Introduction

Huvila, Isto

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Isto Huvila

There is no digital archaeology and no digital society. There is merely archaeology and society, and the digital as a facet of a particular set of technologies and as a cultural phenomenon that permeates the contemporary existence both when it is present and absent. In contrast to earlier perspectives to archaeology and the digital, this edited volume explores the impact of digitality on archaeological work in a societal context. Instead of looking at the impact of digitality in archaeological theory and practice, we go further to see what happens in the society when the digital instils archaeological practices and their premises and vice versa, how archaeological practices are influenced by how 'the digital' has permeated the contemporary culture. For us the outcome of the digital on archaeology does not stop at a conceptualisation of a possible new digital paradigm but at a careful explication and understanding of how it changes the very essence of what archaeologists do.

This book traces the interplay of digital changes and non-digital stabilities throughout the archaeological information process from the field to academic research, museums and the society. As for archaeology (e.g. Edgeworth, 2015; Witmore, 2014; Alberti et al., 2013; Meskell, 2005), information is in this volume as much material, visual, cognitive, social, oral and embodied as it is textual. The individual chapters look into how the management, use and reuse of information and knowledge-making are changing and what implications the changes have on what we know about archaeology and the past. As Stenborg notes later in this book, "archaeology may be considered as a discipline concerned with knowledge or information about the past" but as much as being concerned about the past, as a whole this volume extends its scope to the interest in information and knowledge about the archaeological enterprise. To come closer to this, the different chapters of this volume explore not only the implications of knowing and not knowing about the past but also what access and information means in different existing and emerging contexts of use. The long-term concern of archaeology and this volume alike is not only how archaeological information work happens here and now but also what are its prospects of perpetuation i.e. consequences for knowledge-making also in the future.

The digital change is partly a very tangible and partly an imagined shift of changing priorities and perspectives. It is intertwined with societal politics and practices of conducting and using research, defining and valuing cultural heritage and for instance, keeping and managing archival information. Closer to the everyday practices working with archaeology, it is shaped by organisational and disciplinary change and inertia, the persistence of enduring qualities of archaeological work, and the longevity of how and what is known about archaeology in the future, how the digital influences archaeological work and especially its repercussions in other branches of archaeological work and broader in the society, what are the central skills and competences of archaeologists and non-archaeologists working with archaeology and archaeological information.

At the same time as we posit that digital archaeology or digital society do not exist, we ask whether digitality and its wider implications for research make a paradigm shift (e.g. Kristiansen, 2014a), a scientific intellectual movement (Frickel & Gross, 2005) or a mere appropriation of a particular set of

technologies in the use of the perennial enterprise of doing archaeology. The conclusion might be that it is of that all but nothing of it in particular. It will have the role it will be given.

Using to a set of glimpses to different parts of the archaeological information process and the influence of digital in the archaeological work from archaeological fieldwork to the desks of administrators and large-scale data intensive research to museums and global audiences of archaeological heritage this volume seeks answers to

- how the concept of archaeological information is changing and is not changing?
- how digital technologies for documentation and knowledge-making impact the types of information valued today, and the types of information kept for future uses
- what should be done with archaeological work and the management of archaeological information to make the best out digitality and to avoid the worst?

These questions will be discussed in the following seven chapters of this volume. The aim of this volume is not to provide a comprehensive, total overview of archaeological practices but rather by making excursions to some of the central areas of archaeology within which the digital is making a difference, to shed light to its implications on archaeological information work. By bringing together insights from these specific areas of archaeological work, it is possible to get an idea of the impact of the digital and to understand the mechanics of archaeological information in the digital society. Central themes for all of the chapters is the diversity of archaeological information, how archaeological information is made in different contexts and situations, and what are the implications of the digitisation of archaeological information work.

There are obviously limitations to what is covered in this volume. Even if there is a tendency to write internationally about archaeology and archaeological work, and to make propositions of its theoretical and practical premises and exploits, there is really no such thing as archaeology in general. There are principles and similarities in both theoretical and practical perspectives and undertakings but at least as many differences that make archaeologists to work differently in different parts of the world and even in different places and contexts within one country or locality. As the writers of this volume all based in Sweden, we are well aware of that much of our empirical observations and the theoretical implications of our work alike are stemming from the Swedish and Nordic context. Even if all of us have been working to different extents in and on archaeologies, archaeologists and archaeological information work outside this specific area by conducting fieldwork in different parts of the world or by conducting research that pertains to areas and conditions outside Scandinavia, we are aware of our perspective that comes from our specific backgrounds and means that it has limitations. In practice, all observations and propositions we make, might not be equally pertinent in all possible contexts and situations around the globe and we strongly encourage to read this volume as critically as all archaeological and other scholarly literature should be read when it comes to the general applicability of its propositions.

A second limitation relates to the range of themes discussed in this volume. We do write only little about artefacts and only very specific aspects of them, and we almost omit the management of physical collections. We write about fieldwork but only from specific perspectives. The same applies to public and community archaeology. We are writing about the use and reuse of legacy archaeological data in the context of the management and archiving of archaeological information and specific lines of data intensive archaeological research. Everything written in the volume has implications to the education and training of archaeologists even the perspective itself goes only implicitly through the volume. All of these and many other topics and perspectives are facing the implications of digitisation, archaeological information work is conducted in these contexts as well,

and they are not less central to the contemporary archaeological work than the themes discussed in more detail in this volume. We could have selected the topics otherwise but we do still feel that insights into this particular combination of partly typical and partly uncommon vantage points can serve as a useful onset to understanding the dynamics of archaeological information work in the contemporary, digital society.

Before starting our perusal of these issues in detail, it is necessary to discuss briefly our take on what is meant by archaeological information and making of information, what is archaeological work, and what we mean when we are referring to the digital society as a scene for the digitisation of archaeological information work.

Knowledge in the making

A fundamental aim of archaeology, and of archaeological information work as an informational layer or second-order activity related to archaeological work, is to create new knowledge of the past human activities. The exact definitions of what archaeology is all about vary to a certain extent but on a fundamental level, describing archaeology as a knowledge-creating enterprise is uncontroversial. Archaeological work itself consists much more than mere knowledge production. Our definition of archaeological work in this book draws from an understanding of work as a "distinct evolving set of inter-linked human activities with either explicitly or implicitly understood purpose, meaning and value" (Huvila, 2008). A general understanding of what counts as work is generally shared in a community but the more specific understanding of its meaning can differ between individuals (Star & Strauss, 1999). In this volume, archaeological work covers all purposeful engagement with and for archaeology, within which, as noted earlier, knowledge creation is a central aspect. Knowledge creation is, of course, not unique to archaeology. It pertains to science, scholarship and numerous branches of professional and leisurely activities even if in many cases the knowledge-oriented enterprise is intertwined to more practical and tangible aims.

In this volume, our interest is information and especially the activities of informing and getting informed as a part of the knowledge generating endeavour in archaeology. However, instead of focussing on knowledge production as an ultimate aim of all archaeological work and how archaeology as a whole creates new knowledge, the pivotal point of our attention is how the production of knowledge is entwined in the mundane practices throughout the archaeological enterprise. Our interest lies on various types of local and situated acts and activities of *knowledge-making* (Börjesson et al., 2016), information work as a premise of these activities, and only secondarily on how they influence the grand endeavour of *producing* archaeological knowledge as a whole. In contrast to the larger organisational knowledge producing processes (Li et al., 2017), information research only rather recently engaged in a more systematic inquiry into the particulars of these often mundane and invisible practices. Even if we are acknowledging that the making of knowledge is about producing ontologies (Nickel, 2015), in contrast to the concern of theoretical archaeology in the ontologies themselves, our interest lies in how they are made to come into being. In order to understand how a discipline like archaeology produces knowledge, it is necessary to study how individuals and organisations acting within that discipline engage in the specific and hands-on albeit still highly political (Nickel, 2015) micro-level practices of making of the ingredients (e.g. data, Tempini, 2015, or information, Huvila, 2012b) and premises of knowledge, and the knowledge itself. In this sense, archaeological information is an ingredient of archaeological knowledge and that of the perpetuation of archaeology as a discipline, similarly to how information in general is an 'ingredient'

of knowledge (Huvila, 2012b), and knowledge-making is a part of archaeological information work. In practice, this information can be many things as earlier research has shown. Archaeologists and other users of archaeological information are informed by a broad range of things from printed, digital and oral to embodied sources and archaeological sites and artefacts (e.g. Huvila, 2006; Zahlouth & de Paiva, 2012; Huvila, 2014a; Olsson, 2016).

What is then knowledge-making in practice? As the examples throughout the book demonstrate, knowledge-making happens everywhere and it is a part of the social conduct and materialities of doing archaeology (similarly to how it is a part of scholarly practices in general, Barad, 2007). There is certain disagreement whether archaeology should be seen primarily as a discipline that produces "knowledge from inside" (Ingold, 2016) at the moment of first observation (like anthropology), or whether it is a discipline based on revisiting those observations documented for later analysis and use (Hicks, 2016b). A valid remark is that also the primary observations are made on another kind of an 'archive', that of the archaeological traces (Olivier, 2015). Instead of one of the extremes, a closer look at archaeological work both in the chapters of this volume and elsewhere in the literature, shows rather convincingly that archaeologists do the both – which does not negate the relevance of debating the primacy of visiting or revisiting because there is a fundamental difference between examining the theoretical underpinnings of archaeological inquiry and explicating how archaeologists are working in practice. Even if it can be debated whether archaeology is, for instance, "the study of the past at the present" (Edgeworth, 2006, xi) or the "temporality of landscape revisited" (Hicks, 2016a, 34) as Hicks (2016a) does, in practice, as the debate shows, archaeologists can be doing the both. There is no doubt that visiting a site and observing in person has a special role in archaeological knowledge-making but at the same time, it is equally apparent that the *longue durée of* archaeological or archaeology-related knowledge-making only starts when someone engages in (archaeological) fieldwork, makes first observations and produces documentation. If not forgotten, the documentation (in some texts, e.g. Hicks 2016b, "archaeological knowledge") ends up in a continuum (Upward, 2000; Upward et al., 2013) of organising, managing, use and reuse similarly to how archival records have many parallel lives and uses instead of one singular life-cycle (McKemmish, 2001).

The forthcoming examples in this volume show that even if archaeology can be described as a discipline with a passion for collecting (e.g. Shanks, 2012) not only in theory but also in practice, the practical archaeological knowledge-making is equally ambivalent in its rapport with the use of these collections in its disciplinary enterprise of making knowledge than the theorists (e.g. Hicks, 2016b; Edgeworth, 2016; Hicks, 2016a; Ingold, 2016; Baird & McFadyen, 2014; Edgeworth, 2006) are. Similarly to how most things can be informative but not everything is information (Buckland, 1991), not all things are equally central or valuable for knowledge-making (Bazerman, 2012). The socio-material practices of making knowledge are both conditioned by and manifesting theoretical paradigms, policies on both disciplinary and societal levels, and politics of disciplinary practices (Epstein, 2003). Similarly, knowledge-making is framed by the multiple contexts of its making, makers and projected uses. At the same time, however, the materialities and premises of knowledge-making itself have an influence on theoretical developments. Even if there would be no direct causality between postmodern ideals and digital practices (Hand, 2008), or the emerging of new types of information and paradigmatic changes in a scholarly discipline (Kristiansen, 2014b), they are not disconnected (Huvila, 2014b).

In addition to the context within which it is happening, Haviland and Mullin (2009) point to another pertinent locus of knowledge-making, namely to those who are making knowledge. As a form of work and "epistemic design" (Cope & Kalantzis, 2011a) referring both to the design of a thing (as a noun)

i.e. its morphology, and to the act of making or marking out (Lat. *designare*) knowledge (Cope & Kalantzis, 2011a), knowledge-making is a form of authoring (Haviland & Mullin, 2009), which is performed by someone and attached with particular, yet varying forms of authorship (Huvila, 2012a) that pertain not only to knowledge as metaphorical creating and making of knowledge but to how embodied artisanal acts of making knowledge can be literally generative of new ways of interacting with the world (Smith, 2004). In archaeology, the role of field directors or academic researchers as knowledge-makers is hardly disputed but the chapters in this book show that in archaeology, similarly to knowledge-making in other disciplines (Haviland & Mullin, 2009), there is a large number of invisible or half-visible knowledge-makers with a less clear and well-articulated roles.

One particularly relevant question is, of course, why certain knowledge-makers and why some practices of knowledge-making are less visible than some others. A partial answer is that practices remain visible unless they are articulated and individuals involved in them are engaged in articulation work (Strauss, 1988), to quote Suchman (1995), "making work visible". Morville (2014), a consultant and information architect offer two other, simultaneously simple and complex explanations: human nature and organisational culture. People are impatient when they are attempting to cope with their lives and seek fast, simple and most often, in practice, partial solutions whereas organisations have a tendency to have been built to function like machines composed of dedicated experts working detached from and unaware of each other without a clear idea of the whole and its constituents whether they are people or something else.

Digitisation and digital society from the perspective of archaeological knowledge-making

An aspect of knowledge-making that is especially significant in the context of this volume is the intimate relation of knowledge-making, and the modes or technologies of representing knowledge and its ingredients. Even if it is easy to exaggerate the impact of digital technologies in the context of archaeological work, there is no doubt that many things have changed and are changing. Digitality is both as insatiable and inescapable as Galloway (2014) claims but also misused (Brattli, 2016) to an extent that it has almost become a non-term. As we suggested already in the beginning of this introduction, it may be a part of a broad, perhaps paradigmatic, or at least substantial, shift related to information and knowledge-making in one way (e.g. as it is discussed in this volume), or another (Roosevelt et al., 2015), or as others have suggested, it may be related to a broader on-going shift of the scholarly paradigm (e.g. Kristiansen, 2014a) in archaeology. Many aspects from the big data to advanced visualisation technologies are changing how archaeology can be done. What is apparent, however, is that we do still know rather little about how digital technologies are influencing work in many sectors of life. Even if written as a remark of the current limitations of activity theoretical approach, Lompscher's (2006) decade old observation of the limits of contemporary research effort to "grasp the principal far-reaching role of the computer and the Internet for society and for all kinds of human activity" (Lompscher, 2006, 49) could be expanded beyond computers and Internet and that specific theoretical approach to the research about the digital. Digital mediation of archaeological information is changing how archaeology can be experienced and we know some of the problems with many digital approaches (Boast & Biehl, 2011) but we know still relatively little about what is being mediated and how it should be valued and trusted in terms of authenticity and realism. Is digital leading to a very particular digital version of the past or bringing the past closer to us?

In contrast to opposite claims and high hopes, digital tools have not reduced the time required for learning (Cook et al., 2010). The nearly ubiquitous access to information (Dutton, 2007) has not significantly simplified how we make decisions (Fioroni & Titterton, 2009, 89). Simultaneously, phenomena like the Open Access and Open Data movements show, the ubiquitous access is to a varying degree a reality and a promise that comes closer when an increasing number of resources become freely available for anyone, and distances every time when a new paywall or limitation to universal access is erected. What has happened is that the digital information technologies have begun to change the assumptions of how things are and should be knowable (Huvila, 2012b), what and how information, information sources and infrastructures should be trusted (Sundin & Carlsson, 2016), and whether information work is to be considered as a rational, emotional or 'everyday-rational' enterprise (Huvila, 2016a). In this broader sense, the impact of digitisation and that of 'the digital' as a form of technology is functioning on a cultural and societal rather than on an individual or a technical level.

Typical literary references to the notion of the digital as a quality of the contemporary society can be criticised for their lack of clarity and consequently, their limited usefulness as analytical concepts. However, also the opposite, very specific attempts to dissect the notion of digital society may be missing a point in their demand of a highly literal understanding of digitality and its role in social intercourse. Characterising our contemporary society as "The Digital Society" can be criticised because the present society is not constituted by the digital and its essential aspects are not an outcome of digital technology (Martin, 2008). Our take on the notion in this volume is slightly less rigid. For us, the digital society is a context characterised by the ubiquity of 'the digital' within which archaeological practices and information work take place rather than an essentialistic entity. It is a powerful metaphor that can stand as a reminder of that digital technologies and 'the digital' as a technology has had and is having an incontestable, either direct or indirect, impact on virtually all human pursuits, including archaeological work. Precisely because the digital technologies and the metaphor both participate in attaching meaning to the contemporary society, we find that the notion of digital society is a useful conceptual tool for underlining the societal aspects of digitality in the contemporary context and to emphasise how archaeological work is conditioned not by the digital not only within archaeology but also in a wider societal context.

The emergence of digital technologies has obvious implications in the context of knowledge-making. Cope and Kalantzis (2011b) suggestion that "the transition from print to digital text has the potential in time to change profoundly the practices of knowledge-making, and consequently knowledge itself" does not apply only text but also all other modes or technologies involved in the process. Much of knowledge-making in the contemporary society is conditioned by pre-digital practices both in archaeology (Huvila, 2016b) and beyond (Cope & Kalantzis, 2011b), but in contrast to suggestions made for some years ago, there are not only tentative possibilities (Cope & Kalantzis, 2011b) but also actual indications that even academic and professional knowledge-making practices might be changing. General patterns of knowledge-making in the society are following the logic of the convergence culture (Jenkins, 2006, 2014), culture of participation (Huvila, 2012b), or the (affective) capitalism of knowing (Huvila, 2016a), and to a certain extent it seems that knowledge-making is becoming more dynamic, participatory, responsive and recursive (Cope & Kalantzis, 2011a), chains of trust become more convoluted (Davidson & Goldberg, 2010) even in academic and professional contexts. Still it would be wrong to assume that influence of the digital in the context of specific disciplinary practices would be as uncomplicated as that, or that it would be good or bad *per se*.

On terminology

As already stressed, this book is about archaeology as much as it is a book in archaeology. We, as the authors of this volume, write about *archaeological practices* in a broader sense than as a reference to mere field practices. In some of the chapters references to specific practice theories (e.g. how the notion is used by Pickering, 1995) are more explicit whereas others refer to them in more general sense. Instead of trying to define a fundamental archaeological practice (cf. e.g. Aitchison, 2007 who notes that different archaeologists have different ideas of what constitutes "archaeological practice"), our interest in in the diversity of different practices archaeologists are engaged in.

The different chapters refer also to *archaeological documentation.* Similarly to, for instance, Gardin, documentation (the outcomes of something being documented) is in this volume considered to be a superordinate concept and data is seen as one type of what is documented in and about archaeology. However, what is acknowledged here is that *archaeological data* can be many things and many things can be archaeological data. With this concept, this volume are probably the most incoherent and vague as archaeological data is understood rather loosely as anything that can function as an ingredient for archaeological information and knowledge, however, without a capability to directly inform anyone.

The understanding of documentation comes close to how the term is used in documentation studies (Lund, 2010). Documentation (as noun) is an outcome of documentation (verb and activity) of something by someone. In archaeological context is it is often a question of documenting observations during field or laboratory investigation and documenting how these observations were done. As several of the chapters in this volume show, documentation is done and created also as a part of many other types of archaeological activities from archiving to exhibition design and beyond, either directly or indirectly. Similarly to how we write about archaeological practices and other concepts, instead of trying to reach a full consensus we have strived to a general shared understanding, however, maintaining eventual nuances in how each of us perceive and use concepts to convey our views.

Chapters

This volume consists of eight chapters written by the members of the Archaeological Information in the Digital Society research project funded by the Swedish Research Council grant "Digitized Society - Past, Present, and Future". Of the authors, Dell'Unto, Löwenborg, Petersson and Stenborg are archaeologists by training whereas Börjesson and Huvila represent the field of information studies. These are not the only fields represented though as different authors have background and interest in various neighbouring fields from museum and archival studies to heritage studies, and geographical information science and statistics to computer and information systems science. The volume has been written in company but not together to give room for different perspectives and to retain the polyvocality of bringing different disciplinary perspectives together. As such, it is of them all without being a work of theoretical or empirical inquiry into archaeology, information studies research on archaeological information work, or, for instance, an archival studies investigation of records management in archaeology.

As a whole this volume ended up revolving around two major themes of information and data and that of visual approaches. However, instead of being a two-part volume, these two themes converge with each other and with a large number of other themes that emerge in different contexts to be brought together and explicated again later in the volume. Börjesson and Huvila write about the prospects of making digital archaeological data available for future knowledge-making. The chapter is based on the results of two interview studies of archaeologists working in and with Swedish contract

archaeology sector. Löwenborg's chapter discusses the use of big harmonised GIS data sets from a large number of excavations in archaeological knowledge-making.

Whereas Löwenborg's take on archaeological fieldwork is based on statistics, the chapter of Dell'Unto focuses on fieldwork but instead of a macro-level perspective, it takes a micro-perspective to knowledge-making at an excavation and instead of statistics, it is based on a visual approach. In contrast to the long history of claims that visual methods are useful for archaeological reasoning, Dell'Unto digs deeper in the question and discusses how and on what premises how real-time visualisation in field converges and benefits archaeological knowledge-making. Petersson, in collaboration with Larsson, continue with the theme of visual approaches but instead of investigating it in the context of fieldwork, their perspective is on museums and the impact of digitisation on storing and storytelling for heritage communication. Petersson draws from an extensive review of examples of the use of digital technologies for conveying archaeological information from the Nordic countries, including projects they have been participated as observers and designers. Stenborg continues a related line of inquiry in his chapter on the mediation of archaeological information. He draws from two case studies of the mediation of archaeology in two seemingly distant but in many respects related cases related to medieval Swedish and indigenous Brazilian artefacts and their afterlife as artefacts and digital objects.

This volume is concluded by two chapters and an epilogue. First, Huvila draws together insights from the earlier chapters in the book to outline a more systematic understanding of archaeological information work. Whereas the first of these two chapters scrutinises information, the final chapter of the book expounds on the question of the impact of the digital by outlining the *loci* of its influence on archaeological information work on the basis of the empirical and practical findings of the authors of this volume.

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