nature of information (s. 2), and delineate some implications of that thesis. The independent and original contribution to knowledge is presented in disciplinary and substantive terms throughout this narrative (particularly s. 3) and summarised in the conclusion (s. 4).

In accordance with the guidelines for the award, each of the selected outputs was originally *published* in the "various conventional meanings of published" (London Metropolitan University, c. 2011). The submission comprises two book-length monographs (**Output A; D**), two scholarly chapters in edited collections (**Output G; H**) and five scholarly articles in peer-reviewed journals (**Output B; C; E; F; I**). Each has been open to critical academic peer scrutiny, including peer review (**Output B; C; E; F; G; H; I)**, independent external research evaluation (**Output D; E; F; G**)[1], and post-publication critical review in academic and professional journals (**Output A; D;** see: Appendix C). The outputs are both part of "part of a common academic corpus" and "located in an academic discourse" (London Metropolitan University, c. 2011) associated with an established scholarly field, in this case Information Science (s. 2). The outputs do not represent the complete published work of the researcher (cf. Appendix B) but "a sub-set that presents a coherent and linked original contribution" (London Metropolitan University, c. 2011) developed in this narrative commentary (s. 3). Bibliographic details of the selected outputs are presented in Appendix A, and a full list of outputs produced during the period is presented in Appendix B[2].

[1] **Outputs D, E, F** and **G** were included in the London Metropolitan University submission to the Unit of Assessment 36 of the Research Excellence Framework 2014.

[2] References to outputs comprising the submission are given in bold throughout and as listed in Appendix A (e.g. **Output A** through **Output I** inclusive). References to other scholarly and research work by the author provided for context and/or further information are given in normal weighted font following the Harvard method. All outputs referenced directly in the text, footnotes, or appendices are included in the bibliography and in Appendices A and/or B. Cross-references between different parts of the critical commentary are given by section and where relevant by subsection number (e.g. s. 2; s. 3.2).

2. Contexts for the research

The research addresses the nature of information in the digital age[3]. In the research the nature of information refers to its structure and organisation (broadly, ontology)[4], its capacity to generate meanings and knowledge (epistemology) and the uses to which it is put both within society generally, and within particular social practices (socio-cultural context). The thesis threaded through each output is that one significant consequence of the proliferation of digital technologies has been a shift in tacit understandings about the nature of information, and in turn tacit conceptions of both the nature of knowledge and the nature of knowing. This shift is conceptual and does not involve a fundamental change in the objective nature of information itself; instead the research analyses changes in the ways in which the nature of information is *framed, understood* and *marshalled* within the various social practices associated with digitality (cf. **Output A**: 18-23). These social practices include those academic and professional discourses with which my research explicitly engages; principally: Information Science, Librarianship, Computer Science, Information History and Digital History (**Outputs A - I).** They also include aspects of popular culture that are analysed by the outputs, such as fiction, film, television, photography,

[3] For "digital age" and "digitality" see the discussion in s. 3.3.

[4] In Information Science and in related disciplines such as Librarianship, Computer Science, and Web Science, "ontology" is used in both the familiar philosophical sense to indicate the philosophy of being, and in a more technical sense to mean the formal framework for organising information, such as taxonomies, navigation structures and classification schemes (on the model of biological taxonomies). The two meanings are related in obvious ways. In my research and in this narrative commentary ontology is generally used in both senses, with context making the intended meaning clear.

videogames, and viral memes (particularly: **Output D; G; H; I;** See also: Tredinnick, 2009c; 2009d; 2009e; 2009f; 2009g).

The central thesis presented above is understood to have notable consequences for the understanding of contemporary culture, society, and knowledge production (s. 3). These consequences are addressed throughout my research, but particularly in those outputs submitted for examination. Each develops the argument that the ways in which we talk about and use information under changing conditions of its creation, circulation, and consumption influence what we come to emphasise in information's ontological nature, and that this in turn influences the epistemic[5] values of the contemporary culture. My research can therefore be understood as addressing the following research questions (RQ 1 – RQ 3):

1. How has the nature of information been conceptualised in the various academic and cultural discourses within which the concept of information plays a significant role?
2. To what degree do these concepts reflect the prevailing historically situated technological, social and cultural conditions of the creation, reproduction, dissemination, and use of information?
3. How do conceptions concerning the nature of information influence and inform predominant conceptions concerning the nature of knowledge?

A version of these research questions is given in the earliest output presented here (**A:** 21), and subsequent outputs address them both explicitly and implicitly (s. 3). To this extent they can be considered to have guided my research. However, the form in which these research questions are presented above represents a *post hoc* articulation of the underlying but largely unarticulated scope the research, a form derived after reflecting on the underlying research themes of my research in the writing of this commentary. As such the research questions given above also represent both a way of knowing the research and a method of understanding and analysing it for the purpose of this narrative commentary

[5] For the use of "epistemes" in this context see s. 3.5; see also: **Output C; Output D** (117-118).

(Richardson, 1994: 516), a perspective congruent with the theoretical frameworks developed in my research and summarised below.

My research is broadly situated within the Information Science discipline in the UK[6]. Information Science is an interdisciplinary academic and professional field addressing the collection, classification, retrieval, analysis, manipulation and dissemination of information, and related theoretical concerns (Bawden & Robinson, 2012: 2). It has been described as "a tangled skein of many intertwining threads" (Shera & Cleveland, 1977) reflecting the diverse professional and scholarly perspectives within the field. With roots in librarianship and documentation (Bawden & Robinson, 2012: 2)[7], the emergence of Information Science has been attributed to demands for improved storage and retrieval techniques during the Second World War (Taylor, 1999: 51), and a growing interest in the problems of managing scientific and governmental information collections during the post-war period (Goffman, 1970; Shera & Cleveland, 1977; Bawden, 1999). Information science was therefore originally associated with scientific and technical collections, and this situational context influenced its early disciplinary perspective (**Output A:** 53-83). An important dimension in the discourse of the discipline became the degree to which Information Science could be constituted as a *scientific* discipline (e.g. Belkin, 1975a; 1978; Brookes, 1975; 1980; Farradane, 1979; Roberts, 1976; Vagianos, 1972; Wellisch, 1972). This partly reflected a conscious attempt by the pioneers of Information Science to divorce the discipline from the literary associations of librarianship (**Output A:** 79-80). But it also reflected the desire to construct a rigorous research base for the effective management of technical collections. From its inception the discipline therefore betrayed an acute anxiety about its status as a science (Belkin, 1978), an anxiety that it has never fully shaken[8].

[6] A fuller account of the discipline of Information Science is given in **Output A** (53-83); remarks on the history and context of Information Science and its relationship with allied disciplines are also present in **Outputs C, F and I**. Some other comments on the contemporary field are found in Tredinnick (2001; 2004b; 2005b; 2006c; 2011e; 2012) which have not been submitted for award. The brief account of the discipline in this critical commentary above highlights only those aspects most relevant for the research presented here.

[7] Hjørland (2014a) also lists in addition to Documentation, Library Science, the Science of Bibliography, and Scientific Information as precursor fields.

[8] Day (2005) for example has written that "information studies theory has remained a positivist enterprise", and Buckland (2012) has asked "what kind of science *can* information science be?" concluding that it is "at most, a science of the artificial."

Information Science carved out a distinctive position during the post-war period addressing the organisation of large-scale information systems, particularly computerised systems. This period marked the heyday of the discipline and witnessed the development of its founding theoretical assumptions. These were originally organised around what Ellis (1992; **Output A:** 64-72) described as a "physical paradigm" emphasising objective characteristics of information, epitomised by the *Cranfield Experiments* (Cleverdon, 1967; 1970; **Output A:** 70-71). With the personal computing revolution, Information Science subsequently underwent "a cognitive shift" (Ellis, 1992), increasingly emphasising the social, cognitive, and personal contexts of information retrieval and use (**Output A:** 72-77). Theorists such as Belkin, (1982a; 1982b), Taylor (1968) and Kuhlthau (1989; 1993) stressed subjective aspects of information retrieval[9]. Nevertheless the cognitive shift largely represented a changing focus of research, from artefacts and collections to the contexts of information discovery and use, rather than addressing questions concerning the nature of information directly (**Output A:** 76)[10].

More recently, the discipline has struggled to maintain its distinctive position, with information management, computer science and knowledge management encroaching on its disciplinary concerns (**Output A:** 80-82). The discipline is also currently witnessing a convergence of Information Science and Media, Culture and Communications Studies, particularly in relation to the Research Excellence Framework (REF) 2014 in which the independent sub-panels that had existed in the 2008 RAE have been merged. Much of my research has explored themes at the meeting point of this convergence.

My scholarly career in Information Science began in 2004 when I joined London Metropolitan University as a Senior Lecturer[11]. I had previously studied Information Science,

[9] Belkin's *Anomalous States of Knowledge* (ASK) model is discussed in **Output A** (73-74); Taylor's *Question-Negotiation* model is discussed in **Output A** (74-75); Kuhlthau's model of information seeking is discussed in **Output A** (75).

[10] **Output A** (77) describes this issue in the following terms: "Cognitive and physical paradigms [...] converge in their isolation of the information object from the subjective experience of information; they diverge only in whether the information object or the subjective experience is investigated."

[11] London Metropolitan University withdrew from all profession education in Librarianship, Information Science, Information Management and Knowledge Management in 2012, ending a sixty-year period of continuous provision in which the institution became for a period under the stewardship of the late Edward Dudley one of the most highly respected centres of information studies in the country. This submission represents the last award as part of that continuous tradition.

worked in a professional capacity, and published one scholarly article (Tredinnick, 2001), and at the time of my appointment had a commission for a professional book (Tredinnick, 2004a). However, only with this appointment did my hitherto largely unarticulated disciplinary interests begin to be formulated in terms of scholarly research within a defined disciplinary and institutional context. My research at this early stage betrays a desire to return to the roots of the discipline; in doing so it helped me confront the self-doubt of a new academic position, as well as helping me develop both my understanding of the discipline and my personal perspective within it (particularly: **Output A; C;** see also: Tredinnick, 2004b; 2005b). By tackling the kinds of questions influential in Information Science's formation described above, my early outputs explicitly attempt to both delineate and colonise the discipline, and to address my concerns about its continuing legitimacy in the face of profound technological and social change.

Although addressing the concerns of Information Science, my research has often done so from a critical perspective[12]. In particular, I have highlighted an apparent "naive humanism and uncritical positivism within the study of information" (**Output A:** xiv; cf. s. 3.2) and "an apparent reluctance within the information community generally to engage with developments in theory outside of a fairly narrow set of ideas" (**Output A:** xi). These, I have suggested, are the legacy of the discipline's original anxiety concerning its scholarly status (**Output A:** 63). I have also suggested that Information Science and related disciplines display "a wilful refusal to engage with anything that touches on the concept of *meaning,* despite the fact that *meaning* seems so central to information itself" (**Output A:** xi) and have traced some of the historical influences on this reluctance (**Output A:** 25-84; **C; F**). These insights have informed some of my commentary on professional practice (particularly: **Output F**, but also: **Output A; C; D**) [13].

In keeping with these observations my research embodies a theory-first perspective, reflecting contemporary trends in the field which have tended to emphasise the theoretical

[12] These criticisms are more strongly stated in my early work than I would choose today, reflecting my position as an early career researcher described in this section above.
[13] These insights have also informed some of my commentary on professional practice in outputs not submitted for award, particularly: Tredinnick (2004a; 2004b; 2005b; 2006c; 2006d; 2006e; 2011a; 2011b; 2012).

over the applied (e.g. Bawden & Robinson, 2012; Brier, 1996; 2008; Day, 2005; Hjørland, 1998; 2004; 2005a; 2005b; 2014a; and Raber, 2003). The submitted outputs therefore draw on a range of theoretical perspectives infrequently deployed within Information Science[14]. Nevertheless my research remains grounded in post-structuralist perspectives, particularly drawing on Barthes (e.g. 1972; 1977; 1989), Derrida (e.g. 1976; 1978; 1981; 1988; 1995; 2002), and Foucault (e.g. 1967; 1970; 1972; 1977; 1979; 1980; 1984a; 1984b; 2003)[15].

While this incorporation of post-structuralism into the discipline of Information Science is far from unique (cf. Beghtol, 1986; Raber, 2003; Day, 2005; Radford, 2005), it is distinctive. Since the cognitive turn Information Science has been generally conceived as a field exploiting empirical social research methodologies common in the social sciences generally[16]. Where incorporated, Information Science has often appropriated the methods of critical research at the expense of the theory (**Output A**: 163). This situation reflects Hjørland's description of Information Science "as a kind of applied epistemology" (1998; **Output A**: xv), but with an emphasis on the "applied." My research, by contrast, largely eschews applied concerns and seeks to develop the academic discourse of Information Science beyond applied professional contexts[17]. This is not to suggest that the research lacks application but that any practical application is largely an incidental outcome. This theory-first perspective emphasises the distinctive disciplinary position of Information

[14] These include semiotics (particularly: **Output A; C; D; G**), post-structuralism (particularly: **Output A; C; D; G**), postmodernism (particularly: **Output A; D; H; I**), meme theory (particularly: **Output A; D; I**), complexity theory (particularly: **Output A; E; I**), cultural and media theory (particularly: **Output D; H**), and new media theory (particularly: **Output D; I**) amongst others.

[15] Derrida's work is explicitly referenced in **Outputs A, C E** and **G**. Foucault's work is explicitly referenced in **Outputs A, C, D, F** and **G**. Barthes' work is explicitly referenced in **Outputs A, C, D** and **G**. However the broad insights from these perspectives are present throughout my research.

[16] Hjørland (2014b) identifies thirteen "metatheries" of the field, and notes: "The general development in the field can perhaps be characterized by a movement from information theory (Shannon and Weaver, 1949) towards semiotic theories (e.g., Wersig 2003; Brier 2008) – that is, towards theories of signs, languages, and meaning in a social perspective"; In 2006 I described this situation in the following terms: "The study of information has periodically exploited semiotics as a critical approach, but has not engaged in any serious way with post-structuralist or post-modernist theory" (**Output A:** xi). In relation to semiotics I have also argued, following Harland (1987:4), that its incorporation into Information Science predominantly represented an appropriation of semiotics as method and technique largely insensitive to the broader philosophical context (**Output A:** 163)

[17] Most of my more applied work has been excluded from this submission. It includes: Tredinnick (2001; 2004a; 2004b; 2005b; 2006c; 2006e; 2011b; 2011c; 2011d; 2011e; 2012). The works within this submission that most explicitly address issues of professional practice are: **Outputs A, B** and **F**.

Science, both in taking information itself as its primary theoretical object[18] and in exhibiting "concern for all aspects of the communication chain" (Bawden & Robinson, 2012: 8).

For these reasons I have often approached my research as a literary exercise; writing has provided the methodological apparatus through which to rethink those issues with which my research engages. Over the course of my research I have come to conceptualise this position in light of Richardson's work on *Writing: A Method of Inquiry* (1994). Richardson's post-structuralist perspective emphasises the unstable nature of writing, and questions claims to knowledge and privileged ways of knowing. Aitchison & Lee have observed that "questions of writing, and of textuality more generally, are the sites of major challenge to positivist and realist conceptions of knowledge production" (2006: 266). Questions of this kind are also central to my research, which often explicitly addresses narrative, textuality, intertextuality, metaphor, and literary conventions to attack positivist and realist conceptions of knowledge production within the information disciplines from a post-structuralist perspective (e.g. **Output A:** 25-51, 115-202**; C; D:** 21-78**; E; F; G; I**; see also s. 3.4).

This preoccupation with questions of writing stresses Bruner's distinction between a logico-scientific or rationalist mode, which "attempts to fulfil the ideal of a formal mathematic system of description and explanation" (Bruner, 1986: 12) and a narrative mode that "deals in human or human-like intention" and strives "to locate experience in time and place" (Bruner, 1986: 13; cf. **Output D:** 39-54). The submitted outputs tend towards this latter perspective, but within a disciplinary context that has often tended towards the former. I have therefore come to understand the writing process as both "a way of 'knowing'" the subject matter and "a method of discovery and analysis" in which "form and content are inseparable" (Richardson, 1994: 516). As a consequence the research is generally interpretive in situating theories and concepts as outcomes of enquiry (Robson, 1993: 19), emphasising an epistemological scepticism toward the notion "that any method or theory, discourse or genre, tradition or novelty, has a universal or general claim as the […]

[18] Information Philosophy (e.g. Floridi, 2002; 2005) and Information Theory (e.g. Shannon, 1948; 1953) both also take information as their primary theoretical object; however both largely eschew both the wider socio-cultural context of information production, dissemination and consumption, and questions of meaning. Nevertheless there are obvious links between these three discourses.

privileged form of authoritative knowledge" (Richardson, 1994: 518) and situates writing as a "constitutive force, creating a particular view of reality and the self" (Richardson, 1994: 518).

The research is therefore generally situated as a theoretical and critical study that aims to provide new theoretical frameworks for the understanding of cultural phenomena (**Output A:** xiii - iv**; D:** xiii). The research is richly interdisciplinary combining elements of Information Science, Librarianship, Information and Systems Theory, Media and Cultural Studies, History and Literary Studies (particularly **Outputs D; H; I;** cf. **Output A:** xi). The theoretical context is eclectic, drawing on diverse perspectives with respect to their potential to elucidate research questions rather than to provide final or foundational claims, but is anchored by the epistemological scepticism of post-structuralism (**Output** A: xi; **Output D:** xiii). Validity is situated in the *persuasiveness* of the findings as ascertained through peer scrutiny within academic, professional, and general discourses, and the research makes no claims to objectivity as measured against any arbitrary or agreed standards (**Output D:** xiii). Transparency and reliability are situated in the internal coherence of the theoretical positions developed within each output and across the outputs as a whole (**Output G**). The work is subjectivist in orientation, and makes no claims to repeatability. As a theoretical and critical study the theoretical positioning of the research is fully immanent and emergent, articulated in the work as a whole rather than in subsequent claims about that work which are inevitably partial and incomplete.

3. Critical commentary

3.1 Introduction: This critical commentary on the research outputs traces the thesis about the nature of information and its development over time through five interdependent themes[19]. These research themes do not exhaust the issues analysed in the research outputs, but are indicative of recurring preoccupations that draw explicitly on my analysis of the nature of information, and build into a boarder set of research positions and theoretical debates. The commentary below describes the coherent development of these themes out of a single research thesis, and outlines areas of substantive contribution to knowledge.

3.2 The nature of information: Each of the submitted outputs addresses the nature of information as a theoretical and critical object, and the *apparent* transformation of that nature under conditions of digital production, reproduction, transmission, and consumption (RQ 1 & 2)[20]. Each output also addresses the apparent socio-cultural transformations that information engenders, and the role of digital information in

[19] These themes are: the nature of information (s. 3.2); digitality (s. 3.3); textuality (s. 3.4); the nature of knowledge (s. 3.5), and history and historicity (s.3.6)

[20] **Output A** (3) defines digital information as "that subset of all information that at some point in its life-cycle has been created, stored, and/or transmitted with the aid of computers, and which has some ongoing relationship with this computer-mediated form" (3). A footnote explains the three common meanings of *digital* in relation to *digital information.* This is the only place in my research where a definition of digital information is provided, and that definition is dependent on the nature of information which is left undefined for reasons reflecting my theoretical outlook (**Output A:** 18-23).

perceptions of change (s. 3.3). Information and digital information are fundamental to the research, and understood on multiple levels[21].

The nature of information is an important theoretical debate within a number of disciplines[22] and has been called the "fundamental problem" of Information Science (Brookes, 1975; **Output A**: 3)[23]. The question became possible largely as a consequence of the pioneering work of Shannon (1948)[24], who transformed information into an object of theoretical analysis, emphasising its objective characteristics and eschewing subjective issues of meaning and interpretation **(Output A:** 4-6; 65-67). Shannon's model of communication influenced the emerging discipline of Information Science[25], not only as an explicit model, but also because of the questions that it raised about information's fundamental nature (Fairthorn, 1967; Artandi, 1973; Belzer, 1973; Belkin, 1978; Machlup, 1983; **Output A:** 65-67)[26]. Shannon's work suggested to early theorists of Information Science that information could be regarded as an objective and stable entity independent of (although not without) interpretation and meaning[27]. For many, a truly scientific

[21] For example: binary code or bit (**Output A**), webpage (**Output A; B; C; D; F**); memes (**Output A; B; D; E**); cultural meaning of documents (**Output A; D)**, digital artefacts (**Output D; H**), digital images (**Output D; H**), digital photographs (**Output H**), etc.

[22] Principally these are: Information Science; Communications Theory, and the Philosophy of Information. Other disciplines that address the topic tangentially include: Librarianship and Information Management; Knowledge Management; Complexity Theory and various physical sciences including theoretical physics.

[23] Examples discussed in the submitted outputs of engagement in Information Science with this debate about the nature of Information include: Fairthorne (1967), Goffman (1970), Wellisch (1972), Belzer (1973; 1974), Auerbach (1974), Furth (1974), Otten (1974), Whitmore & Yovits (1974), Brookes (1975; 1980), Belkin (1975a; 1975b; 1978; 1982a; 1982b), Farradane (1976; 1979), Pratt (1977), Machlup (1983), Ellis (1984; 1992), Kahlthau (1989, 1993), Buckland (1991, 1997, 1998), Cornelius (1996; 2002), Madden (2000), Bawden (2001), Taylor (2001), Raber (2003), Capurro & Hjørland (2003), Furner (2004) and Hjørland (1998, 2004, 2005a, 2005b). The outputs also discuss the influence of Shannon on the material sciences (particularly: Landouer, 1991; 1996), and complexity science (Cilliers, 1998; 2005; Lewin; 1999; Manson, 2000; Nowotny, 2005; Taylor, 2001; Thrift; 1999; Urry, 2005; Waldrop, 1992)

[24] Subsequent popularised by Shannon & Weaver (1949)

[25] Hjørland (2014a) has written that "Information gained a new cachet from 'information theory' and Shannon's information theory resonated far beyond its technical niche".

[26] Shannon (1948) was careful to claim validity for his model only within the explicit context of communications engineering; he later wrote: "The word 'information' has been given many different meanings by various writers in the general field of information theory. It is likely that at least a number of these will prove sufficiently useful in certain applications to deserve further study and permanent recognition. It is hardly to be expected that a single concept of information would satisfactorily account for the numerous possible applications of this general field" (1953).

[27] Contrary to a common misconception, Shannon did not imply that the meaning of information was irrelevant to anything other than the specific engineering problem he was tackling. In his original

discourse demanded a more objective concept of information. Farradane, for example, argued that "If information Science is to be at all an experimental science it must have some observable elements or phenomena that can be isolated for initial study" (1979: 13)[28]. While the discipline slowly moved away from this overt positivism (s. 2)[29] in fact Information Science never did attain a theoretical consensus concerning the nature of information, and information remains largely an implicit concept within the discourse (cf. Goffman, 1970; Otten, 1974; Cornelius, 1996; 2002)[30].

The most recent attempt to provide a coherent theoretical model of information has been developed in the emerging field of the philosophy of information (PI), particularly in the work of Floridi (2002; 2004a; 2004b; 2005; 2011a; 2011b). Over a period of fifteen years[31], Floridi's synthesis of analytic and constructivist approaches mirrors, and is arguably an extension of, the Kantian transcendental synthesis of empirical and metaphysical philosophy (Beavers, 2012; see: Floridi, 2003)[32]. His theory of "strongly semantic information" (2004b; 2011b) draws on the traditional hierarchy of data, information and knowledge. However, Floridi incorporates a truth criterion into this relationship, defining information as "well-formed, meaningful and truthful data" (2004a; 2011a; 2011b: 31). This truth criterion has been the subject of some controversy (e.g. Fetzer, 2004; Dodig-

paper he wrote: "The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have *meaning* […] These semantic aspects of communication are irrelevant to the engineering problem" (Shannon, 1948).

[28] cf. Teskey (1989: 7): "if information Science is to justify itself as a science, then it must produce a scientific theory of information that can be tested and evaluated across the whole field of Information Science."

[29] **Output A** (53-84**)** argues that although Information Science turned away from the overt positivism of its early approaches, it nevertheless retained a tacit positivism in relation to information through its isolation of information from the subjective processes of retrieval, need, or use.

[30] For a fuller discussion of the influence of Shannon on the emerging Information Science, see: Output A: 4-6; 64-72.

[31] Floridi (2011b) incorporates as chapters much of Floridi's prior work on the philosophy of information, and thus stands as a culmination of that work, but also impresses the coherence of Floridi's approach throughout the period.

[32] Beavers observes: "a philosophy that is both realist and constructivist, while simultaneously pluralistic without being relativistic sounds contradictory at first, but no more so than advocating both transcendental idealism and empirical realism, as Kant does […] Floridi's informational structural realism would seem to be more of a fulfilment of Kantian epistemology, rather than just another variant of it, though one stripped of the extensive grand architecture that often characterizes German philosophy." (Beavers, 2012: 7)

Crnkovic, 2005; Sequoiah-Grayson, 2007); it is perhaps in danger of excluding from consideration much that we had assumed to be informational.

The submitted research engages with the debate concerning the nature of information directly (particularly: **Output A**: 1-24), exploring facets of information that emerge from an analysis of that debate[33], but largely rejecting what it describes as the "initial positivism" (**Output A**: 54) of Information Science[34]. Instead the research describes information as a subjective and unstable entity, emphasising the historical and socio-cultural contexts in which the nature of information is conceptualised, and the subjective meanings and experiences that information can be understood to generate (**Outputs A - I**)[35]. Placing the question of the nature of information into its discursive contexts tends to emphasise historical aspects of the debate (particularly: **Output A; C; D; E; F; G**). In doing so the research adopts a perspective similar to that described by Weller (2008):

> Definitions are not particularly useful to the *historical* study of information, since information should be defined and understood in relation to the historical context, which changes. […] Therefore, in a sense, what matters is not what information *is* but *how* society perceives it and how and why this can change over time.

Because the research analyses historical contexts, the nature of information is ultimately a subordinate concern to the ways in which information has been understood at particular times under particular influences (particularly: **Output A; G; H; I)**. By extension the influence of information on society and culture is subordinate to the ways in which particular claims about the nature of information come reflexively to influence society's assessment of its own situation (particularly: **Output A; D; I)**. Yet despite this historical inclination in the analysis, the research is not a historical study as such; the historical

[33] **Output A** (1-23**)** sets out these facets of information in a series of binary oppositions within the debate: object and subject; material and form; stability and mutability; mimesis and semiosis, and simplex and complex. With the benefit of hindsight, this schema is perhaps a little too formalistic.
[34] **Output A: (78)** quotes Foucault (2003: 10) to question the motivation behind the positivism of Information Science: "We should be [...] asking ourselves about the aspiration to power that is inherent in the claim to being a science. The question or questions that have to be asked are 'what kinds of knowledge are you trying to disqualify when you say that you are a science?'"
[35] I describe this duality as the *meaning* of information, which explicitly denotes both the meanings generated by informational artefacts and the meanings attributed to the concept of information itself (**Output A:** 1-142)

framing offers a heuristic device through which to approach information as an object of theoretical analysis, and its focus remains primarily theoretical.

The theme of the nature of information is established in the earliest submitted output, which poses a question that guides my subsequent work: *what is information, and how is information related to knowledge or knowing?* (**Output A:** 3; see also: s. 3.5). This work examines both the concept of information and its history in various related discourses (**Output A:** 1-114)[36]. It questions whether *meaning* can ever be excised from the concept of information[37], and concludes that information is always a culturally situated concept whose definitions become meaningful only within particular discursive contexts. But it also suspends judgement on "the meanings of these contested words" in order to address how "they are deployed to muster meaning and authority to the support of certain subject positions" (**Output A:** 20-21**).** In this way the research emphasises the discourses relating to the nature of information over the theories on which they rely:

> The key point to recognise is not that terms such as *information*, *knowledge*, *data*, *document* and *text* are used to indicate slightly different concepts by different theorists and in different schools of thought; this itself is just a reflection of the problematic nature of language. Instead, the point to recognise is that these problematic terms mark out the boundaries between contested ideas. The difficulty in reaching agreement about their meaning in part derives from the kinds of research questions that are addressed, but also in part from fundamental differences in the conceptual outlooks into which they are slotted […] Thus, while it may appear that different theoretical viewpoints share a basic understanding of key problems because they share a vocabulary in which those problems can be articulated, the reality is more complicated (**Output A**: 19).

The research juxtaposes contemporary theoretical perspectives to challenge assumptions within the informational disciplines[38]. These perspectives are not presented in my work as oppositional or alternatives to the theoretical models of Information Science, but as ways of teasing-out some aspects of the problem of information that have been generally

[36] **Output A** discusses in detail with the history of information as a concept in Librarianship (25-52**)**, Computer Science (85-114**)**, and Information Science (53-84).
[37] E.g. "One is tempted to identify a refusal to engage with anything that touches on the concept of meaning, despite the fact that meaning seems so central to information" (**Output A: xi**)
[38] The theoretical perspectives that are juxtaposed with the discourses of Librarianship, Information Science, and Computer Science include semiotics (**Output A:** 143-172), post-structuralism (**Output A:** 173-201), postmodernism (**Output A:** 203-231), and complexity theory (**Output A:** 233-260)

underdeveloped in Information Science, particularly the centrality of *meaning* (**Output A:** 115-142**;** s. 2). Thus they are intended not as replacements for the replace existing theoretical paradigms of Information Science, but ways to better understand them and their limitations (**Output A:** 22).

As an early work, **Output A** played an important role in refining my disciplinary perspective, helping to define not only a problem-space that subsequent outputs colonise but also theoretical responses to that problem-space. The perspectives with which it engages therefore form the foundation of my subsequent work[39]. Subsequent outputs can be constituted as attempts to delineate facets of the nature of information, not by testing explicit propositions as in **Output A**, but by analysing how particular answers arise within particular historically situated moments and function for particular situated ends in keeping with the view that "what matters is not what information *is* but *how* society perceives it and how and why this can change over time" (Weller: 2008). The research therefore seeks to define what is initially described as a space of "seemingly trivial terminological disagreements" within which "violent ideological battles are waged" in an "on-going cycle of appropriation" (**Output A:** 19); later, following Rorty (1992; xxxiv) this is described as a process of "drawing a line around a vacant place in the middle of a web of words, and then claiming that there is something there rather than nothing" (cf. **Output G**). Through this process the question posed in **Output A** emerges as integral to the reflexive function of information as a defining aspect of the contemporary age (particularly: **Output A; D; H; I**).

While the nature of information is not addressed in these explicit terms by the subsequent outputs[40], each builds on the position developed in **Output A** to explore how the nature of information influences our experiences of digitality (s. 3.3). One example presented as indicative subsequent analysis of web and social media ontology in the research (**Output B; C; D; E; F; I**). Multiple outputs argue that both hypertext and the web imply "an explicit rejection of the epistemological models applied to traditional approaches to managing

[39] Complexity theory is subsequently addressed directly in **Outputs E** & **I**. Semiotics is addressed in **Outputs C** & **D**. Postmodernism is addressed in **Outputs D, G, H** & **I.** Post-structuralism is addressed directly in **Outputs C, D** (particularly 117-120), **G** & **I.**

[40] This is not to imply that the nature of information is not discussed at all, or that subsequent outputs do not engage with that debate on a theoretical level. See s. 3.4.

information" (**Output C**: 169). My research situates Web 2.0 in **"**a shifting understanding of status of information, knowledge and the role of the user in respect of information applications" (**Output B:** 229) that "subtly inverts the traditional conception of information and knowledge" (**Output B:** 231). Social media "treats information and knowledge as things constructed in social interaction, and in the interaction between users and information systems" (**Output B:** 232; cf. **Output D:** 107-113**)**. The tacit assumptions concerning the nature of information these positions imply are understood to represent a significant change from the ontological assumptions underpinning prior information retrieval approaches (**Output A; B; C; D; E; F),** a perspective that draws on my analysis of the nature of information and its consequences.

These questions concerning web ontology are frequently addressed in the outputs as consequences of the influence of aggregate complexity in web studies (**A:** 233-259; **B; D; E; I).** This position recognises a similarity between the conceptual schemas offered by post-structuralism and complexity theory **(Output A; C; E; I;** cf. Ciliers, 1998; 2005), but argues the latter functions to conceal unarticulated and politically-situated assumptions about the structure of society, information and knowledge (**Output E; I)**. Complexity, it is argued, has a broadly metaphorical function in the description of web ontology disguising such situated assumption; the "power and persuasiveness" of this metaphor conceals "both its underlying assumptions, and its realisation in the model of the web" (**Output E:** 813**)**. In the later research this argument is developed in terms of rhizomes (**Output I:** 416; cf. Deleuze & Guattari, 2001), which help illuminate the "subversive, colonizing and opportunistic […] organic nature" of web ontology, and which complete the association between complexity and post-structuralism than underpins my analysis in multiple outputs **(A; B; D; E; I)**[41].

The broader socio-cultural consequences of these perceptual shifts are explored throughout my research, which in this way generalises the theoretical discussion in my early research to a variety of cultural phenomena (**Output B; C; D; E; F; G; H; I)**[42]**.** In each

[41] Other outputs address related issues concerning the epistemological and ontological assumptions of professional discourses in relation to the nature of information (**A; B; C; F)**.

[42] These include the professional discourses of Librarianship, Information Science, and Computer Science (**Output A; C; F**), information organisation and retrieval (**Output A; B; C)**; language, writing and text (**Output A; C; D**); photography (**Output D; H);** film, video and television **(Output**

case, as in the example of web ontology above, my research maps the consequences of the analysis of the nature of information underpinning **Output A.** Taken in its totality my research therefore argues that while information has undergone no objective transformation in the digital age, a shift in the conception of the nature of information is traceable, and this shift influences a wide range of socio-cultural artefacts and practices. This thesis is originally stated at the opening of **Output A** (1):

> The central premise of this book is that the digital revolution has destabilised traditional understandings of the nature of information. This is not to suggest that the nature of information has itself changed, but rather that the digital age has unleashed qualities that were always coiled unrealised within our ideas about information.

This destabilisation of information is posited as ontological, arising by association from the ontological qualities of the dominant modes of information production, reproduction, transmission and consumption in particular historical periods (particularly: **Output A:** 1-24; **D:** 59-78; **F**)[43]. It arises in part because of the conflation of information with the material vehicles of its transmission, implicit in the professional practice of librarianship (**Output A:** 25-52; **F**) but also integral to perspectives that stress the *thing* of information within Information Science and the material sciences (Landouer, 1991; 1996; Buckland, 1991; 1997; 1998), and in part because of the way the technologies of reproduction constrain the uses to which information is put. The outputs argue that digital technologies strip information of the influence of the material vehicles to which it was once married[44]. The apparent destabilising of the ontology of information itself is seen to have significant consequences for the status of knowledge, not least because of the close association between the vehicles of knowledge production, and the nature of knowledge (**Output B; C; D;** s. 3.5). While this thesis is present in **Output A** (1 - 23) it is fully developed in **Output D**

D; H); history and archiving (**Output D; G; H);** internet celebrity **(Output I); c**ultural identity (**Output D:** 135-148**)** etc.

[43] The framing of this argument in ontological terms does not imply that such perceptions occur within a political vacuum. The research demonstrates the ways in which such seemingly trivial question are shot through with political positions. For example, the reluctance of Librarianship to engage with the contents of its collections is associated with a humanist perspective (**Output A:** 25-52), and the discourse of hypertext and the web with a liberal libertarianism arising out of US West Coast counter-culture (**Output A:** 253; **E**).

[44] Digital information of course still possesses a material form, but that form generally no longer significantly bears on its reproduction or use (see: **Output D**: 59-78).

(59-116); subsequent submitted outputs explore the many consequences of this thesis, the most important of which are outlined below (s. 3.3 – s.6).

3.3 Digitality: The submitted research outputs each ostensibly address questions of digitality, the condition of living in digital culture (Negroponte, 1995) (RQ 2 & 3). The importance of digitality is explicit both in the substantive topics addressed by the outputs[45], and the titles of those works[46]. Digitality represents the socio-cultural context within which the research is situated, and the prior condition under which the analysis could be developed. However the concept of digitality developed by the research is itself taken to be dependent on transformations to perceptions about the nature of information and knowledge associated with digital technologies (s. 3.2 – 3.6). That is to say that digitality is addressed principally as a consequence of the theoretical analysis of the impact of digital information on culture, society, scholarly discourse, and professional practice rather than as a defined technological shift[47]. This reflexivity is typical of my analysis of digital information and its consequences, and re-emerges in several of the major themes explored in this commentary (particularly s. 3.5; 3.6).

The concept of digitality implies that information technologies have profoundly shaped contemporary culture, society and the self (**Output A:** 2; **D:** 3). This is a common but controversial theme in contemporary social theory. While ideas such as *future shock* (Toffler, 1970), *the post-industrial society* (Bell, 1974), *the postmodern condition* (Lyotard, 1986), *the cult of information* (Roszak, 1988), *technopoly* (Postman, 1992), *the death of*

[45] Broadly: digital information (**Output A**); the web and web 2.0 (**Output A; E**); hypertext and the web (**Output C**); digital culture (**Output D**); digital information and research libraries (**Output F**), Information History (**Output G**); Digital History (**Output H**) and the ontology of the web (**Output I**)

[46] The titles of four of eight outputs include the concept of digitality ("digital information", "digital age" and "digital discourse"); three others allude to significant aspect of the digital infrastructure (the World Wide Web, Web 2.0, and Hypertext). The title of one output does not explicitly allude explicitly to digitality ("The Making of History: remediating historicised experience"), but that output was contained within an edited collection itself entitled "History in the Digital Age". See: Appendix A.

[47] This marks a significant distinction between my work on digitality and that of other theorists (s. 3.3) and highlights the ways in which the analysis of socio-cultural change is inflected by questions about the nature of information. **Output D** for example is entitled *Digital* Information *Culture* for precisely this reason. Similarly (cf. s. 3.2) **Output A** (2) explicitly frames the socio-cultural change accompanying computing and communications technologies as a "challenge posed by digital information."

distance (Cairncross, 1997), *the network society* (Castells, 2000), *remediation* (Bolter & Grusin, 2000), *the moment of complexity* (Taylor, 2001), *participatory culture* (Jenkins, 2003), *the second information revolution* (Brock, 2003), *the cult of the amateur* (Keen, 2007), and *produsage* (Bruns, 2007; 2008) testify to its persistence, they also imply for many theorists both technological determinism, and the exaggeration of difference (e.g. Khiabany, 2003; Webster, 2006; cf. Williams, 1974; see also: **Output D**: 21-5).

The research engages with these expressions of digitality directly[48] and extends them by presenting technological change as a subjective experience arising from the relative visibility of particular social and cultural practices over time. It generally addresses not change itself as an objective outcome of the technological context, but the *perception* of change as evidenced in the discourse of technology and culture including both academic theories and popular culture (particularly: **Output D:** 39-56; also: **Output B; E; F; G; H; I**). Such perceptions are themselves an integral part of the cultural and social context and this relationship comes to be framed within my research as reflexivity between culture and technology described in the "mythopoeic function" of the *culture* idea (**Output D:** 16-18; see also: 24-25). The social and cultural context of digital technologies is fully theorised in **Output D** (3-55) which provides a foundation for subsequent outputs.

The subjective experience of digitality emerges as a theme of my early research. **Output A** for example notes that there exists "a preoccupation across a wide range of disciplines with the kind of social and cultural change that has accompanied the computing and communications revolution" (**Output A:** 2). In this period "the challenge posed by digital information" is explicitly associated with both "the nature of digital information itself, and the uses to which it is put" (**Output A:** 2). Both technology and the context of its use play a part in the experience of change; the distinctive characteristics of digitality describing that

[48] For example, Toffler (1970) is discussed in **Outputs A, D,** and **I**; Bell (1974) is discussed in **Outputs A** and **D**; Roszak (1988) is discussed in **Output F;** Postman (1992) is discussed in **Outputs D** and **I**; Cairncross (1997) is discussed in **Outputs A, C, D, E, F** and **I**; Castells (2000; 2001; 2003; 2004) is discussed in **Outputs A, D, G** and **I**; Bolter and Grusin (2000) are discussed in **Outputs D** and **H**; Taylor (2001) is discussed in **Outputs A, B, D, E, F** and **I**; Keen (2007) is discussed in **Outputs C, D, E** and **I**; Bruns is discussed in **Output I.** In addition, the research addresses significant implicit descriptions of digitality developed by Baudrillard (1994), Berners-Lee (1990; 1991; 1995; 1999), Landow (1997), Jenkins (2003; 2008), Lessig, (1999), and O'Reilly (2005) amongst others.

change reflect shifting assumptions attenuating our experience of information under conditions of digital reproduction (**Output A; B)**. The idea that digital technologies provide a profound challenge to both our experiences and to particular embedded socio-cultural practices becomes a recurring theme of subsequent outputs (e.g. **Output B; C; F; G; H; I**). However the theme of technological change is developed more explicitly in the subsequent outputs. **Output D** for example notes that "How we experience the socio-cultural effects of digital technology and how we describe those experiences are enmeshed and entangled" (**Output D:** 22). Later:

> How we explain and contain the experience of change within the cultural sphere also influences how we experience that change. The kinds of narratives we tell about our experiences change the way in which we confront the digital world (**Output D: 167**).

In this context digitality becomes a way of explaining and containing contemporary experience, rather than an objectively measuring social, cultural, or economic developments (cf. Castells, 2000; 2001; 2003; 2004; Webster, 2006). Digitality is therefore fundamentally unstable, reflected in its mythopoeic function - its implication in the formation of myths (**Output D:** 16-18**).** The position on change delineated in **Output D**[49] underpins the theoretical arguments of subsequent work, which iterate, generalise and expand on this position by addressing technological change in a variety of contexts[50].

The focus of my interest in technological change develops over the course of my research. It is originally addressed largely in profession contexts, including commercial information and knowledge management (**Output B**), and Library and Information Science professional roles (**Output A; C; F)**. In later outputs change is addressed more explicitly in the context of aspects of popular culture beyond professional contexts, including photography (**Output H**), television and mass media (**Output D; H**) and viral memes (**Output I**). My more recent research also seeks to apply these insights to the experience of history and a historicised

[49] Particularly chapters 1 - 3 which set out the theoretical foundation for that work (pp. 3-56).
[50] For example, both **Tredinnick (2009a; 2013b)** situate the ontology of the web in terms of the discursive formations in which that ontology is developed thus presenting a description of the network as fundamentally a social entity, rather technological in form. It is suggested that the technological underpinnings of the network tend merely to emphasise certain qualities of existing and emerging social relationships.

past more generally (**Output G; H**). This transition maps onto the changes in my teaching and scholarship, which have migrated from Library and Information Science to Media & Communications. Nevertheless running through these different outputs is a coherent approach to addressing change through addressing perceptions of change.

The preoccupation with perceptions of change means that digitality is often of less central concern than superficially implied by the outputs[51]. The critique of contemporary digital culture is primarily a vehicle for both exposing the mythologies of late modernity, and exploring epistemological scepticism[52]. Each of the submitted outputs returns to this pattern of argument in various forms[53]. Therefore while digitality forms the socio-cultural contexts for my research, and the prior-condition under which the themes and arguments in my research could be developed, it is never in itself the subject matter of my research. My research in not about digitality *per se*, but what the experience of digitality reveals of our prior assumptions, experiences, and shared social worlds (particularly: **Output A; C; D; F; G; H**). This marks a distinction from much of the prior work on digitality described above.

By addressing the subjective experience of change my research confronts problems of determinism common to the sociology of technology (particularly: **Output D:** 22-25). Appeals to the complex interrelationship of technology and culture characteristic of soft determinism and media ecology are rejected (**Output D:** 23); instead it is argued that,

[51] This is a realisation that developed during the course of the research; towards the end of **Tredinnick,** (2008: 167)**,** I write: "during its composition, this became a book about more than anything the process of change in the digital age: how we situate ourselves within a mutating cultural tradition, how we cope with the constantly shifting terrain of culture, and how we manage the new challenges posed by the emerging cultural forms and social spaces of the digital age." (167).

[52] "Mythologies" alludes to Barthes (1972) and is discussed in **Tredinnick (2006a:** 174; **2008; 2011a**).

[53] **Outputs A** (25-52), **C**, and **F** for example each argue that Librarianship incorporated into its professional values assumptions about the stability and objectivity of information artefacts that reflected the assumptions that predominated at that period when the professional discourses came to maturity (s. 2.4). The adequacy of professional values is of more concern to these works than any putative qualities of digitality itself. **Outputs A, B** and **I** develop similar arguments in relation to the concepts of information and knowledge in the discourse of the Web (s. 2.5). **Outputs B** and **D** explore the mythologies of later modernity in relation to knowledge its ontological underpinnings. **Outputs G** and **I** explore the mythologies of late modernity in relation to historical discourses and the stability of historical sources and historical representations, developing Baudrillard's provocative description of history as "our lost referential; our myth" (1994: 43) (s. 2.6). **Output D** generalises these positions to a wide range of social and cultural practices in contemporary western societies. In each case digitality is itself of less central concern than the underlying historically situated socio-cultural assumptions of these various discourses.

"problems like the dilemma of determinism emerge not from the objective relationship between technology and culture, but from the ways we subjectively frame, describe, and represent that relationship between these two significantly indistinct and liquid ideas" (**Output D:** 25). Causation in this context is situated as characteristic of narrative modes of explanation and inadequate to the experience of digitality (**Output D:** 39-55). For example, my research rejects Williams' (1974) critique of McLuhan's determinism, but also rejects McLuhan's (1964) reductive account of mediation to understand both as historically situated subjective interpretations of the same underlying phenomena (see: **Output D:** 39-56) that remediate experience (Bolter & Grusin, 2000; see: **Output H**).

3.4 Textuality: an important vehicle in the research for analysing the influence of changing conceptions concerning the nature of information on digitality has been the analysis of textuality (RQ 2 & 3)[54]. While writing and information are not regarded synonymously, writing often explicitly functions as information's surrogate in the theoretical analysis (particularly: **Output A; C; D; F; G**)[55]. This conceit allows an extension of the historical context of the research that addresses perceptions of present-centeredness in the discourses of both digitality (s. 3.3) and the nature of information (**Output A:** xiv see also: s. 3.2; s. 3.6)[56]. It has also enabled the research to emphasise precisely those interpretive contexts within which information is situated that are often concealed by the scientific and technical origins of Information Science (particularly: **Output A:** xi – 24; 115-141; **C; D**: 39-56; **H**), allowing the research to draw on critical perspectives that emphasise questions of

[54] The concept of textuality is particularly associated with Barthes (e.g. 1972; 1977; 1989) and Lotman (e.g. 2001). Hanks (1989) describes it as: "the quality of coherence or connectivity that characterizes text" but qualifies this: "whereas the formal and functional properties of sign complexes can aid in the establishment of textuality, it is the fit between the sign form and some larger context that determines its ultimate coherence". My research, and my use of the term *textuality* (in place of for example "text" and "writing") emphasises both this "fit" and the wider context to describe the articulation of writing, written artefacts, and literary culture.

[55] In my research the nature of information is often addressed through various surrogate arguments: the nature of writing (**Output A; D; F; G**); the nature of cultural artefact (particularly: **Output D;** but also: **Output G; H; I**), and the nature of the historical record (Particularly **Output G;** but also: **Output D; H**). Each represents a narrower case of the broader category of information. This approach is intended to broaden the discursive context of the research beyond Information Science in keeping with its interdisciplinarity (s. 2).

[56] One of the limitations of information as a theoretical concept is that it lacks historical reach, largely as a consequence of the influence of Shannon's (1948) model of communication on contemporary concepts of information. Cf. **Output A:** xiv)

meaning, such as for example semiotics, literary criticism and theory, and aesthetics (particularly: **Output A; C; D;** cf. s. 2.2). Finally it has enabled the research to denaturalize prior technological changes to explore the patterns of experience over time (particularly: **Output D)**. The transformation of writing under conditions of digital reproduction and consumption therefore stands as a narrower case of the wider transformation to conceptions of information[57].

Recent years have seen growing interest in writing practices in digital contexts. Poster (1990), Landow (1997), Vandendorpe (1999), Hayles (2008), and Lyons (2011) for example have each explored digital writing practices and their apparently novel characteristics and uses. Much of this research has drawn on both post-structuralism (particularly Barthes, 1972; 1977; Derrida, 1976; 1978) and theorists associated with the Toronto School (McLuhan, 1962; 1964; Ong, 1982; Havelock, 1986). Crystal (2001; 2006; 2008) has analysed changing language use in digital communications and the emergence of orally inflected forms of writing. Most persuasively, Bolter (2001) and Bolter and Grusin (2000) argue that new technologies *remediate* older cultural forms and apply this to writing practices. These various studies suggest that digital writing is both distinct and important. Yet despite these efforts to situate digital writing, the field remains embryonic, often emphasizing the distinctiveness of digital writing at the expense of the continuities in writing practice.

The submitted outputs engage with this prior work[58], and expand on it by placing digital writing in significantly extended historical and theoretical contexts. This extended context allows the research to question the assumed novelties of digital writing practice and to better understand the perceived distinctiveness of digital texts (particularly: **Output D**: 59-

[57] Where writing is directly addressed by the analysis it is usually subsequently generalised (**Output A; D; F; G; H**) For example, **Output D** generalises the discussion of digital textuality (59-76) to other digital cultural artefacts (79-94), and subsequently to questions of knowledge (97-114), power (117-133), identity (135-146) and memory (149-165) under conditions of digitality. **Output F** generalises the discussion of digital textuality to research library services, and **Output G** generalises the discussion of digital textuality to historical research and the historical record, and this is subsequently expanded in the related work **Output H**.

[58] For example, Landow is discussed in **Outputs A, C, F** & **I.** Bolter is discussed in **Output C.** Bolter and Grusin are discussed in **Outputs D** & **G.** Crystal is discussed in: **Outputs A, D** & **G.**

78). Fundamental to this reappraisal is the recognition that written artefacts are increasingly central to the experience of digitality[59]:

> ...writing has reasserted itself as the dominant mode of knowledge and information transmission. Through e-mail, wikis, blogs, social networking and instant messaging, text is becoming integral to culture, work and social relationships. We put text to more and different uses than ever before, distorting it towards communicative ends in more inventive ways (**Output D:** 59).

This observation relies on understanding writing beyond the narrow confines of books and literary artefacts, a view particularly associated with book history, but also evident in perspectives emerging from the Toronto School and post-structuralism. Instead the outputs research emphasise the more ephemeral and social uses of writing in everyday contexts (particularly: **Output D:** 59-78**)**, an emphasis that arises directly from treating writing for its informational qualities.

The eclectic approach of the research emphasises the ways in which the possibilities of writing as a medium are framed by ontological questions implied by different modes of reproduction (particularly: **Output D:** 59-78). The most influential of these within contemporary theory are those that arise with print reproduction (**Output A:** 25-52; **C; D:** 59-78**; F; G**). While this theme emerges in the early outputs[60], it is most fully articulated in subsequent work, which develops a model of digital writing emphasising its distinctive ontology and uses (particularly: **Output D:** 59-78). This model draws on synthesis of prior research on writing, book history, and language, presenting the distinctive qualities of digital writing as potentialities within the system of writing itself realised under different

[59] Perspectives that stress the emergence of secondary orality with telecommunications (Ong, 1982; Havelock, 1986) or which stress the emergence of visual culture (e.g. Evans & Hall, 1999) tend to imply tacitly or explicitly the decline in the function and importance of writing (**Output D:** 59).

[60] For example, **Output A** explores the history of writing and its relationship to language in a sequence of four chapters. The most significant of these chapters traces the incorporation of tacit assumptions concerning the ontological nature of writing into the discourse of Librarianship, assumptions reflecting the importance of the printed work in the history of Librarianship, and largely carried over into contemporary practice (**Output A**: 59-78). This influence of the printed work on the conception of information is also a concern of **Output C,** which exploits a post-structuralist perspective to critique the ontologies of hypertext and the Web. These two related early outputs begin to formulate the relationships between text, information and knowledge fundamental to subsequent work. They also articulate important questions which become fundamental to subsequent outputs about the role of the printed work in framing ontological assumptions.

conditions of its production, reproduction, and use. Among its elements is included the performativity of writing, drawing on both the philosophy of language (Austin, 1976) and post-structuralism (Kristeva, 1980). **Output D (75)** summarises this model as follows:

> As texts have become integrated into communications processes, they have taken on some of the characteristics of oral utterances, leading to a general orthographical drift. The have also become the site of performance. The proliferation of texts has led to a decline in the unity of the textual artefact […] As a consequence digital texts find new meanings in the dialogues they create within their ephemeral contexts. The proliferation of texts has also led to a decline in the stability of the textual medium […] Text is becoming again a more mutable and malleable medium. This unsettles the link between textual authority and the original creative act in which it is invested. […] Digital texts therefore challenge the association between the authorial act and the authority of the text forged by printing, pluralising the notion of textual authority. As the stability of the printed text is replaced by the mutability of the digital text, the authenticity of the textual artefact can no longer be secured against its participation in an original creative act. Digital texts break the chain of duplication that printing erected to tie the text to its creation. They are less likely to be seen as a site of authority in their own right, and more as a site of the construction of meaning through social processes.

This description arises directly out of the analysis of the nature of information (s. 3.2), and models the effects of technology on perceptions concerning that nature. It also underpins the subsequent analysis of the relationship between information, writing and and knowledge (s. 3.5).

It is argued that a significant proportion of what we take to be essential characteristic of writing represent the characteristics of particular literary forms at particular historical moments subject to particular uses, especially those of the printed work in the late age of print (**Output A:** 25-51; **D:** 59-78). This betrays a debt to the work of earlier theorists, particularly McLuhan (1962; 1964), Eisenstein (1983; 2005), Havelock (1986), Ong (1982) and Caruthers (1990). Nevertheless the analysis presented in the later outputs is distinctive in not attributing such characteristics to the structural qualities of particular literary forms or modes of reproduction, but to the production, circulation and consumption of writing within specific defined cultural contexts (Particularly: **Output D:** 59 – 95); **F; G**). It therefore emphasise the cultural values projected onto the printed work within a defined cultural

context, rather than the structural consequences of the technology of print reproduction itself (particularly: **Output D:** 59-95).

Throughout this analysis it is argued that the values associated with “print culture” (**Output A**: 25) arise not with the introduction of the printing press but with its “apotheosis in the nineteenth century” (**Output A:** 30). It is during this period that the influence of the printing press “combined with a social and cultural transformation arising out of industrialisation to create a crisis of legitimacy in the idea of knowledge" (**Output A**: 30; see also **Output A:** 25-52; **D:** 59-78). Integrating insights from the history of reading (e.g. Cavallo & Chartier, 1999; Fischer, 2003), this approach downplays the significance of literary production and emphasise issues associated with literary consumptions. Therefore the uses of writing are given equal prominence to the structure of texts and their reproduction (cf. Poster, 1990; 2006; Bolter, 2001), and the research resists treating the printed work as the paradigmatic exemplar of literary culture, while recognising the historical significance or printing. This marks the clearest distinction with work from the Toronto School (Mumford, 1947; McLuhan, 1962; 1964; Ong, 1982; Havelock, 1986), and from the book history tradition (Steinberg, 1974; Eisenstein, 1983; 2005; Lyons, 2011).

The characteristics of digital writing implied by the model developed in the research are ultimately presented as potentialities of writing generally that come to be emphasised under particular social and technological conditions. The research argues that digital writing is not fundamentally different, but that digital writing tends to be used in ways which emphasise different potentials under different epistemic conditions (s. 3.5). **Output D,** for example, argues that the mode of reproduction “does not determine […] cultural values, but creates a field of possibility for the creation, dissemination, and use of textual works” (2008: 68). Later in the same work it is argued:

> These values emerged out of the mode of reproduction; they are not intrinsic to writing but are just one modality of writing. And while our values are still largely those of the printing tradition, digital textuality is not quite the same. [76]

The model of digital textuality and its relationship to the socio-cultural and technological context mirrors, and indeed is a case study of, perceptions of the changing nature of information generally (22).

3.5 The nature of knowledge: The treatment of digital textuality associates shifts in writing and its reproduction with epistemological scepticism of the mid-twentieth century. From this perspective, the destabilising of the traditional conceptions of the ontology of writing has consequences for the status of knowledge. This possibility is implied by the integrational linguist Roy Harris, who has written:

> It is striking that the Western academic tradition, which has relied so extensively on writing – as opposed to oral transmission – for its very existence, has so far produced no comprehensive theory of writing itself (Harris, 1995: 1)

Notwithstanding Harris' own work (particularly: 1995; 2000), no comprehensive theory of writing has subsequently emerged. Nevertheless, it is perhaps reasonable to suppose that changes in the uses of writing may have a profound impact on the status of knowledge generally, and particularly scholarly knowledge (cf. Lyotard: 1986: 4). Derrida (1976) pursues this theme in his research, implying that the destabilisation of writing as a vehicle for meaning is made visible by the proliferation of media and communications technologies:

> The development of the practical methods of information retrieval extends the possibilities of the "message" vastly, to the point where it is no longer the "written" translation of a language, the transporting of a signified which could remain spoken in its integrity. It goes hand in hand with an extension of phonography and of all the means of conserving the spoken language, of making it function without the presence of the speaking subject. […] But this nonfortuitous conjunction of cybernetics and the "human sciences" of writing leads to a more profound reversal. The "rationality" […] which governs a writing thus enlarged and radicalized, no longer issues from a logos. Further it inaugurates the destruction, not the demolition but the de-sedimentation, the de-construction, of all the significations that have their source in that logos. Particularly the signification of *truth.*

The supposition of shift in the status of knowledge accompanying the digital age (RQ 3) is explored in my research, which draws on Derrida's observations and outlines the relationship between information, writing and knowledge (particularly: **Output A; C; D; G**)[61].

The notion that technology undermines objective knowledge is a persistent theme of the sociology of technology, particularly evident in post-modernist scepticism. Lyotard for example argued that computers encouraged the "exteriorization of knowledge" (1986: 4) leading to "an internal corrosion of the legitimacy principles" (1986: 39) and suggests that "the nature of knowledge cannot survive unchanged within this context of general transformation" (1986: 4; Output D: 97-116). Baudrillard (1994: 79) similarly argued that the proliferation of information comes at the cost of meaning, attributing the implosion of meaning to the corrosive effects of information itself. The theme has also become common if controversial in cyberculture; Andrew Keen for example suggests digital culture accomplishes an "undermining of truth" (2007: 17) where "every posting is just another person's version of the truth, every fiction is just another person's version of the facts" (2007: 3).

The research engages directly with these debates[62], but extends them by associating the anxiety concerning objective knowledge and objective truth as itself a consequence of digitality and social change (s. 3.3). It is argued that objective knowledge remains fundamentally unchanged, but that digital technologies emphasise precisely those existing uncertainties that prior information technologies such as the printing press had tended to conceal (**Output B; D:** 97-115). This analysis of the conditions of knowledge draws directly on the analysis of digital textuality (s 3.4) and nature of information (s.3.2). The relationship between knowledge, information and writing emerges in the early outputs presented here, which note that information is not only entwined with conceptions of knowledge[63], but

[61] The relationship between information and knowledge has traditionally been a central theoretical concern of information science, typified by for example Brookes' *Fundamental Equation* (1975), and in the incorporation of Polayni's (1952) tacit knowledge into Knowledge Management. However, my research follows Derrida (1976) in exploring the triadic relationship between information, writing and knowledge throughout.

[62] For example, Lyotard is discussed in **Outputs A** (203-231) & **D (**99-101**).** Baudrillard is discussed in **Outputs A** (203-231), **D** (103-104), **G** & **H.** Keen is discussed in **Outputs B** & **D** (108-109).

[63] E.g. "no discourse on information can escape defining either tacitly or explicitly both its understanding of knowledge and its understanding of how knowledge comes to be represented

that any theory of information will necessarily imply both epistemological positions (**Output A:** 20-21) and a theory of representation (**Output A:** 117). No suggestion of a causal relationship is made, (of particular theories of information leading to particular epistemologies or vice versa), but rather a complex entanglement of theoretical concepts. Particular aspects of this relationship are explored in multiple outputs (**A; B; D; F; G)**.

While in the early outputs the analysis of the conditions of knowledge is defined in terms of Foucault's concept of discourse (**A**: 175-177; **C**), this is subsequently developed using Foucault's (1969) concept of the *episteme*, understood as "the a priori historically situated frameworks that ground knowledge and truth" (**Output D:** 118), and that determine the boundaries of thought and language use (Foucault, 1969). Particular epistemes are predicated in part on assumptions concerning the nature of information. This occurs because of the centrality of writing to the Western intellectual tradition particularly throughout the modern period (Harris, 1995; Foucault, 1969), the association between information, writing and knowledge, and the transformations to the perceived ontological qualities of writing and its uses (s. 3.4). The research argues that the epistemes of the modern period are characteristic of the late age of print, and conflate notions of objectivity and rationality with the stabilising influence of print reproduction on the ontology of the text. Both trends in twentieth-century philosophy - such as the linguistic turn (e.g. Wittgenstein, 1953; Saussure, 1966; White, 1969; cf. Rorty, 1967), post-structuralism, and post-modernism - and the anxieties accompanying digital and social media expose the ways in which an association of objective knowledge with a stable information artefact is already problemetised after the destabilising effect of mass media (**Output G**). Thus they represent critical responses to their own historically situated socio-cultural context, rather than a reappraisal of the conditions of knowledge *per se* (s. 3.6).

Digital technologies, particularly interactive social media, complete the divorcing of objective knowledge and stable information artefact implied by twentieth century epistemological scepticism (**Output D:** 97-116**).** This divorce occurs because the ontology of the web in particular (s. 3.2) and digital information in general explicitly and deliberately unsettle the relationship between information, writing and knowledge that pertains in the

through cultural products" (**Output A:** 262)

age of print (s. 2.4). This is not presented as an outcome of technological change itself, but a political stance built in to the technology by its creators, and from which arise many of the anxieties around the influence of the web in relation to intellectual property, anonymity, power, and in particular knowledge (**Output A; B; C; D; E; G)**. Thus what appears superficially to be a technological shift towards greater user interaction conceals a shift in the dominant epistemological paradigms of contemporary western cultures – a shift in the ways in which information becomes validated as truths - that not only has its roots in the political activism of mid-twentieth century counter-culture, but is also contested at every level within the social and technological system itself (**Output B; D; E; F)**[64]**.**

However, the research does not present this as a fundamental transformation in the nature of knowledge, nor a transformation in the ways in which claims to knowledge are situated within their social, cultural, academic and scientific contexts. Instead the shift is chimerical, framed as variation in the subjective emphasis which is placed upon competing truth claims within recorded culture **(Output D):**

> Participatory culture undermines this sedimentation of objective knowledge in the vessels of its transmission and dissemination precisely because it undermines the stability of the cultural artefact itself […] But the investment of objective knowledge in the stable vessels that enabled its transmission and dissemination has always been a kind of fiction […] the digital age has not changed the nature of knowledge; it has merely changed the way in which we organise its creation and dissemination […] Underneath the placid surface of the documentary culture of the modern age, the same churning of ideas and outlooks that characterises the post-modern condition was always under way (**Output D:** 110 – 112)

The processes by which claims to truth are evaluated are invariant, but under conditions of ubiquitous and continuous information technologies those processes become re-incorporated into the record (particularly in social media contexts). Therefore, drawing on

[64] **Output B** for example notes that "hypertext and the Web were developed with an explicit rejection of the epistemological models applied to traditional approaches to managing information"; his argument informs other outputs submitted here (**C; D; E; F; G; I**).

Williams' (1961) concepts of *documentary* and *lived* cultures (**Output D:** 50), the research argues that "the participatory mode of the digital age unites the documentary and lived cultures" separated by modernity (**Output D: 113**)[65]

This focus on the subjective experience in the analysis of conditions of knowledge characterises my work (cf. s. 3.2; 3.3). It's significance arises from the ways in which shifting perceptions informing the epistemic conditions of contemporary culture impact on all contexts in which knowledge production and organization are at stake (not least discourse of Information Science itself). In that analysis of the conditions of knowledge the research outputs not only echo but also attempt to explain the epistemological scepticism of digitality, and of the post-modern condition (Lyotard, 1986; cf. Baudrillard, 1994).

One response to this scepticism developed in the later outputs is the concept of second-order literacy[66], developed in preference to the existing concept of information literacy (**Output D**: 113-115). Information literacy tends to emphasise a skills-based or competency-based approach to educational marginalisation within digital culture that tends to overlook the socio-cultural contexts within which those skills and competencies are practically embedded (e.g. Andretta, 2005; Bundy 2004). Second-order literacy by contrast is fully embedded in socio-cultural practices and emphasises the meaning-making processes and participatory modes of digital culture (**Output D:** 114**),** to situate the conditions of knowledge in participatory meaning-making social activities (particularly: **Output D**: 79-115). The most obvious manifest way in which this is addressed in the later ouptuts is in relation to historicity, and the conditions of historical knowledge, which pertain not just to the past (**Output G; H**) but also to the present (**Output D; H**)

[65] Of particular importance to this statement is the function of memory in late-medieval and early modern culture, as explored by Yates (1966) and Carruthers (1990) and discussed in **Output D** (59-78)

[66] Coined along the lines of secondary orality (Ong, 1982).

3.6 History and historicity: Both history and historicity are integral themes in each of the submitted outputs. Historical framing contributes both a principle of organisation and a heuristic device to approach change (e.g. **Output A; C; D; E)**[67]. Each of the submitted outputs explicitly engages with notions of change within historically situated contexts (cf. s. 3.2)[68]. Historical themes such as preservation, digital archiving, and their relationships to documentary culture (s. 3.5) are also addressed (e.g. **Output D; G**). In addition history has influenced the methodological and theoretical perspectives employed (particularly: **Output A; D; E; G; H; I)**[69]. The outputs are saturated by notions of history and historical change, reflecting the central theme of technological change as a subjective and embedded social experience (s. 3.2).

However, as it develops the research increasingly addresses the historicity of digitality itself, and questions the nature of history as both a popular and an academic discourse under conditions of digital reproduction (particularly: **Output D:** 149-166; **G; H)**. This analysis reflects the impact of digitality (s. 3.3) and digital textuality (s. 3.4) on conditions of knowledge production and consumption (s. 3.5), particularly in relation to both the nature of information (s. 3.2) and to epistemological scepticism. The historicity of digitality becomes increasingly understood as fundamental to the meaning-making modes of the second-order literacies of digital culture (s. 3.5) and to the formation of digital subjectivities (**Output D**: 135-147) (RQ 3). In this analysis the nature of history debate is framed by the socio-cultural and technological contexts of that debate itself – the nature of history debate is itself historicised. In this way the theme of historicity, particularly as developed my later outputs (**G, H; I)**, ties together many of the substantive arguments in my earlier research outputs.

[67] This function is highlighted from the earliest outputs; **Output A** for example makes it clear that one of its aims is "to address a problem of the study of information being generally ahistorical" which it does by attempting to understand "the historical context of ideas that have informed the understanding of information" (xiv).

[68] E.g. **Output A** addresses elements of the history of Librarianship (25-52), Information Science (53-84), and Computer Science (85-114); Library history is also addressed in **Output F;** multiple outputs explore the historical contexts of the discourses of the World Wide Web (**Output C; D; E; I**); several outputs address aspects of the history of writing, printing and textuality (**Output A; C; D; G; H**).

[69] While the outputs do not claim to be modelling the practice of historical research, (they are not *histories* as such but merely exploit historical narrative modes), in each case the historicity of technology and information is emphasized in keeping with the narrative modes emphasise by my research (s. 2). The past therefore provides within my research both a narrative framework and a means to understand and confront the experience of change (s. 3.3).

Questions suggested by the relationship between technology and history have emerged in two distinct fields, both closely related to Information Science. Information History, which has been described as "the historical study of information for its own sake" (Weller, 2007), is a field of research that explicitly addresses both the history of information, and the role of information in producing histories. Largely developed by Alistair Black (1996; 2006) and Toni Weller (2007, 2008, 2010, 2011; cf. Weller & Bawden, 2006; Bawden, 2010), Information History goes beyond library history in both its sphere of interest, and its focus on historical method and historiography. Digital history, a branch of the digital humanities, addresses both the use of technology in historical research, and how technology can be used to create new kinds of historical representations (Weller, 2013)[70]. Both fields have generally addressed the history *of* information and information technology, and historical research *through* information and information technologies. My research extends these emerging disciplines by addressing how technology influences our understanding of the nature of history itself (particularly: **Output G; H**).

The nature of history has been the subject of significant critical scholarship throughout the latter twentieth-century, particularly after the publication of Hayden White's *Metahistory: the Historical Imagination in 19th Century Europe* in 1973. Subsequent theorists such as Jenkins (1991; 1995; 1999), Munslow (2003; 2006) Eaglestone (2001) and Ankersmit (2001) developed epistemologically sceptical approaches to historical representation and attacked more realist-inflected approaches offered by Marwick (1981), Carr (2001), Elton (2002) and most provocatively Evans (1997). Keith Jenkins for example maintained that the *past* and *history* are different that "float free of each other" and "are ages and miles apart" (1991: 7). The reality of past experiences is rarely seriously doubted (Munslow, 2003), but the possibility of re-presenting those experiences in historical accounts remains more problematic. Jenkins (1991; 1995; 1999) along with other post-modernist, deconstructionist, and new history theorists question whether the truths of history and the truths of the past are ever commensurable. In response, Fulbrook sought to reconcile historical research and historical scepticism, suggesting that "most historians make at least an implicit claim for

[70] Digital History developed out of the Computing in the Humanities tradition (e.g. Higgs, 1998) and adopts some of the preoccupation of that precursor field.

some degree of truth value for what they are saying" (2002: 7). More recently de Groot (2008) has investigated the ways that historical themes are inflected in popular discourse and the mass media, from film and fiction to computer games, adopting a subjectivist position on historical representation from post-modernist historiography.

My research engages with this debate directly[71], but develops the themes of that debate by exploring the impact of technology on the emergence of historical scepticism in the late twentieth century itself, what this implies about the nature of the past, and how history is subjectively experienced as a lived part of digital culture (particularly: **Output D; G; H**). From the early period the research is situated in relationship to post-modernist or "new" historiography with an emphasis on historical scepticism; **Output A** for example states:

> The historiographic approach for the historical sections broadly follows post-modernist historical readings influenced by Foucault (particularly 1972), Jenkins (1991) and White (1978); that is to say that history is not understood to be a recounting of objective events, but an uncovering of subjective interpretations goverened very often by the application of power (xiv).

However, the later period of outputs expand on this theme, coming to situate postmodernist epistemological scepticism as a mode of cultural engagement that is itself historically situated, and inseparable from the historical context in which it was formulated. Therefore historical scepticism is understood to itself reflect a broader anxiety about the threat to scholarship posed by digitality, and the prior anxiety concerning the threat posed by mass media and mass communications (s. 3.5). While post-modernism explicitly emerged in response to the proliferation of mass media and technologies, the proponents of post-modernist history do not address the role of either mediation or technology in history or historical representation directly (**Output G**). The epistemological doubt of postmodernism is reproduced outside of its own historical context in a way that conceals its own historiocity. This argument is introduced in **Output D,** and iterated and elaborated in **Output G**.

[71] Particularly in **Output G** where the fullest exploration of the nature of history debate takes place. See also: **Output D** (149-168)**.**

As it develops the analysis converges on the notion that historiographical scepticism and the subjectivity of historicised experience is both an integral part of the experience of digitality, and an outcome of the shifting conditions of knowledge production under conditions of digital culture. While digital culture "has both forgotten its own past and neglected its own future" (**Output D**: 149), the discourse of digitality is saturated by notions of historical significance (**output D; H)** and historical signification (**Output D; G**). The research interrogates the influence of modes of information production, transmission and consumptions on the nature of history debate (**Output G**).

In general it is argued that the shifting ontologies of information lead to shifting perceptions of the past (**Output D:** 149–166; **G; H**). **Output D** for example suggests that "the anxiety about a loss of cultural memory reflects not only tension about our relationship with the past, but also tensions about the role of digital information technologies in our lives in the present and the foreseeable future" (**Output D**: 149). This work focusses on historical issues related to the status of the archive and libraries, and their political function with contemporary states. However, this theme is iterated, elaborated and expanded in the more recent outputs, which explicitly question whether "history any longer [has] meaning in the information age" (**Output G:** 175) and describe the "epistemological crisis" of postmodernist history as a reaction to the emergence of media and communications technologies, and pluralisation of access to and intervention in accounts of the past. It is argued that "history occupies the spaces between the record and the past and does not seem to belong to either" (**Output G:** 189**)** and that "the new mutation of writing accompanying the technologies of the information age […] expose the knowable past as a vanishing referent" (190). In this way the analysis of the nature of history arises direction out of the prior analysis of the nature of information (s. 3.2), textuality (s. 3.4) and knowledge (s. 3.5) .

This more recent work explicitly seeks to go beyond earlier conceptions of the impact of computing on history, which often address methodological rather than philosophical issues, and thereby largely reduce digital technologies to the role of *tool* (e.g. Higgs, 1998). By contrast the research argues that the most significant impact of digitality on history and the historical past arises from the ways in which underlying shift in assumptions concerning the

relationship between information and knowledge change the ways we conceive of the knowable past **(Output G)**. This theme is developed in my research in relation to popular notions of historicity (**Output H:** 41**),** where I suggest that:

> Advancements in media and communications technology have shifted the site of history's making, transforming the public from spectators of historical events to participants in historical dramas. These changes have collapsed the distinction between the present, and the truly historical, such that we begin to interpret, frame and understand events as already historicised at the very moment that we experience them.

Following Chopra-Gant (2010), this idea is developed as "instant history" (**Output H**). This latter period of research meditates on the central function of absence in the historical narrative, and suggests following Barthes (1989) that "history cannot function in the presence of the original; it requires an absent space onto which to project a narrative of the past" (**Output H:** 57**)**. This statement summarises the broader perspective on the critical importance of interstices in my research – the importance of the unarticulated spaces between and within discourses - that emerges as a preoccupation in relation to each of the key themes of my research and defines much of the theoretical approach.

The nature of history in this context therefore confronts shifting attitudes towards knowledge, meaning, and truth (s. 3.5). While history is applied methodologically, the theme of history serves to explore the status of knowledge in the age of print, particularly academic and scholarly knowledge (**Output H**). Printing, is argued, stabilised the concept of the historical trace, and helped stabilise the truths towards which historical discourse aspires (**Output H**). The effect of digital technology is to destabilise those truths by undermining the vehicles of their transmission. Thus in the research the nature of history stands in place for the nature, reliability, and epistemic foundations of academic scholarship in general.

4. Summary and conclusions

This narrative commentary has summarised the coherence of the submitted research by tracing their engagement with a number of interdependent themes arising out of a central thesis concerning the nature of information and their relationship to the disciplinary field of Information Science (s. 2; s. 3.). The commentary has addressed the thesis that one significant consequence of the proliferation of digital technologies has been a change in tacit understandings about the nature of information, and in turn tacit conceptions of both the nature of knowledge and the nature of knowing. While not fundamentally altering the nature of information itself, it has been argued that technological change has transformed the social, cultural and professional contexts in which information is embedded and used. This change has notable epistemological, ontological and socio-cultural aspects. This has been described in relation to the research questions underpinning this critical commentary (s. 2), which underpin each of the five substantive themes of my research outputs (s.3).

The apparent transformation to information that arises as a consequence of digital technologies (s. 3.2) is understood to have a number of notable consequences; in their generality, these consequences have been described in terms of digitality, the condition of living in digital culture (s.3.3). Digitality has been ascribed to the subjective experience of digital culture arising from changes in the relative visibility of particular social and cultural practices over time, changes which chart a mythopoeic relationship between technology and culture. One of the ways in which this has been analysed in the research is through the

practices and contexts of digital textuality – the culture of the text in digital contexts particularly ephemeral and social contexts (s. 3.4). The digital text, it has been argued, unsettles the association between writing and the material artefact, undermining the ontological qualities projected onto the medium of writing in the age of print, and in particular the association between text, authenticity, and authority. Because of the association between writing and recorded knowledge, the changing status of writing has notable consequences for the status of knowledge, which can be charted through the epistemological scepticism of post-modernism (s. 3.5). One of the ways in which this has been explored in the research has been through the impact of technology on conceptions of the nature of history and the historical past (s. 3.6). In general the research argues that profound social and cultural changes accompany the digital age, but that these changes arise from the subjective experience of change as we move toward a state of ubiquitous information.

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Appendix A: Outputs submitted for award:

The following outputs by the research have been included in the submission for the award of Ph.D. by Prior Output:

A Tredinnick, L. (2006a), *Digital Information Contexts: Theoretical Approaches to Understanding Digital Information,* Oxford: Chandos Publishing.

B Tredinnick, L. (2006b), Web 2.0 and Business: A Pointer to the Intranets of the future, *Business Information Review,* 23 (4): 228-234.

C Tredinnick, L. (2007), Post-Structuralism, Hypertext and the World Wide Web, *Aslib Proceedings,* 59 (2), 169-186.

D Tredinnick, L. (2008), *Digital Information Culture: The Individual and Society in the Digital Age,* Oxford: Chandos Publishing.

E Tredinnick, L. (2009a), Complexity Theory and the Web, *Journal of Documentation, 68 (5):* 797-816.

F Tredinnick, L. (2009b), The Analogue Library in the Digital Age (2010), *The Danish Journal of Library Research [Dansk BiblioteksForskning],* 5 (2/3): 37-50.

G Tredinnick, L. (2011a), Rewriting History: digital discourse and the knowable past, in Weller, T. (2010), *Information History in the Modern World,* London: Palgrave MacMillan.

H Tredinnick, L. (2013a), The Making of History: remediating historicised experience, in Weller, T. (c.2013), *Digital History,* London & New York: Routledge.

I Tredinnick, L. (2013b), Each One of Us is Several: Networks, Rhizomes, and Web Organisms, *Knowledge Organization,* 40 (6): 414-421.

In addition to the thematic and theoretical links addressed in this narrative, several of the submitted outputs are linked in more explicit ways. **Outputs A** and **D** were commissioned and written as a coherent sequence. Chapter 7 in **Output A** was written in parallel with **Output C** and embodies many of the same concerns**.** The material in **Output B** was further developed in chapter 6 of **Output D. Output E** was suggested by the research that contributed to chapter 9 of **Output A** (although the focus of each is different)**. Output F** was commissioned by the editors on the basis of **Output A. Output G** was commissioned by the editor on the basis of **Output D. Output H** was commissioned by the editor on account of **Output G**. **Outputs G** and **H** appear in volumes by a single editor and can be considered as related works reflecting arguments that develop across the two outputs. **Output I** was commissioned from the editors, and was conceived a counterpart to **Output D**. These kinds of relationships reflect both patterns of research and publishing developed by the researcher and constrained by the institutional context within which the research was conducted. They are also an outcome of the iteration and elaboration of ideas over time (s. 1).

Several of the outputs were written as invited contributions to special issues or edited collections. **Output B** was written by invitation of the journal editors. **Output C** formed part of a special issue produced within London Metropolitan University by invitation of the journal editors and publishers. **Output F** was an invited contribution to a Danish journal, and a revised version of the work was subsequently translated into Danish for incorporation into an edited collection (Tredinnick, 2012). **Output F** and **Output G** were both written by invitation of the editor of each collection. **Output I** was an invited contribution to a special edition of a journal requested by the editor. I have been fortunate in being given these opportunities and am grateful to the various individuals concerned in co-ordinating the special issues and edited collections.

Appendix B: All published outputs

In accordance with the guidance notes for submission, the following list includes all scholarly outputs produced by the researcher, including those that have not been included as a part of the submission:

- Tredinnick, L. (2001), Building an Intranet Content Management Strategy, *Vine,* 31 (3): 20-26.
- Tredinnick, L. (2004a), *Why Intranets Fail (And How to Fix Them),* Oxford: Chandos Publishing.
- Tredinnick, L. (2004b), The digital age and the changing profession, *Library and Information Update* 3 (10), October 2004.
- Tredinnick, L. (2004c), Organizing the Internet: Library Trends 52 (2); Edited by Andrew Torok, *Journal of Library and Information Science,* 36 (2): 90-91.
- Tredinnick, L. (2004d), "Managing your Internet and Intranet Services; by Peter Griffiths", *Learning & Teaching Support Network (http://www.ics.ltsn.ac.uk/*).
- Tredinnick, L. (2005a), The Information Society: a study in continuity and change, *Journal of Librarianship and Information Science,* 23 (4): 100-102.
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- Tredinnick, L. (2005d), Digitizing Collections: strategic issues for the information manager; Laura M. Hughes, *Library and Information Research,* 29 (92): 68.

- Tredinnick, L. (2006a), *Digital Information Contexts: Theoretical Approaches to Understanding Digital Information,* Oxford: Chandos Publishing.

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- Tredinnick, L. (2006e), Taming intranets, *UKeIG Intranet Managers Group,* London, 28th March 2006.

- Tredinnick, L. (2007), Post-structuralism, Hypertext, and the World Wide Web, *Aslib Proceedings,* 59 (2), 169-186. 2007.

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- Tredinnick, L. (2009a), Complexity Theory and the Web, *Journal of Documentation,* 65 (5): 797-816.

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Appendix C: Extracts from published reviews:

The following extracts from reviews of **Output A** and **Output D** were published in various academic and professional journals. They are presented here as indicative of post-publication critical review in concordance with the guidelines for submission (s. 1).

C1: Extracts from reviews of Output D: *Digital Information Culture: The Individual and Society in the Digital Age* (2008)

> It is a long time since I read a book as engaging as this one. Tredinnick offers a dynamic and fascinating discussion of the changing culture of information [...] makes for fascinating reading and one that will certainly become an invaluable text on my bookshelf. *Journal of Librarianship and Information Science,* 41 (Dec 2009): 249-51.
>
> Tredinnick's book is a fascinating read that explores the real impact of digital technology on our approach to print and on our traditional ways of working and thinking. It highlights many issues related to narrative and social discourse that capture the reality of the social system, and how this discourse reflects the experience of culture in the digital age. *Online Information Review,* 33 (1): 208-209.
>
> This is an impressive and very useful book. It is impressive in drawing on a wide range of relevant ideas (on history, society, culture, technology) to tease out the ways in which we can validly speak about the cultural aspects of digital information. It is very useful because it will almost instantly join lists of recommended reading wherever information, knowledge and library studies are formally taught […] Chandos have published one of their best recent books with

this one. […] Certainly a winner here and, unusually for such a book, one that admirably stays this side of cliché and pomposity. *Ariadne,* 55 (April 2008).

For this reviewer Tredinnick's text is the first to cover all the bases in exploring the pervasive cultural change that we have experienced through the late twentieth and early twenty-first centuries. Tredinnick contextualizes cultural change and digital technologies in a way that many authors writing on the same subject do not. His knowledge of transdisciplinary theory (across literary criticism, cultural studies, media and communications, information science) provides a holistic perspective on digital culture which offers real insight. Drawing on the legacy of literary criticism and cultural theory embeds Tredinnick's analysis in a broad historical context, which avoids the techno-euphoria of many authors on digital technology. Read it. [*Library Review,* 59 (3): 236.

This is a book about the influence of information technology on our lives [...] What follows is a fascinating , erudite investigation into the impact of the digital technologies we use daily [...] I know no other book discussing these fields in such a coherent, logical, readable manner [...] Enjoy the book, argue with it - then buy another copy for your library!", [*Library and Information Update, M*arch, 2008, p. 24.

Digital Information Culture is, like its companion *Digital Information Contexts*, a thought-provoking book. [...] The book contributes much to the literature on digital culture as an emerging social phenomenon. It reads easily and is a must-read for all interested in digital culture and socio-cultural changes. *Library Hi Tech,* 26 (4): 688-689.

The book [...] will be of interest to those who do not search for immediate answers but turn to analysing how the questions are constructed. The main value of the book is in uncovering complex contexts in which our expectations to digital technology are situated and in responding the need for reflection on such approaches. Discussion is enriched by the multiple examples of approaches and fears emerging in fiction and films. *Journal of Documentation,* 65 (2): 205.

This book contains a thoughtful examination of the complexities in relationships between the concepts of culture and the digital environment as it has developed and currently exists. [...] This is a most useful title and one that should be recommended as a text for units that cover the intersection of culture and technology. *Library Management,* 30 (4/5): 342-343.

Readers […] will find this erudite and theoretically nuanced work engaging and powerfully thought provoking. […] Digital Information Culture provides an erudite overview of major issues connected with digital culture and serves as a prolegomena for further study. *Journal of Electronic Resources in Medical Libraries,* 6 (2009): 184-185.

Librarians are often at the cutting edge of the digital information world, and they may be interested in the impact it has on culture at large. The first part of this book examines the representation of technology in culture and the narratives that have evolved in response to changing technology; the second part highlights the common thematic elements of digital culture. *Computers in Libraries,* June 2008.

C2: Extracts from reviews of Output A: *Digital Information Contexts: Theoretical Approaches to Understanding Digital Information* (2008)

A must-read for all interested in the context of digital information and its place in information science. *Online Information Review,* 31 (2) 2007, 243-244.

It is a most important task of information science to develop a theoretical framework, and a book such as this one, which provides critical analysis of current perspectives, is a most welcome contribution [...] The breadth and focus of this book is impressive [...] This book is no small contribution […] We badly need insights of this nature in our field. […] I highly recommend it and I also recommend a further discussion and development of the theoretical basis of our field. *Journal of Documentation,* 63 (5) 2005: 792-800.

Contexts is an extremely thought-provoking work and an important one too. I challenge anyone to emerge from reading this book entirely unscathed (if not changed) - this is a work in which the reader will find many areas with which to agree or disagree but not remain neutral. [It] is recommended for graduate and postgraduate students on information management courses, information management professionals, as well as those involved in allied academic fields, such as cultural studies, communications studies, and media studies. *Alexandria,* 19 (2) 139-142.

Digital Information Contexts does a fine job of making difficult theoretical concepts accessible to information professionals. *Journal of Web Librarianship,* 2 (1): 91-93.

In *Digital Information Contexts* Tredinnick draws on the overlaps and intersections between information science, cultural and media studies to provide a provocative re-conceptualization of the way in which we think about information itself. [...]Information management as a profession and academic discipline needs to reflect, reshape and evolve. Tredinnick knows this, noting the changing information and cultural environments in which knowledge is formed. Digital Information Contexts provides a valuable step (perhaps a push) in the right direction. *Library Review,* 59 (3): 235-236.